



KERALA WATER AUTHORITY



DETAILED PROJECT REPORT

for

**AUGMENTATION OF WATER SUPPLY SCHEME TO
KOCHI CITY AND ADJOINING AREAS (PHASE I)-
CONSTRUCTION OF 190 MLD ULTIMATE
CAPACITY WATER TREATMENT PLANT
AT ALUVA AND ALLIED WORKS**

Prepared by Special Team, KWA

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CERTIFICATE

This is to certify that the detailed project report titled “**AUGMENTATION OF WATER SUPPLY SCHEME TO KOCHI AND ADJOINING AREAS (PHASE I)- CONSTRUCTION OF 190 MLD ULTIMATE CAPACITY WATER TREATMENT PLANT AT ALUVA, ERNAKULAM**” has been prepared by the special team constituted as per the decisions taken in the online meeting conducted by Additional Chief Secretary, Water Resources Department, Govt of Kerala on 18.01.2022. It was decided to constitute a special team to expedite the design and tender for the proposed WTP at Aluva without any patented technology. The team consisted of the following members:

Team Leader:

1. Dr. Shyju P. Thadathil, Executive Engineer, PPD Camp office, KWA, Kochi

Members:

2.Sri. Bijeesh D., PA to SE, P H Circle Kochi.

3.Sri. Mohammed Ashraf, Assistant Executive Engineer, Project Division Perumbavoor

4.Smt. Sindhu C. Nair, Assistant Executive Engineer, Project Division, Kochi

5.Sri. Ajith K Thankachan, Assistant Executive Engineer, O/o the Chief Engineer, NR, Kozhikode.

6.Smt. Ruxana S., Assistant Executive Engineer, O/o the Chief Engineer, SR, Thiruvananthapuram.

The special team stationed at head office and worked for three weeks from 21.01.2022 and completed the hydraulic design, detailed structural design, structural drawings, detailed estimates and completed the detailed project report with all requirements to render technical sanction.

EXECUTIVE SUMMARY

The Detailed Project Report (DPR) has been prepared for providing a Water Treatment Plant (WTP) benefitting directly and indirectly Corporation of Kochi and surrounding areas of Municipalities and Grama Panchayaths. For the project area consisting of one Corporation, 5 Municipalities and 13 Grama Panchayaths, a master plan for drinking water distribution has also been prepared which can be modified in accordance with better possibilities in future. The proposed WTP is to be constructed in the 1.57 Hectares of land owned by KWA at Aluva which is very near to the present WTP complex. As an initial part of the study, the Project Planning and Development wing, Project Division, Perumbavur and higher officials of Kerala Water Authority had visited the proposed site and conducted several discussions and collected all basic data and information for design of the system. A special team was constituted on 21st January 2022 to expedite the DPR preparation task. The special team worked continuously for four weeks and prepared the DPR consisting of all relevant information, observation and analysis. The detailed hydraulic and structural design of the WTP has been prepared as described in DPR. This aspect has contributed to the new way of approaching project planning, designing and execution for important and complex works. It is observed that 190 million Liters per Day (MLD) ultimate capacity WTP is required for the total project area to fill the gap of water demand by the end of 2050 considering probable accelerated growth. Considering the special nature of raw water turbidity issues at the Periyar River, the clarification units are designed with up flow type units with plate settlers at top. For filtration units, dual media filter beds are provided to enhance quality and to minimize footprint area. The water demand estimation has been performed in the conservative way and hence it will be adequate for even next 3-4 years after 2050. Total estimated cost for the construction of WTP, intake works, raw water and other transmission lines is observed to be **Rs. 285 Crores (Rupees Two hundred and Eighty-Five Crores Only)** including 18% GST and 10 years operation and maintenance costs. Total 10 years operational expenses excluding power charges are estimated to be **Rs. 30 Crores (Rupees Thirty Crores Only)** including 18% GST. The WTP is to be equipped with sludge handling and disposal units also. It is planned to provide ecofriendly units for the system with gardens especially for the exterior portions of the units. For conserving energy and optimizing performance of the system solar energy source is also planned to be used. Also, for trouble free performance of the system, at all points of influence, sensors for measuring values of flow and required parameters are to be installed. Using Internet of Things (IoT) enabled software system, the control of the entire process can be performed effectively. It has been planned to implement the project within a short span of time.

PROJECT AT A GLANCE

Sl. No.	Item	Description
1	Name of Project	Interim augmentation of Water Supply Scheme to Kochi and adjoining areas (Phase I)- Construction of 190 MLD Ultimate Capacity Water Treatment Plant at Aluva, Ernakulam District
2	Name of District	Ernakulam
3	Project area	Kochi Corporation, 5 Municipalities and 13 Grama Panchayaths
4	Source of raw water	Periyar River, at KWA headworks, Aluva
5	Ultimate Capacity of WTP	190 MLD
6	Components	Aerator, Channels, Horizontal flow Baffled flocculator, Sludge blanket clarifier with plate settler, Dual media filters, Disinfection units, Wah water and air wash units, Clear water reservoir, Overhead reservoir, Pump house and Chemical house
7	Total Project cost	Rs. ₹ 285 Crores (including 18% GST)
8	Project cost for WTP alone	Rs. ₹ 94.05 Crores (including 18% GST)
9	10 year operational and maintenance cost	Rs. ₹ 30 Crores (including 18% GST)
10	Implementation agency	Kerala Water Authority
11	Period of execution	14 Months

ABSTRACT OF ESTIMATE

ABSTRACT OF ESTIMATES				
Sl.No.	Est.ID		Name of work	Amount (Rs.)
1	2022/51 52	1	Relaying the existing pipelines-working charges	₹ 15,00,647
		2	Relaying the existing pipelines-cost of materials	₹ 35,31,791
		3	Clear water pumping mains-working charges	₹ 2,07,22,759
		4	Clear water pumping mains-cost of materials	₹ 6,23,24,485
		5	Valve chambers for pipelines	₹ 2,85,260
		6	Road restoration for pipelines	₹ 5,09,17,719
2	2022/51 76	1	Demolishing existing structures	₹ 32,00,049
		2	Compound walls and gate	₹ 1,06,40,552
		3	Service roads	₹ 36,34,463
		4	Yard lighting	₹ 25,36,313
		5	Solar energy installations	₹ 72,00,000
		6	CC TV camera installation	₹ 4,52,400
		7	Landscaping and gardening	₹ 12,88,207
		8	Drainage arrangements	₹ 18,97,884
3	2022/57 34	1	SCADA and Automation	₹ 4,16,44,521
		2	Supply, erection and commissioning of 1000KVA and 500KVA transformer	₹ 1,23,30,922
		3	Supply, erection and commissioning of clear water pump sets	₹ 1,02,51,348
		4	Power allocation and UG cabling	₹ 90,00,000
4	2022/38 54	1	Aerator	₹ 1,15,32,008
		2	Raw water channels	₹ 98,76,979
		3	3D models for display etc.	₹ 5,01,660
5	2022/50 70	1	Flocculator, clarifier and channels	₹ 18,31,76,535
		2	Sludge pit 6m Dia	₹ 20,93,169
6	2022/50 56	1	Filter house block-1, block-2 and block-3	₹ 39,44,27,944
		2	Water supply and sanitary fittings	₹ 6,33,206
		3	Supply and fixing of laboratory items	₹ 10,16,585
7	2022/51 43	1	Clear water pump house	₹ 2,47,24,233
		2	Clear water channels	₹ 89,04,653
		3	Building for Substation and transformer	₹ 43,95,859
8	2022/49 83	1	Chemical house	₹ 2,30,63,446
		2	Chlorine room	₹ 34,37,213
		3	Chlorinator	₹ 24,00,000
9	2022/56 42	1	Supply and fixing of pipes and fittings and pumps and motors	₹ 3,92,55,992
		3	Electrical items for WTP	₹ 1,82,90,261
			TOTAL	₹ 97,10,89,065
			GST @ 18%	₹ 17,47,96,032
			Unforeseen items	₹ 2,41,14,904
			GRAND TOTAL FOR WTP AND ALLIED WORKS	₹ 1,17,00,00,000

11		1	Ten-year maintenance of the WTP and other connected components. (Only the electrical energy charges payable to KSEB during the maintenance period shall be borne by KWA.)	₹ 25,04,12,022
			GST @ 18%	₹ 4,50,74,164
			Unforeseen items	₹ 45,13,814
			Total	₹ 30,00,00,000
			GRAND TOTAL (including 10 years O&M expenditure)	₹ 1,47,00,00,000
12		1	Cost of construction cost of WTP alone	₹ 79,70,24,085
			GST @ 18%	₹ 14,34,64,335
			TOTAL	₹ 94,04,88,420
1	2019/86 05	1	Intake well cum pump house, pump set and 1829 mm raw water pumping main	₹ 19,98,37,803
2	2022/80 78	1	Clear water pumping main from WTP to Kalamassery areas	₹ 72,07,92,761
3	2022/80 73	1	Laying of equivalent pipeline of 1626 mm dia from headworks to Nirmala School Junction	₹ 22,81,00,054
			TOTAL FOR INTAKE WELL AND PIPELINES	₹ 1,14,87,30,618
			GST @ 18%	₹ 20,67,71,511
			Unforeseen items	₹ 2,44,97,871
			TOTAL	₹ 1,38,00,00,000
			GRAND TOTAL (including 10 years O&M expenditure + intake and pipelines)	₹ 2,85,00,00,000

CHAPTER 1

INTRODUCTION

1.1 BACKGROUND AND PROJECT GENESIS

Kerala Water Authority (KWA) was established on 1st April 1984 under the Kerala Water and Wastewater Ordinance 1984 to provide for the development and regulation of water supply and wastewater collection and disposal. Vision of KWA states that it would provide quality water and wastewater services in an environmentally friendly and sustainable manner. Mission of KWA emphasizes that it would transform themselves to a consumer-friendly organization providing services at the doorstep. As a strategy, KWA will achieve this by being open and honest in their business dealings and impart financially self-sufficient set up with valuing and developing their employees by continuously improving their work practices.

Kerala being a State of high population density and urban nature in its social set up, providing clean and enough drinking water to the people is a challenge albeit plenty of rivers and water bodies are present. This is since many parts of the topography are a concern for gravity/pressurized distribution through piped networks and presence of natural source of pure water is under a threat from environmental pollution. Many of the coastal zones where population density is very high, natural water availability from open wells, ponds or borewells is scarce due to factors like salinity intrusions. Hence for drinking water availability, the State of Kerala depends upon KWA substantially and Kochi and adjoining areas are no exemption.

Since the Kochi Corporation and adjoining areas are the fastest developing zones in Kerala, providing adequate quantity of high-quality drinking water for its domestic, non-domestic and industrial requirements is matter of extreme importance. KWA is the major drinking water provider for Kochi and based on systematic analysis, it is estimated that by the end of 2050, 478 million liters per day of purified drinking water will be required for the Kochi Corporation and surrounding areas (the gap with existing supply being 143 MLD). However, considering the probable accelerated growth of Kochi and adjoining areas the total demand in the project area is expected to be 600 MLD. Hence a new project proposal as an augmentation to the current system has been worked out. It is proposed to construct a new WTP of 190 MLD ultimate capacity at the KWA own land at Aluva. It will be an easy task to feed the zones surrounding Aluva from this new WTP and hence the existing WTPs can cater the demand of Kochi Corporation comfortably. Since the availability of the area of land is only 1.57 Hectares, it has been a challenge to plan and design a modern type WTP without compromising quality of the treated water. A special team comprising of the engineers of KWA was constituted as per the vision of the Chairman of KWA on 21st January 2022. The team was entrusted with the task of preparing a Detailed Project Report (DPR) for the construction of 190 MLD WTP at Aluva with all requirements of analysis and design of its components within a time span of three weeks.

1.2 OVERVIEW OF SITUATION AND GOALS

A social survey conducted by the students and faculty group of SCMS School of Engineering, Karukutty, Kochi revealed that out of various drinking water sources about 74% of households in the corporation area depend on Kerala water authority (KWA) to meet their water demand. Survey among the population depending on tanker water supply revealed that 60% of the people are not satisfied with quality of water that they get. People commented that ground water quality in the corporation area degraded in recent years. About 45% of households had their drinking water wells at less than 7 m distance from septic tanks. Though 95 % households confirmed boiling of water before drinking; only 10 % had installed any kind of water purification system in their houses. For the case of Municipalities surrounding Kochi Corporation, the situation is not better. For Thrikkakara and Kalamassery area, the quantity of purified water supply is not adequate. Due to the problems in clear water transmission and distribution, there are many tapings in the major distribution pipelines coming from the existing WTPs at Aluva towards Kochi. To eliminate the complex issues in water distribution, it has been planned to remove all tapping points from the major transmission mains from Aluva towards Kochi and the demand of Aluva region will be met by the new WTP at Aluva. Hence the goal of this project is to scientifically distribute purified water as equitable and adequate as possible without disturbing the current system.

1.3 VISION OF WATER SUPPLY STRATEGY

As per the vision of KWA all habitations in Kerala must be provided with clean, safe and adequate quantity of drinking water ensuring and sustaining good public health and environmental outcomes for all citizens, with a special focus on for the poor and women with specific focus on the diverse topography of the state and its implications. Hence the overall vision can be defined as the achievement of the project area with adequate quantity of drinking water to every household in 24 x 7 concept. Improved Institutional governance and enhanced human resource capacities for planning and maintaining the water supply is also coming under the goal. Capacity building for adoptability to modern technologies and applications for the service providers is also another goal.

1.4 ORGANIZATION OF DETAILED PROJECT REPORT

The Detailed Project Report (DPR) for the construction of the 190 MLD WTP and allied works has been prepared by KWA and presented in 7 chapters, describing different project concepts and activities.

Chapter 1 deals with a general introduction to the subject. Vision and goals of the water supply for entire project area and its social implications are described.

Chapter 2 describes the water supply master plan for Kochi Corporation and its adjoining areas.

Chapter 3 illustrates the planning and design aspects of the water treatment plant in detail. Hydraulic design and structural design aspects are separately dealt with.

Chapter 4 deals with the unit operations and treatment process in details. Various components of the water treatment system and its design aspects are also described in detail.

In Chapter 5, detailed estimates for all components of the sewerage project are illustrated briefly. The estimates prepared in PRICE software are included as annexure.

Chapter 6 deals with various aspects of operation and maintenance of the water treatment plant in detail. Since it is decided to impart optimum cost and functional aspects of operation, applications of modern technologies for control of the process are also dealt with.

In the concluding Chapter 7, observations gathered from the pre-feasibility studies for the planning, design and implementation of the water treatment system for the project area is presented. Action plan for the implementation of the project and recommendations for future additions are also dealt with.

CHAPTER 2

WATER SUPPLY MASTER PLAN FOR KOCHI

2.1 GENERAL

Kochi, the headquarters of Ernakulam District is located on the southwest coast of India at 9°58'N 76°13'E, spanning an area of 94.88 square kilometers (36.63 miles²). The city straddles the backwaters, encompassing the northern end of a peninsula, several islands, and a portion of the mainland. To the west lies the Lakshadweep Sea, and to the east is the urbanized region in the rest of the mainland area. Much of Kochi lies at sea level, with a coastline of 48 km.

Ernakulam district is bestowed with all the geographical factors, which help the development of industry, and it is in the vanguard of all other districts in Kerala in the field of industry. The sea along the entire coast of the district and the backwaters abounds in fish of various kinds offer enormous natural facilities for both marine and inland fisheries. Kochi is an ideal place that supports fisheries in its various aspects like education, research, and development. The availability of all types of transport facilities viz., road, rail, canal, sea, air is a factor which is unique to this district. Ernakulam is the biggest commercial center in the state of Kerala. Its MG Road is the location of some of the biggest businesses in Kerala. The Metro Rail which connects Aluva, Ernakulam city and Thripunithura is a rapid transit system of traffic and attracts thousands of people. Lulu Mall which is biggest of its kind in India is situated at Edappally, nearly 8 km north of Kochi city.

The current metropolitan limits of Kochi include the mainland Ernakulam, Fort Kochi, the suburbs of Edappally, Kalamassery and Kakkanad to the northeast; Thripunithura to the southeast; and a group of islands closely scattered in the Vembanadu Lake. Kochi is the seat of High Court of Kerala, the highest judicial body in the state of Kerala. It is home to Cochin Stock Exchange, the only stock exchange in Kerala. Federal Bank, the fourth-largest Private-sector bank in India is in Aluva which is a suburb of Kochi. Smart city, which is the fastest developing industrial hub in Kerala is located at Kakkanad, 12 km away from the city. Kochi is the headquarters of the Southern Naval Command, the primary training center of the Indian Navy. The Cochin Shipyard contributes to the economy of the city. The fishing harbor at Thoppumpady is a minor fishing port in the state and supplies fish to local and export markets. To further tap the potential of the all-season harbor at Kochi, an international cruise terminal and several marinas are being constructed. The International Container Trans-shipment Terminal operating out of Vallarpadam, is India's largest trans-shipment terminal. India's fourth largest stadium and third largest cricket stadium, the Jawaharlal Nehru International Stadium located in Kaloor, is a major facility for football and cricket.

Kochi and its surrounding areas exhibit a high population density compared to the rest of Kerala. As already described in the previous sections, there is acute shortage of drinking water at several areas under Kochi. Since the present water treatment system and its distribution is nearly 60 years old (except few augmentation projects like HUDCO and JNNURM), a careful examination of the entire

project area to deliver a successful mechanism of drinking water distribution system is necessary. In this Chapter an attempt is made for the study of the project area for its water demand, distribution issues and a proposal for modifications in the form of a general masterplan for water supply system to Kochi is presented. **It may be noted that this is only a key plan for the area which is subjected to constant analysis and subsequent updating from time to time to render better performance.**

2.2 A BRIEF NOTE ON HISTORY OF WATER SUPPLY TO KOCHI

The first piped water supply scheme in Kerala was started in 1914 at Kochi. The first water treatment plant in Kerala was also started in 1914 at Chowara, Aluva. The water supply scheme was planned and implemented by the King of Kochi His Highness Rajarshi Rama Varma. Dutch technology for water treatment was adopted. Initial production was 3 MLD in 1934 and chlorination was started, and capacity was enhanced to 6 MLD in 1941. Also, electrification was done in 1952 and production was enhanced to 13 MLD. At present, the production is 63 MLD.



OLD POWER GENERATOR BY MIRRLEES BICKERTON AND DAY LTD., ENGLAND



CLARIFICATION TANK USED AT THAT TIME



OLD VENTURIMETER BY GEORGE KENT LTD., LONDON



OLD PUMP MANUFACTURED IN MANCHESTER, ENGLAND



KILN USED FOR MAKING HOT WATER

Figure 1 History through pictures- Chowara WTP at Aluva (photo courtesy-Manorama online)

2.3 PROJECT AREA

The project area for the water supply distribution master plan consists of **Corporation of Kochi, Aluva, Thrikkakara, Kalamassery, Eloor, Marad Municipalities and Kumbalam, Kumbalangi, Chellanam, Varappuzha, Cheranelloor, Kadamakkudi, Mulavukad, Elamkunnappuzha, Njarakkal, Nayarambalam, Keezhmad, Edathala & Choornikkara Grama Panchayaths** which are very close to Kochi city and surrounding it.

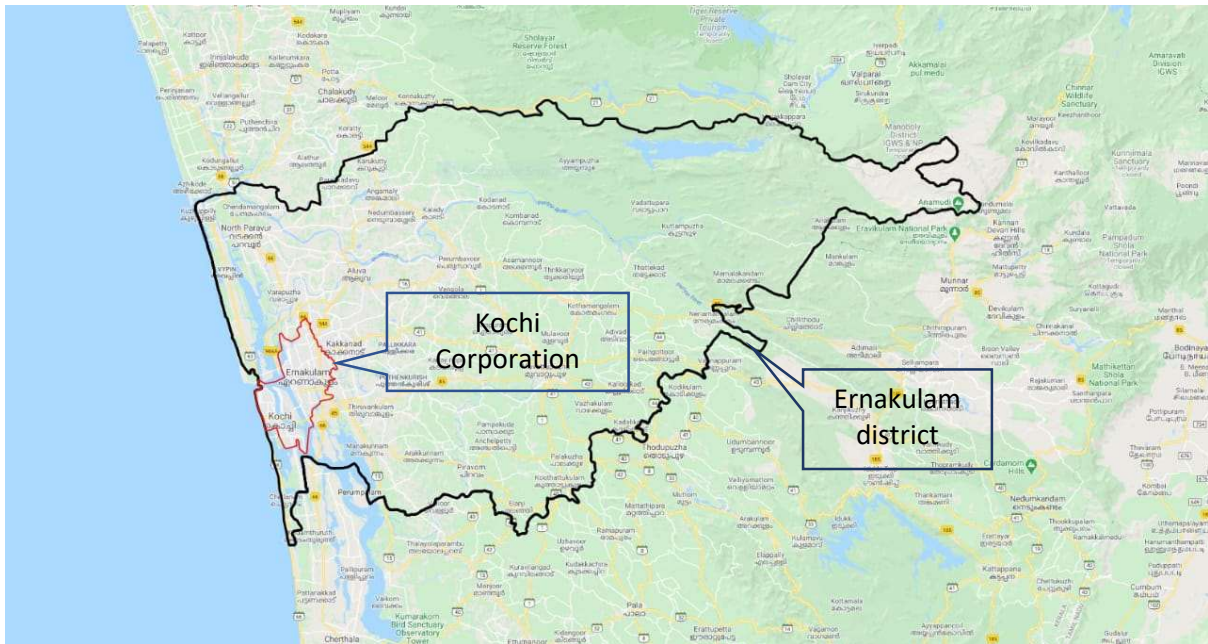


Figure 2. Google map of Kochi Corporation and Ernakulam District



Figure 3. Satellite image of proposed land for new WTP at Aluva

2.4 SOURCE OF RAW WATER FOR WATER TREATMENT PLANTS

There are 4 Nos. of water treatment plants working at the headworks at Aluva. The source of raw water is the River Periyar. For the water treatment plant working at Maradu, the source is the River Muvattupuzha. For a small water treatment plant of capacity 10 MLD at Muppathadam, the tributary of the River Periyar is depended upon. It is planned to construct a new intake well of 18 m diameter at the bank of Periyar River in the KWA headworks itself. Raw water pumping main 1829 mm outer diameter and made of MS will deliver raw water to the proposed WTP. The length of raw water is less than 500 meters. Both rivers are perennial in nature and hence there is abundant supply of raw water.



Figure 4. Source of raw water for WTPs at Aluva- Periyar River

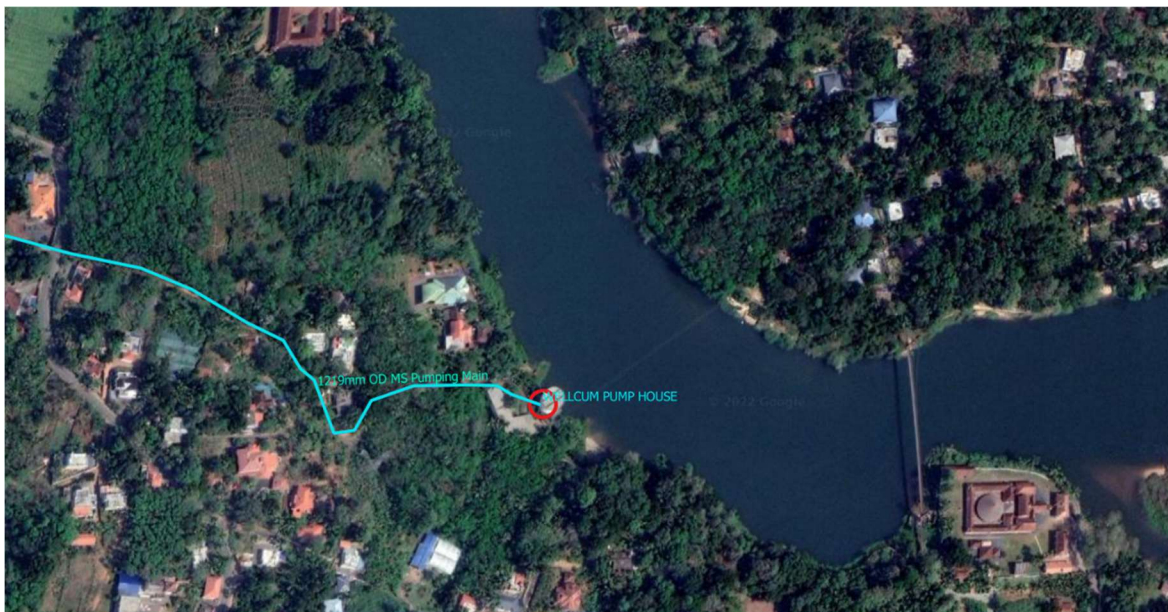


Figure 5. Source of raw water for WTP at Maradu- Muvattupuzha River



Figure 6. Existing WTP complex at Aluva and proposed site near to it

NEW PROJECT PROPOSAL FOR KOCHI CORPORATION
AND ADJOINING PANCHAYATHS

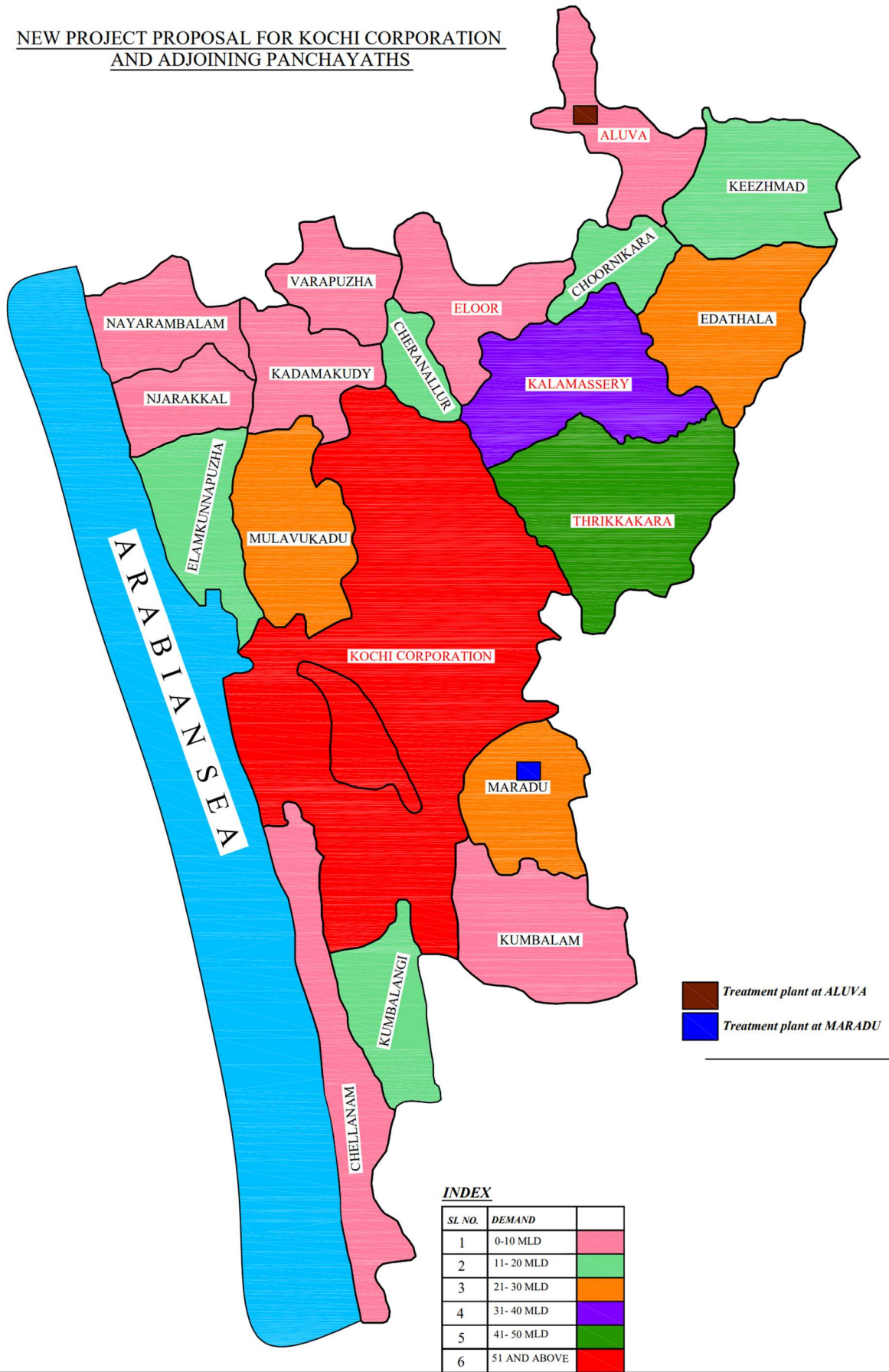


Figure 7. Water demand map for project area

2.5 PRESENT WATER SUPPLY SYSTEM TO KOCHI

There are four water treatment plants (WTP) working at KWA land at Aluva with a total production capacity of 225 million Liters per Day (MLD). The individual capacities of the WTPs are 48 MLD (WTP-1), 72 MLD (WTP-2), 70 MLD (WTP-3) and 35 MLD (WTP-4). At present 290 MLD is being produced daily with an overload of 30%. Out of these, 42 MLD is distributed from Aluva WTP site itself from an Overhead Tank (OHT) cum pumping to Aluva Municipality, Keezhmad GP, Edathala GP and Choornikkara GP. The rest quantity is supplied to Kochi Corporation, Eloor Municipality, Thrikkakara Municipality, Kalamassery Municipality, Njarakkal GP, Elamkunnappuzha GP, Nayarambalam GP, Mulavukad GP, Varappuzha GP and Cheranelloor GP. The treated water is carried towards Ernakulam area through three major transmission mains, the details of which are given below:

Sl. No.	Capacity of WTP in MLD	Year of commissioning	Major transmission mains			
			Diameter of pipeline in mm	Material of pipe	Year of commissioning	Discharge in pipeline in MLD
1	48	1965	900	CI	1965	53
2	72	1975	1050	CI	1975	82
3	70	1992	1200	MS	2003	127
4	35	2002				

Table 1. Details of existing WTPs at Aluva and major transmissions lines from it

From the 1050 mm CI transmission main, 14.40 MLD is given to the Kalamassery pump house through a tapping at Toshiba Junction. There is also a small tapping of 2.60 MLD towards HMT near to it. Also, 20.74 MLD is given to the CUSAT sump through another tapping. At CUSAT junction, 7.56 MLD is given to some portions of Thrikkakara, Edappally and Palarivattom area through a tapping called Edamula line. After that an 800 mm DI line is branched out towards Vaduthala sump to supply 16.80 MLD to Vypin area. After that 11 MLD is tapped to Thoppil pump house. Hence practically no water is reaching to the Thammanam pump house, the destination points of the 1050 mm CI line. From Kalamassery pump house, 7.70 MLD is distributed to Pachalam pump house for Kochi Corporation area, 4.56 for Eloor Municipality and 2.1 MLD for local supply and a special line to CUSAT. From CUSAT sump, 10.1 MLD is supplied to Thrikkakara OHT and 10.35 MLD to the OHT at CUSAT site itself which is for Kalamassery Municipality. Also, 0.31 MLD is supplied to Kalamassery Medical College. From Thoppil pump house, 11 MLD is given to Thrikkakara area. Out of the 16.80 MLD given to Vaduthala Sump, 3.67 MLD is supplied to Chittur and Kadamakkudi area, 3 MLD to Vaduthala area itself, 8 MLD to Vypin area and the remaining quantity to Vallarpadam and Mulavukad area. Due to a damage occurred in the 800 mm pipeline laid beneath the railway track at Perandoor, the quantity received at Vaduthala sump has become reduced. The 900

mm CI pipeline from Aluva is having smaller tapings at Vidakuzha, near Kalamassery which supplies 4 MLD to local network and HMT colony. The rest quantity of 48.80 MLD is reaching at the Perumanoor pump house at Ernakulam, its destination point. Out of these, 1.60 MLD is given to Cochin Shipyard and 2.20 MLD to Naval Base and Vathuruthy area in Wellington Island. Also, 4.80 MLD and 8 MLD are given respectively to Thoppumpady and Karuvelippady pump houses respectively for supply in Western Kochi area. The remaining quantity of 31.15 MLD is supplied to Ernakulam City area.

In the case of the 1200 mm MS pipeline from Aluva, there are no tapping till Samskara junction at Ernakulam and hence major quantity of 100 MLD is directly supplied to Ernakulam City through an interconnection to a 1050 mm CI line coming out from Thammanam pump house. At Samskara junction there is a 700 mm branch-out to supply North-Eastern side of City and Cheranelloor areas. However due to a flow control valve throttled at Samskara junction, the quantity obtained now varies from 90 to 100 MLD. This valve operation is performed to generate back pressure in the line to obtain adequate supply to tail ends of Cheranelloor area. The remaining quantity of 16 MLD is given to Elamkulam Sump and from there it is further supplied to Palluruthy and Edakochi areas of Western Kochi. The Thammanam pump house receives 11 MLD water from WTP at Maradu also. The pump house at Thammanam is mainly used to boost the supply to Corporation areas. From the 100 MLD WTP at Maradu, 6 MLD is supplied to Kumbalam GP, 14.40 MLD to Maradu Municipality, 19.60 MLD to Chellanam and Kumbalangi GPs and Edakochi area of Corporation, 9 MLD to Cochin Port and Navy, 22 MLD to Karuvelippady Sump for Western Kochi, 5 MLD to Thevara area of Kochi Corporation and 11 MLD to Thammanam pump house as said earlier.

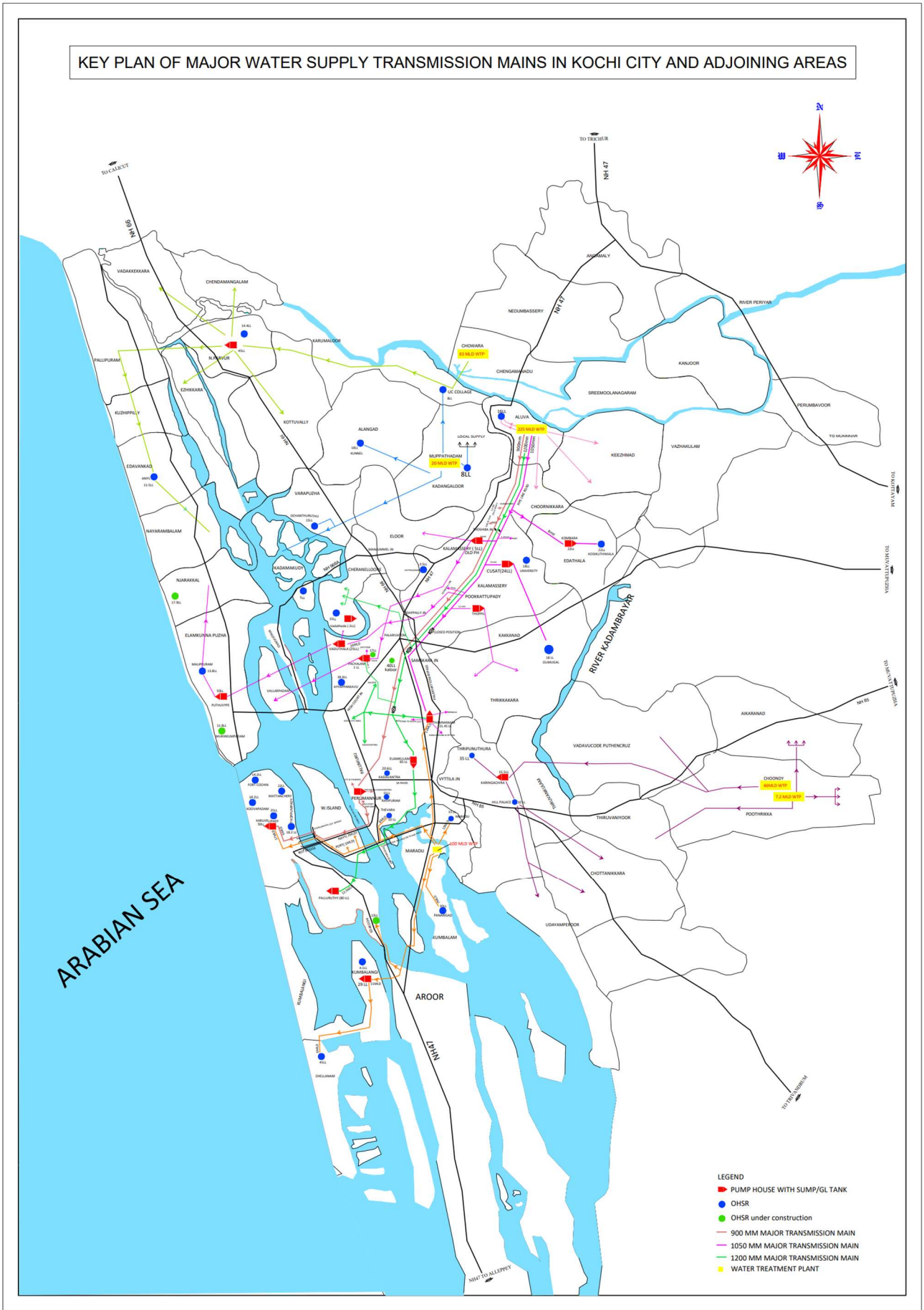


Figure 8. Key plan of major transmission lines in Kochi city and adjoining areas

KERALA WATER AUTHORITY

DISTRIBUTION FROM ALUVA HEAD WORKS (Existing distribution system)

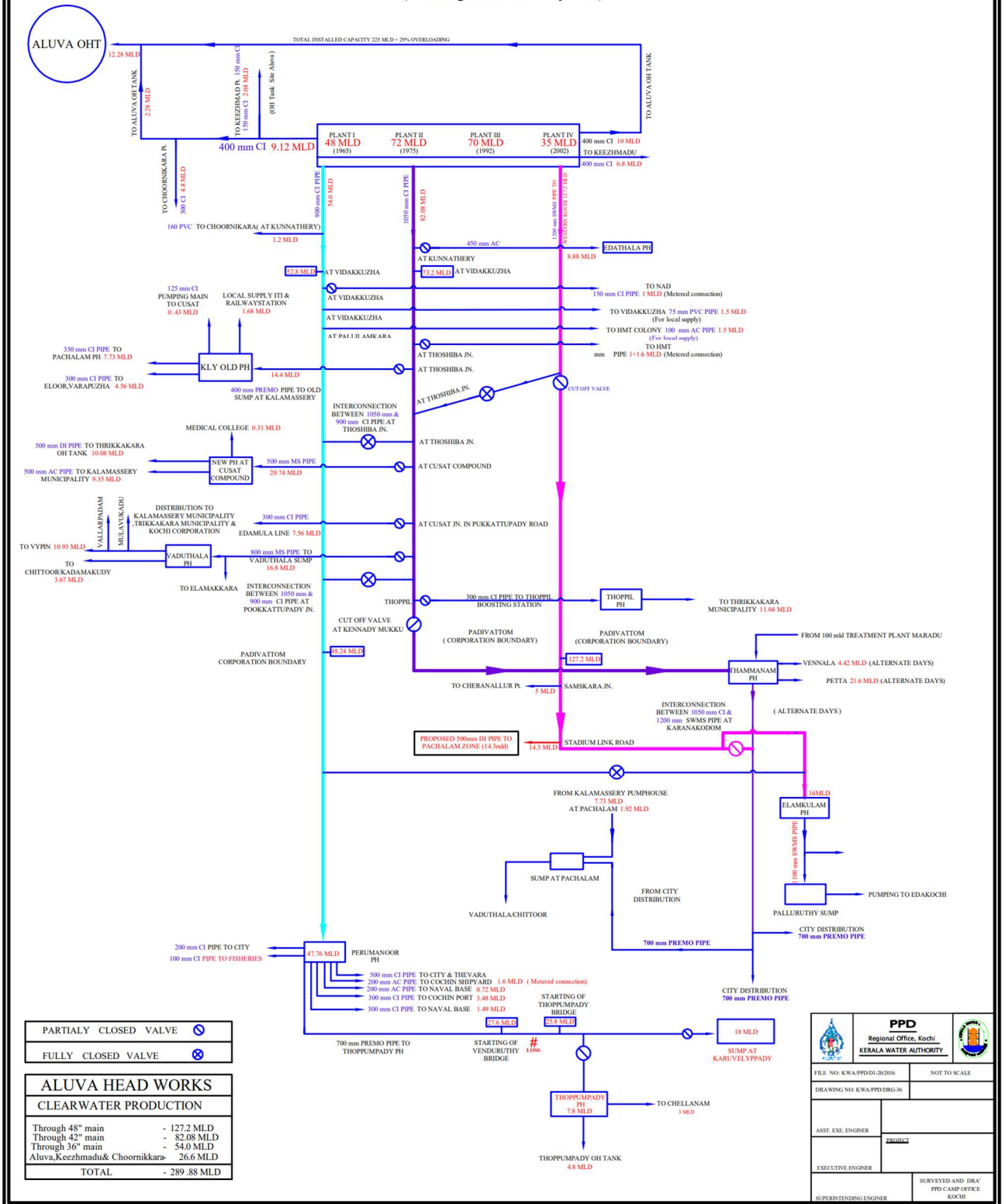


Figure 9. Existing distribution system from headworks at Aluva

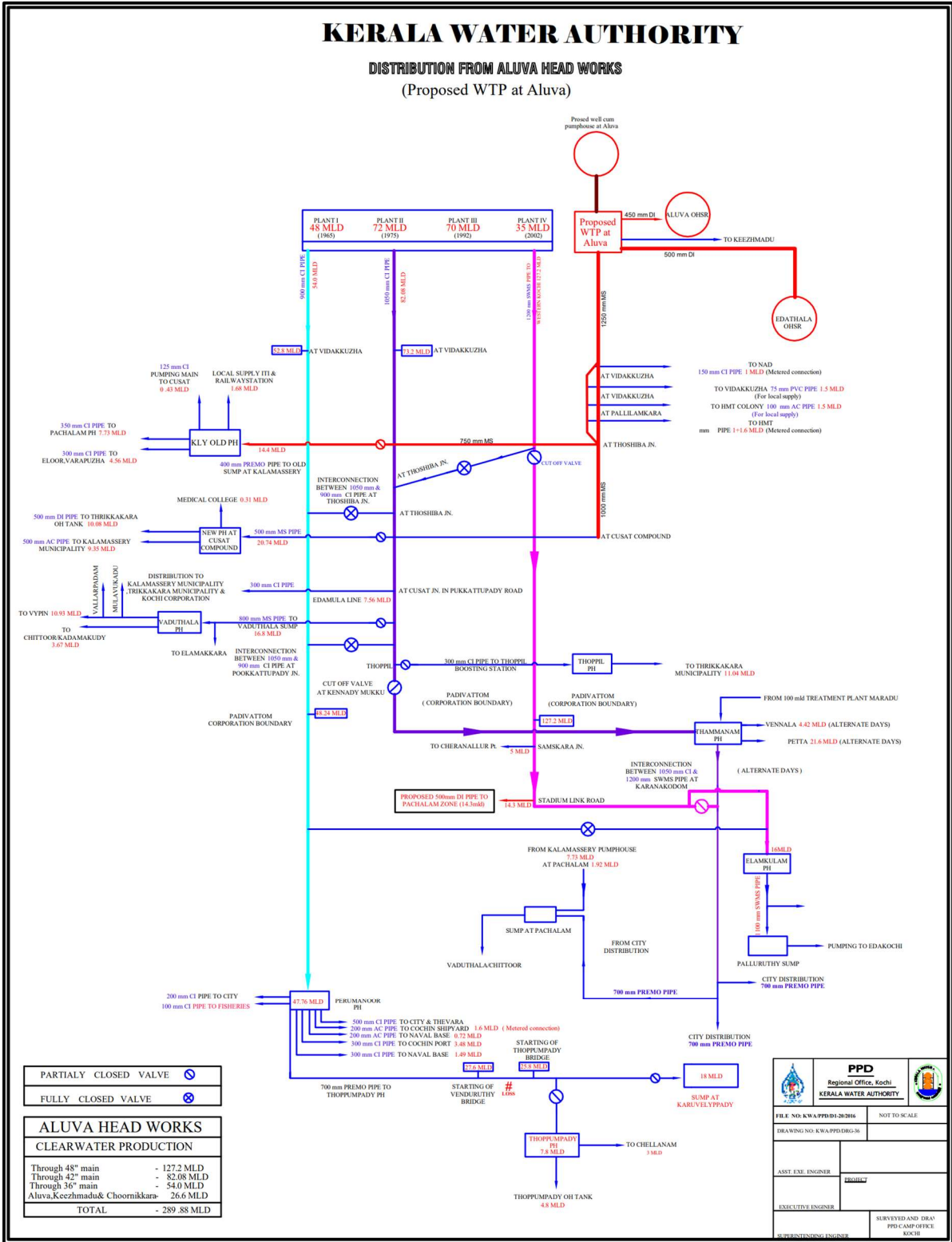


Figure 10. Distribution from Aluva with proposed 143 MLD WTP

2.6 DETERMINATION OF WATER DEMAND

Even though the growth of population for Ernakulam District for the last decade (2001-2011) is 5.69%, each component of the project area shows highly variable growth rate. Hence an average of the district growth rate and specific growth rate of each local body is taken separately for forecast of population for the entire project area. Total water demand in the above scheme area for the year 2050

is 478 MLD. This value has been determined with consumption at the rate of 150 LPCD for domestic use and all major and minor non-domestic water demand and floating population demand as per scientific studies and data available with KWA. 15% of the domestic, non-domestic and floating demand put together as the unaccounted water demand has also been considered. For floating demand, 70 LPCD is taken as per the CPHEEO recommendations since it invariably overlaps with non-domestic demands.

ERNAKULAM DISTRICT AVERAGE	5.69%
HIGHEST GROWTH IN THE PROJECT AREA– EDATHALA GP	22.46%
LSGs WITH NEGATIVE POPULATION GROWTH	
ALUVA MUNICIPALITY	-6.98%
NJARAKKAL GP	-1.68%
MULAVUKADU GP	-4.42%
LSGs WITH HIGHER POPULATION GROWTH	
KALAMASSERY MUNICIPALITY	12.55%
THRIKKAKARA MUNICIPALITY	17.18%
EDATHALA GP	22.46%
CHERANELLOOR GP	16.26%
KEEZHMADU GP	15.51%

Table 2. Population growth trend in project area from 2001 to 2011

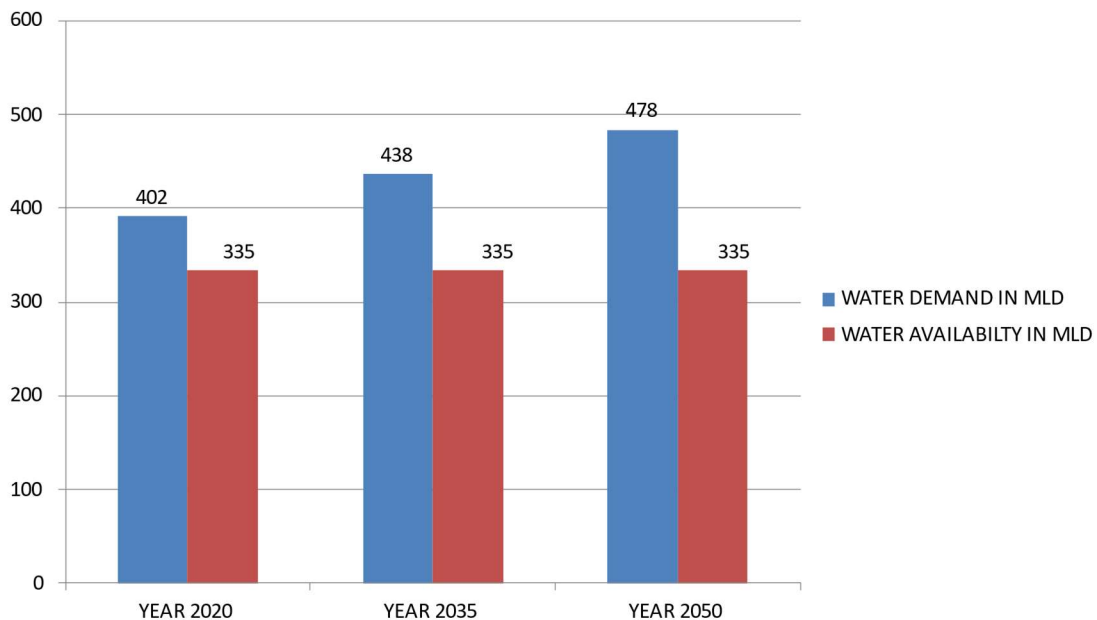


Figure 11. Water demand-deficit scenario for total project area

	YEAR 2020	YEAR 2035	YEAR 2050
DEMAND	402 MLD	438 MLD	478 MLD
AVAILABILITY	335 MLD	335 MLD	335 MLD
DEFICIT	67 MLD	103 MLD	143 MLD

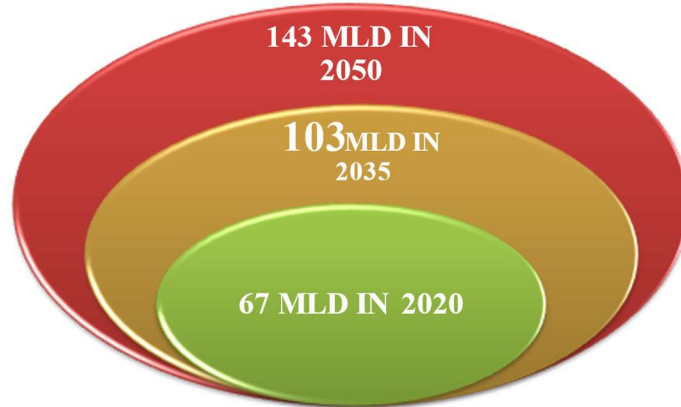


Figure 12. Scope for a new proposal of water treatment plant

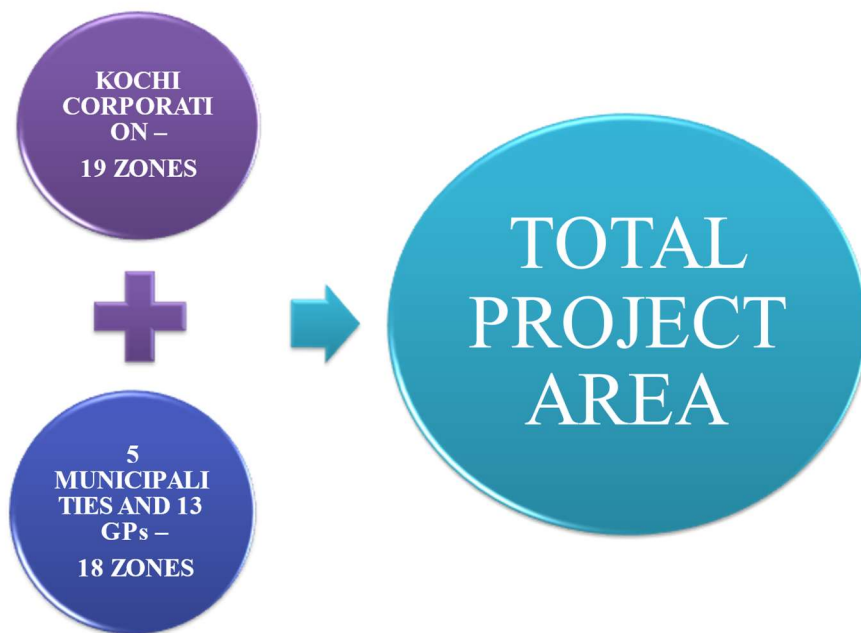


Figure 13. Zoning of project area for effective water distribution

The water demand in 2050 is worked out to 478 MLD by conventional methodology. The present production capacity through the existing water supply schemes is 335 MLD only. Hence to bridge the gap it is proposed to construct a WTP of capacity 155 MLD input so that 143 MLD treated water can be produced. This value of 155 MLD is arrived by considering plant operation time for 23 hours and losses at 4%.

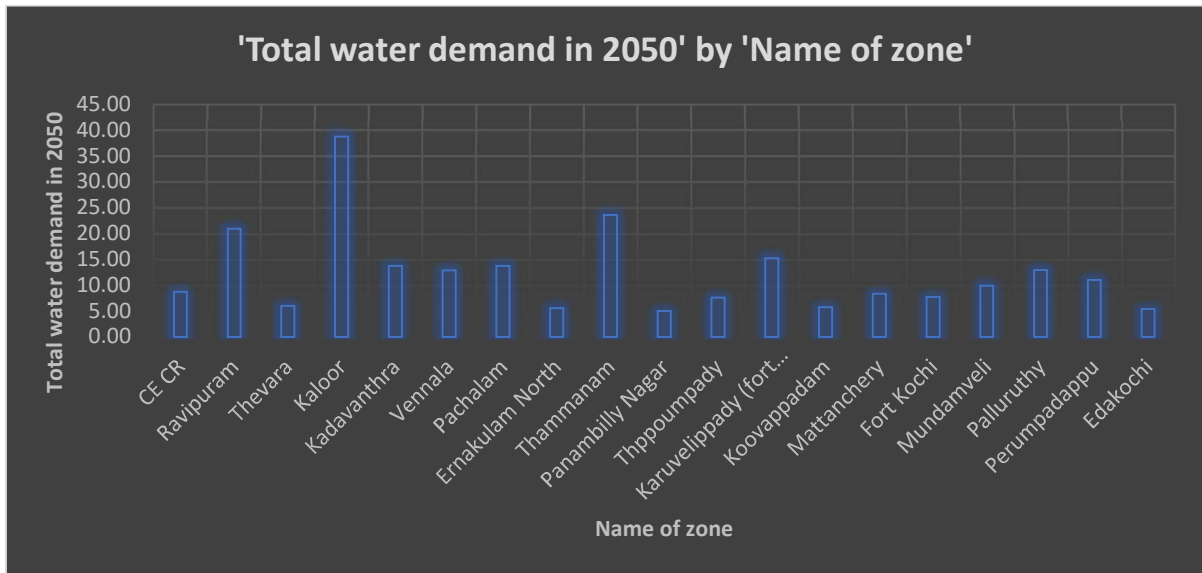


Figure 14. Zonal water demand for Kochi Corporation area

Kochi Corporation in two major zones	Total water demand in 2020	Total water demand in 2035	Total water demand in 2050
ERNAKULAM CITY	130.21	140.37	150.87
WESTERN KOCHI	70.04	76.06	83.54
Total demand in Corporation area	200.24	216.43	234.41

Figure 15. Variation of water demand in Kochi Corporation area

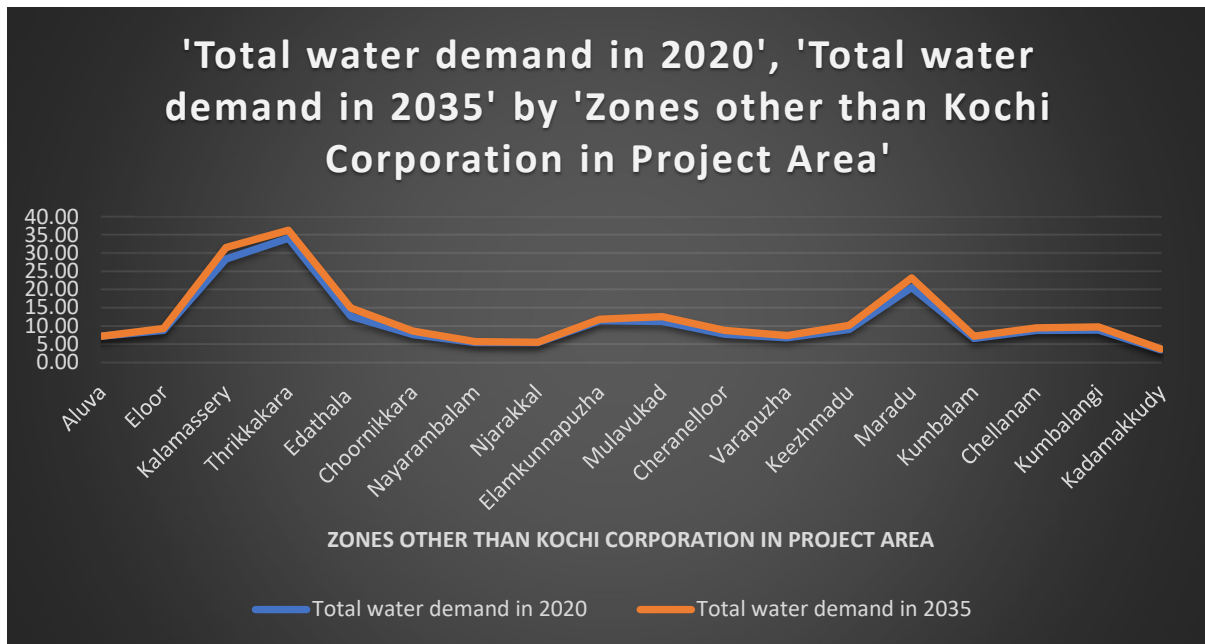


Figure 16. Variation in water demand in zones other than Kochi Corporation area from 2020-2035

However, considering the scope of accelerated growth for the project area in future, the per capita demand can be taken as 200 LPCD and per capita demand for floating population can be taken as 100 LPCD. The water deficit analysis is presented as follows considering such an aspect and the ultimate capacity of the proposed WTP has been determined accordingly.

WATER DEMAND CALCULATION					
SHORT TERM ANALYSIS WITH CONVENTIONAL PARAMETERS					
	2020	2022	2024	2035	2050
demand in MLD	404	408	411	439	478
production in MLD					
Aluva WTPs	225	225	225	225	225
Aluva proposed WTP			76	104	143
Maradu WTP	100	100	100	100	100
Muppathadam WTP	10	10	10	10	10
gap	69	73	0	0	0

Table 3. Water demand calculation with conventional methodology

POPULATION FORECAST AND WATER DEMAND FOR 2050												
Sl. No.	Local Body	Population as per 2011	% Increase of population in last decade	% Increase of population in Ernakulam District in last decade	% Increase of population adopted	Total domestic demand in MLD @ 200 LPCD in 2024	Floating demand @ 100 LPCD in 2024	Total non-domestic demand in MLD in 2024	Total UFW @ 15% in MLD in 2024	Total demand in MLD in 2024	Total demand in MLD in 2035	Total demand in MLD in 2050
1	Kochi [C]	633553	6.38	5.69	6.03	136.74	41.02	48.24	33.90	259.89	276.39	299.87
2	Aluva [M]	22428	-6.98	5.69	0.00	4.49	0.67	2.41	1.14	8.71	8.71	8.71
3	Eloor [M]	36722	3.23	5.69	4.46	7.77	0.58	1.50	1.48	11.33	11.82	12.50
4	Kalamassery [M]	71038	12.55	5.69	9.12	15.91	1.59	12.11	4.44	34.06	37.25	40.35
5	Thrikkakara [M]	77319	17.18	5.69	11.43	17.80	0.98	15.76	5.18	39.72	41.74	48.24
6	Edathala GP	44204	22.46	5.69	14.07	10.49	1.78	2.83	2.27	17.37	19.72	23.17
7	Choorikkara GP	32746	13.41	5.69	9.55	7.37	1.05	0.92	1.40	10.74	11.83	13.51
8	Nayarambalam GP	24127	1.43	5.69	3.56	5.05	0.42	0.80	0.94	7.21	7.49	7.90
9	Njarakkal GP	23760	-1.68	5.69	2.00	4.88	0.55	0.85	0.94	7.22	7.42	7.69
10	Elamkunnappuzha GP	50714	0.30	5.69	2.99	10.54	0.25	1.73	1.88	14.40	14.81	15.39
11	Mulavukad GP	21833	-4.42	5.69	0.64	4.40	0.24	6.31	1.64	12.60	13.91	15.23
12	Cheranelloor GP	30594	16.26	5.69	10.97	7.01	0.53	1.27	1.32	10.13	11.13	12.68
13	Varappuzha GP	26750	9.08	5.69	7.39	5.87	0.22	1.37	1.12	8.58	9.13	9.96
14	Keezhmad GP	36567	15.51	5.69	10.60	8.34	0.47	1.54	1.55	11.90	13.06	14.86
15	Maradu [M]	44704	9.00	5.69	7.35	9.80	0.40	10.10	3.04	23.34	25.89	27.88
16	Kumbalam GP	29193	5.97	5.69	5.83	6.28	0.61	0.77	1.15	8.81	9.41	10.16
17	Chellanam GP	37399	3.29	5.69	4.49	7.92	0.53	1.51	1.49	11.45	12.16	12.38

18	Kumbalangi GP	28248	5.95	5.69	5.82	6.08	0.29	2.82	1.38	10.57	11.39	12.09
19	Kadamakkudi GP	16295	2.98	5.69	4.33	3.44	0.17	0.31	0.59	4.51	4.75	5.03

WATER DEMAND CALCULATION					
LONG TERM ANALYSIS WITH EXPECTED ACCELERATED GROWTH					
	2020	2022	2024	2035	2050
demand in MLD	503	508	513	548	598
production in MLD					
Aluva WTP	270	270	270	278	278
Aluva proposed WTP			123	140	190
Maradu WTP	100	100	110	120	120
Muppathadam WTP	10	10	10	10	10
gap	123	128	0	0	0

Table 4. Water demand calculation for expected accelerated growth

2.7 STRATEGY FOR STRENGTHENING OF CURRENT SYSTEM

The main strategy of clear water distribution is to provide the treated water from the proposed new WTP in the nearby area itself so that the existing 900 mm, 1050 mm and 1200 mm lines to the Ernakulam area from the existing **Aluva WTPs will be released in load and can be effectively used for distribution to Ernakulam City, Vypin, Mulavukad and Cheranelloor areas.** Most of the tapping from these existing lines can also be delinked. Interestingly the total demand at 2050 of the Aluva-Kalamassery-Thrikkakara region comprising of the Aluva, Eloor, Kalamassery, Thrikkakara Municipalities and Edathala, Choornikkara, Keezhmad GPs are 131.51 MLD. Pachalam zone of Ernakulam and Varappuzha zone partially can also be coupled with this and hence water produced in the new WTP can be distributed around the new WTP area easily. It may also be noted that **when the 100 MLD WTP at Maradu is fully functional with some quantity of overload or additional production, Western Kochi and nearby panchayaths will get its benefit substantially apart from Maradu areas.**

The issues faced by the purified water distribution in the Kochi Corporation and surrounding LSG areas are the **low pressure in the pipe network** of discrete areas and intermittent supply due to lack of sufficient quantity at some areas. Most of the Overhead Service Reservoirs (OHSR) are not functional. Water is being directly pumped to the network at most of the places. Zoning of the distribution network has not been developed effectively so far. Hence as a first step to tackle this situation, the entire project area is divided into 37 zones. The zones are identified based on the administrative and geographical boundaries, presence of NH, Railway track, Canals etc. and population scatter. The Kochi Corporation has been divided into 19 zones. During the stage of analysis, the zones are again divided into several sub zones in view of the pressure distribution. It is planned to make use of the overhead service reservoir (OHSR) available and additional OHSR are

also proposed. Under AMRUT scheme six new OHSR are planned. All these activities are planned to be implemented in the phase-II of the project.

Sl. No.	Name of zone	Name of divisions of Corporation included	Total water demand in 2020	Total water demand in 2035	Total water demand in 2050
1	CE CR	Ernakulam South (60%), Ernakulam Central, Ernakulam North (75%)	7.70	8.26	8.69
2	Ravipuram	Ravipuram, Ernakulam South (40%), Island North, Island South	18.53	20.26	20.89
3	Thevara	Konthuruthy, Thevara, Perumanoor (50%)	5.18	5.55	5.95
4	Kaloor	Palarivattom(20%), Karanakodam (50%), Kathrikkadavu (80%), Kaloor South, Kaloor North, Elamakkara South, Elamakkara North, Puthukkalavattam, Ponekkara, Edappally, Devankulangara, Mamangalam, Karukappilly, Pottakkuzhy	33.99	36.39	38.77
5	Kadavanthra	Kadavanthra (80%), Giri Nagar, Gandhi Nagar, Elamkulam	10.55	11.63	13.70
6	Vennala	Padivattam, Chakkarapparambu, Chalikkavattam, Ponnuruni East (50%), Vennala	11.17	11.95	12.81
7	Pachalam	Vaduthala East, Vaduthala West, Pachalam, Thrikkanarvattam (70%), Thattazham	11.73	12.66	13.68
8	Ernakulam North	Ernakulam North (25%), Thrikkanarvattam(30%),Ayyappankavu	4.84	5.18	5.53
9	Thammanam	Palarivattom (80%), Karanakodam (50%), Kathrikkadavu (20%), Ponnuruni, Vyttila, Vyttila Janatha, Poonithura, Chambakkara, Ponnuruni East(50%), Thammanam	20.57	22.01	23.57
10	Panambilly Nagar	Perumanoor (50%), Panambilly Nagar, Kadavanthra (20%)	3.97	4.33	4.95
11	Thoppumpady	Thoppumpady, Karuvelippady (15%), Mundamveli (20%), Tharebhagam(25%)	6.23	6.84	7.54
12	Karuvelippady (fort Kochi pumping+mattanchery pumping)	Moolamkuzhi, Karuvelippady (85%), Chullikkal (50%), Nazareth, Fort Kochi Veli, Amaravathy (50%), kochangadi, Chakkamadam	13.03	14.07	15.20
13	Koovappadam	Cherlai (50%), Panayappalli, Chullikkal (50%)	4.89	5.29	5.71
14	Mattanchery	Cherlai (50%), Eravely, Karippalam(75%), Mattanchery	7.13	7.70	8.32

15	Fort Kochi	Fort Kochi, Kalvathy, Karippalam (25%), Amaravathy (50%)	6.58	7.11	7.68
16	Mundaveli	Mundaveli (80%), Manassery	7.15	8.03	9.87
17	Palluruthy	Kadebhagam, Nambiarapuram, Pullardesam, Thazhappu (50%), Tharebhagam (75%)	11.06	11.94	12.90
18	Perumpadappu	Thazhappu (50%), Perumpadappu, Konnam, Palluruthy-Kacherippady	9.40	10.15	10.97
19	Edakochi	Edakochi North, Edakochi South	4.57	4.94	5.33

Table 5. Details of proposed zones in Kochi Corporation area

Sl. No.	Zones other than Kochi Corporation in Project Area	Total water demand in 2020	Total water demand in 2035	Total water demand in 2050
1	Aluva	7.19	7.19	7.19
2	Eloor	8.77	9.26	9.77
3	Kalamassery	28.42	31.61	33.92
4	Thrikkakara	34.20	36.37	42.00
5	Edathala	12.65	14.90	17.40
6	Choornikkara	7.62	8.58	9.68
7	Nayarambalam	5.42	5.66	5.91
8	Njarakkal	5.35	5.48	5.62
9	Elamkunnappuzha	11.39	11.82	12.26
10	Mulavukad	11.22	12.53	13.83
11	Cheranelloor	7.67	8.72	9.94
12	Varappuzha	6.72	7.31	7.95
13	Keezhmad	9.00	10.18	11.55
14	Maradu	20.60	23.22	24.93
15	Kumbalam	6.56	7.15	7.70
16	Chellanam	8.76	9.42	9.39
17	Kumbalangi	8.85	9.69	10.23
18	Kadamakkudi	3.41	3.65	3.86
	Total demand in satellite LSGs	203.80	222.72	243.14
	Total demand for Kochi	404.04	439.15	477.55

Table 6. Details of proposed zones in adjoining LSGs around Kochi

Sl. No.	Name of the zone	Estimated water demand in MLD by 2050	Quantity of treated water in MLD from new WTP
1	Aluva	7.19	7.19
2	Kalamassery	33.92	33.92
3	Eloor	9.77	9.77
4	Thrikkakara	42.00	42.00
5	Edathala	17.40	17.40
6	Choornikkara	9.68	9.68
7	Keezhmad	11.55	11.55
8	Pachalam	13.68	5.08
9	Varappuzha	7.95	5.95
	TOTAL	153.14	143.00

Table 7. Water demand in Directly Benefitted Project Area (DBPA) around new WTP

existing pipelines to Kochi city		
pipeline	Q in MLD	velocity in m/s
1200 mm	133	1.5
1050 mm	86	1.4
900 mm	59	1.28
total	278	
raw water for 190 MLD WTP		
1829 mm	206.19	0.96
clear water to Kalamassery		
1422 mm	129	1
equivalent pipeline for re-alignment		
1626 mm	145	0.86
changed pipe for 900 mm CI		
1016 mm	59	0.91
changed pipe for 1050 mm CI		
1219 mm	86	0.92

Table 8. Proposal for pipelines associated with new WTP at Aluva

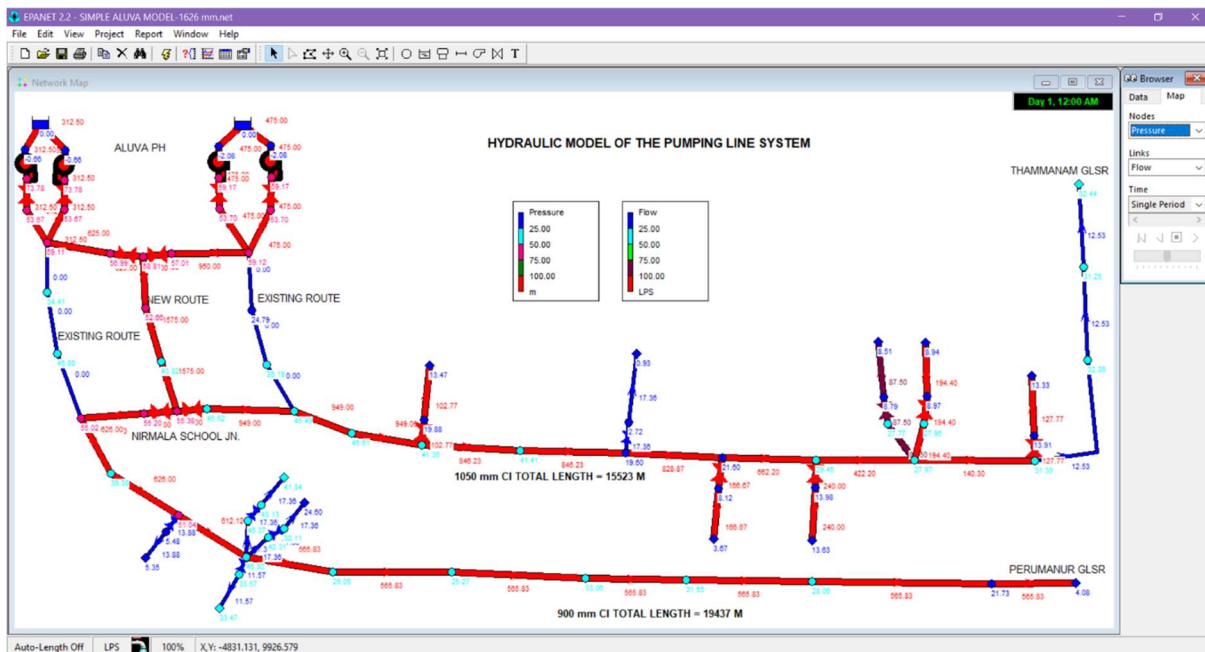


Figure 17. Hydraulic analysis for equivalent pipeline from headworks

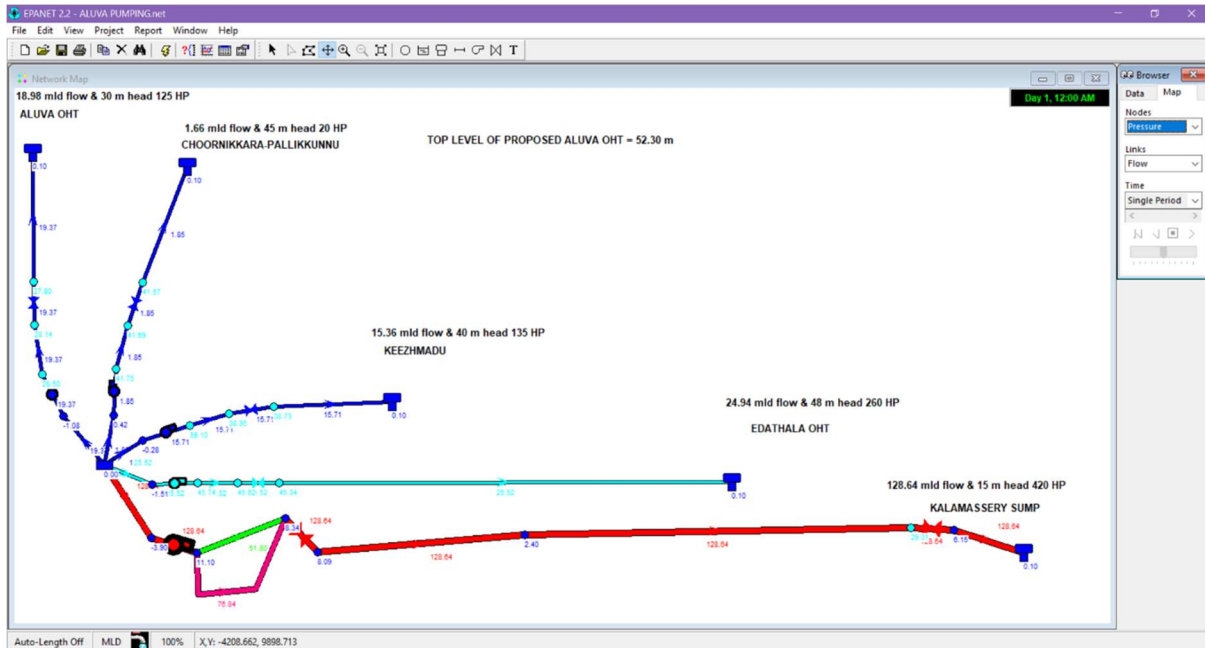


Figure 18. Hydraulic analysis of new pipelines from proposed WTP at Aluva

2.8 REGIONAL DISTRIBUTION OF WATER

The distribution of clear water from water treatments plants are planned to make more effective after the functioning of the proposed WTP at Aluva. The regional distribution planning is illustrated as follows:

2.8.1 ALUVA REGION

For distribution of clear water towards Aluva region, the overhead reservoir constructed in the proposed WTP can be used effectively. The elevation of the proposed tank is provided higher than the existing tank presently used. New pumping line from the WTP will cater the demands of other GPs. A new transmission line of 1250 mm diameter MS pipe will carry 96.72 MLD clear water for Kalamassery, Thrikkakara and Eloor areas.



SLNo.	LSGs	DEMAND IN 2020	DEMAND IN 2050
1	ALUVA	7.19	7.19
2	KALAMASSERY	28.42	33.92
3	ELOOR	8.77	9.77
4	THRIKKAKKARA	34.20	42.00
5	EDATHALA	12.65	17.40
6	CHOORNIKKARA	7.62	9.68
7	KEEZHMADU	9.00	11.55
8	PACHALAM	12.28	14.32
9	VARAPUZHA	6.72	7.95
	TOTAL	126.85	153.79

Figure 19. Water demand in Aluva region

2.8.2 VYPIN REGION

It may be noted that all tapplings from the existing 1050 mm line carrying water from the existing WTPs at Aluva will be disconnected and hence this pipeline will be able to carry 82 MLD water towards Kochi area reaching its destination at Thammanam pump house. out of this, 37.62 MLD will be taken to Vaduthala pump house to cater the demands of Nayarambalam, Njarakkal, Elamkunnappuzha (known as part of Vypin area) and Mulavukad GPs. For Kadamakkudi GP, the demand of 3.86 MLD will be met from Muppathadam WTP. The combined demand of Cheranelloor GP and Kunnumpuram division of Kochi Corporation is 12.25 MLD, which is planned to be met from city contribution.



SL No.	LSGs	DEMAND IN 2020	DEMAND IN 2050
1	NAYARAMBALAM	5.42	5.91
2	NJARAKKAL	5.35	5.62
3	ELAMKUNNAPUZHA	11.39	12.26
4	MULAVUKADU	11.22	13.83
5	CHERANELLOOR	7.67	9.94
6	KADAMAKKUDY	3.41	3.86
	TOTAL	44.46	51.42

Figure 20. Water demand in Vypin-Cheranelloor region

2.8.3 ERNAKULAM CITY REGION

In the Ernakulam city region, 9 Nos. of distribution zones planned. It is planned to use the existing overhead reservoirs and the new overhead reservoirs being constructed (Kaloor and Pachalam) as part of AMRUT projects. Since the 1050 mm CI pipeline will be released of load due to the new WTP at Aluva, the additional quantity of water reaching at Thammanam pump house can be utilised effectively. In addition to this, the water carried by the existing 1200 mm MS line can be effectively utilised without making any additional operations like reverse pumping for city boosting. When the pump sets at headworks, Aluva are made efficient in duty point operation, the available pressure in 1200 mm line is expected to be higher. It is planned to construct additional overhead tanks (Vennala, CE CR and Kaloor Quarters compound) in future and a master sump at Kaloor.



SLNo.	LSGs/ZONES	DEMAND IN 2020	DEMAND IN 2050
1	CE CR	7.7	8.69
2	RAVIPURAM	18.53	20.89
3	THEVARA	5.18	5.95
4	KALLOOR	38.00	43.36
5	KADAVANTHRA	10.55	13.70
6	VENNALA	11.17	12.81
7	ERNAKULAM NORTH	4.84	5.53
8	THAMMANAM	16.57	18.98
9	PANAMBILLYNAGAR	3.97	4.95
	TOTAL	116.51	134.86

Figure 21. Water demand in Ernakulam City region

2.8.4 WESTERN KOCHI REGION

At present water demand of the Western Kochi region is met from Maradu WTP, Perumanoor pump house and Elamkulam pump house. But in future, it is planned to cater this area mostly from Maradu WTP. There are 10 Nos. of distribution zones planned for Western Kochi region. Two overhead reservoirs (Edakochi and Karuvelippady) are being constructed under AMRUT scheme which can cater the demands of highly water stressed zones. In addition to this, the existing overhead reservoirs are to be used effectively.



Sl.No.	LSGs/ZONES	DEMAND IN 2020	DEMAND IN 2050
1	THOPPUMPADY	8.26	10.49
2	KARUVELIPPADY	7.71	9.00
3	KOOVAPPADAM	8.24	9.61
4	MATTANCHERY	8.75	10.21
5	FORKKOCHI	6.16	7.19
6	MUNDAMVELI	5.30	7.14
7	PALLURUTHY	13.05	15.23
8	PERUMPADAPPU	8.00	9.33
9	EDAKOCHI	4.57	5.33
	TOTAL	70.04	83.54

Figure 22. Water demand in Western Kochi region

2.8.5 MARADU REGION

The demands of the zones under Maradu region are met from the existing 100 MLD WTP at Nettoor, Maradu. The production from this WTP can be enhanced after making some modifications at the raw water pump house and the WTP can be modified using dual media filters. Hence the total production is expected to be increased to the range of 20 MLD additional in quantity.



Sl.No.	LSGs	DEMAND IN 2020	DEMAND IN 2050
1	MARADU	20.60	24.93
2	KUMBALAM	6.56	7.70
3	CHELLANAM	8.76	9.39
4	KUMBALANGI	8.85	10.23
	TOTAL	44.77	52.25

Figure 23. Water demand in Maradu region

2.9 KWA PIPELINE ROAD FROM ALUVA TO KOCHI

KWA has its own pipeline road from Aluva WTP site to Kathrikkadavu Railway line in Kochi for a length of 20 km, which passes through Palarivattom and Thammanam. The major pipelines of size 900 mm, 1050 mm and 1200 mm to City are laid through this pipeline road. In the initial stretch from Aluva WTP site to Nirmala School Junction for about 2.40 km, there are two pipeline roads (one is

via Zeenath theatre and other via Rose Nagar). For the remaining stretch there is only one road. It may be noted that in the 2.4 km road from WTP to Nirmala School Junction along Zeenath Theatre Road, there exist 900 mm and 1050 mm clear water pipelines and that along Rose Nagar route there is only a 1200 mm clear water pipeline. In the remaining length of the pipeline road, three pipelines of 900 mm, 1050 mm and 1200 mm are passing.

2.10 KWA LAND AT ALUVA

The 1.57 hectares of land near to the existing WTPs is suggested for the construction of the new WTP. However, 43 nos. of staff quarters were situated in this land. Most of these were very old and in a dilapidated condition. 19 Nos. of them were occupied by KWA staff. The inmates of these quarters were replaced at several other available staff quarters. Also, a new staff quarters building is now being constructed at the headworks. In addition to this, there exist a 14 Lakh Litre OHSR in the middle of the land as shown in the layout which was constructed during 1981. This reservoir serves the high-level zone of Aluva Municipality. Besides this, some space is utilized as store yard in which old pipes are kept.

Instead of the conventional circular type Clariflocculators and sand filter beds, the use of sludge blanket clarifier with plate settlers and dual media filters will make the plant more compact and highly effective. If the sludge blanket clarifier is adopted, required area becomes still lesser. The new WTP of the above type can be safely and comfortably accommodated in the 1.57 hectares of land. The existing old 14 Lakh Litre OHSR may be demolished if required. The new OHSR can be placed above the filter house without occupying a separate independent area. Also, the disposal of sludge is easier due to the proximity of the water body. Dedicated power connection can also be easily achieved with less cost due to the existing infrastructure.

2.11 ADVANTAGES OF PROVIDING WTP AT ALUVA: TECHNICAL AND OTHER ASPECTS

Advantages of locating the new WTP at the own land of KWA at Aluva is illustrated below:

Sl. No.	Performance pointer	WTP at Aluva KWA land
1.	Recurring floods in River and turbidity	The site is at higher elevation of +28.00 m compared to the high flood level of +7.30 m of 2018 floods and turbidity can be controlled effectively with sludge blanket clarification with plate-settler
2.	Sludge disposal	Effectively addressed since water body is very near
3.	Dedicated power line	Already available for existing WTP complex
4.	Proximity of public transport systems and utilities	Only 10 km to international airport, 1 km to railway station, 1 km to KSRTC bus station, 1 km to metro rail station and close to KWA offices since located in the heart of Aluva city.

5.	Land availability	KWA own land is already available. But staff quarter's is to be relocated first and careful planning is required since the extent is limited.
6.	Raw water carriage	It is an extremely easy task since it is very close to the intake.
7.	Clear water carriage	It is an easy task since most of the pipelines are to be laid through the road owned by KWA.
8.	Distribution planning	Highly effective since the major areas are located around Aluva
9.	Project cost including capitalized operational cost	This is minimum compared to similar setting
10.	Pace of execution	Rapid implementation is possible
11.	Administrative control	Highly advantageous since existing infrastructure and offices are in proximity
12.	Production of treated water	Quickly possible due to proximity of intake and treated water will be ready for distribution to areas towards Kochi.

Table 9. Advantages of locating WTP at Aluva

2.12 PLAN FOR MODERNISATION OF WATER DISTRIBUTION SYSTEM

The aspects of re-structuring of the water supply distribution system for the project area are illustrated as follows:

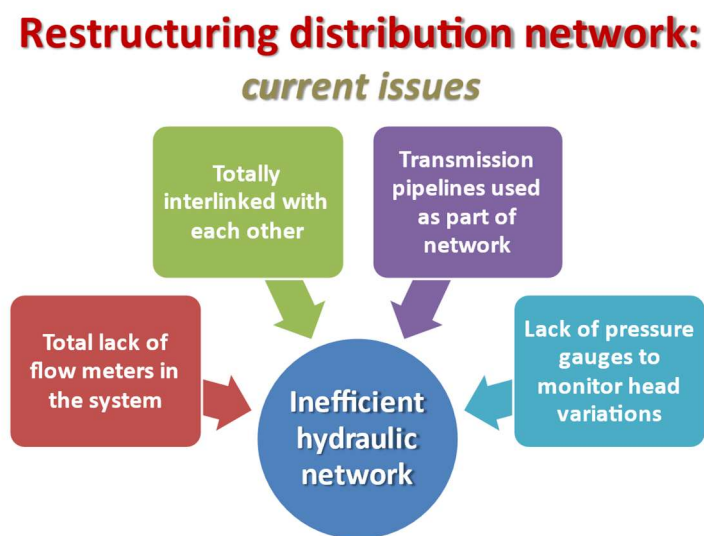


Figure 24. Issues in the current distribution system of water supply

Restructuring process of network

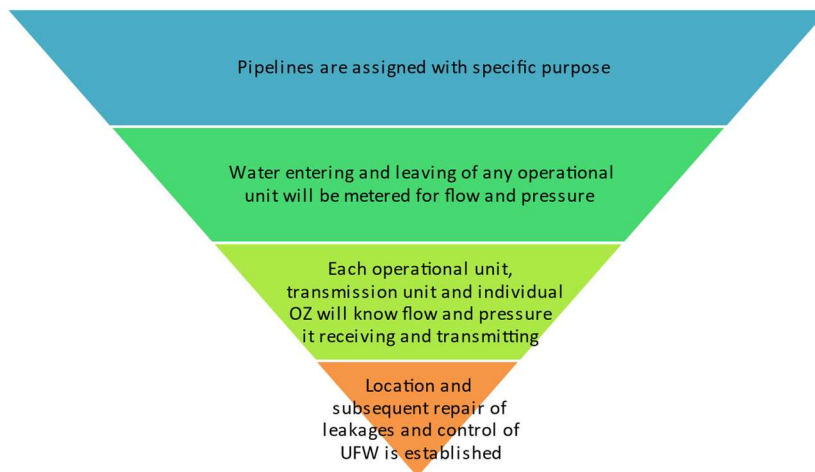


Figure 25. Restructuring process in water distribution network

It is being planned to make the entire water distribution system from the WTPs towards consumer point a smart system by adopting several scientific and systematic procedures. The information regarding all infrastructure used in the water supply network is to be gathered. There are several control points in the system where continuous monitoring of the flow and pressure variations are to be monitored for making the supply trouble free. The points of water shortage (scarcity hotspots), points of recurring maintenance (maintenance hotspots) and points of poor water quality (quality hotspots) etc. are to be identified through such systematic process and remedial action is to be taken.

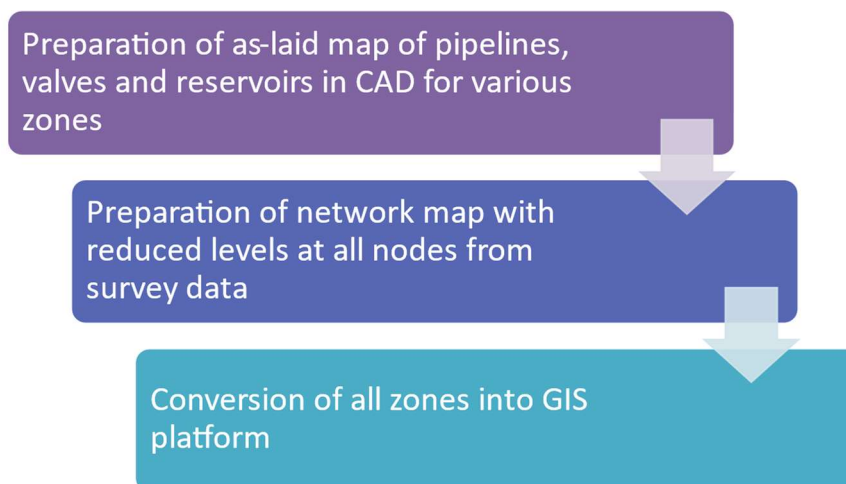


Figure 26. Conversion to a smart water distribution network-activity-1

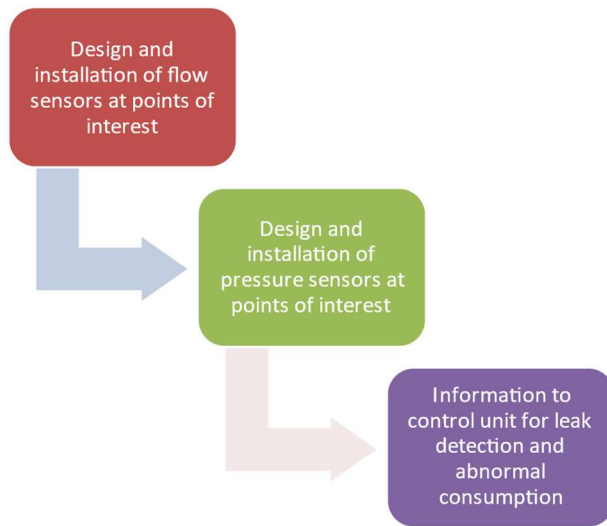


Figure 27. Conversion to a smart water distribution network-activity-2

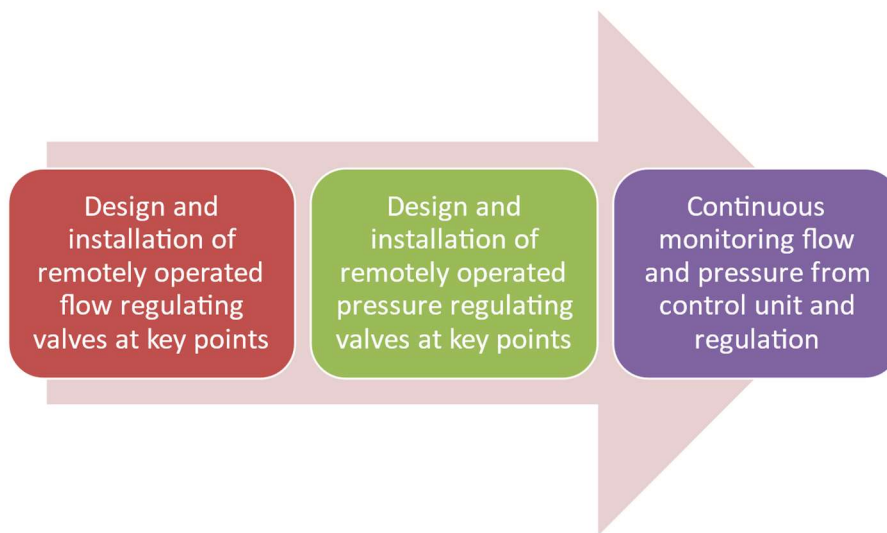


Figure 28. Conversion to a smart water distribution network-activity-3

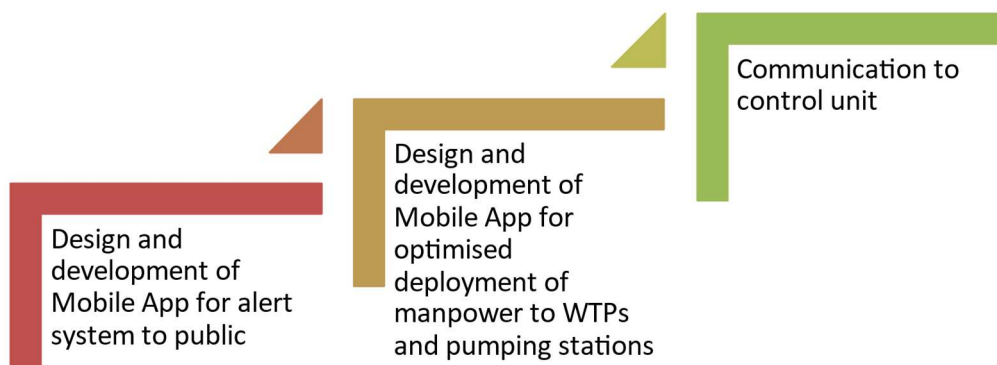


Figure 29. Conversion to a smart water distribution network-activity-4

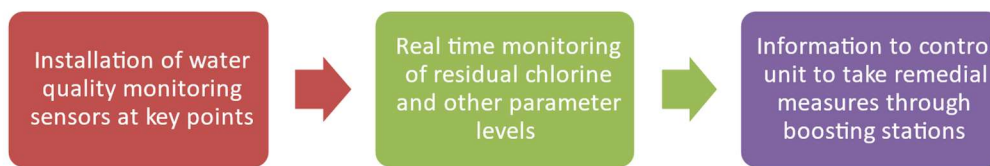


Figure 30. Conversion to a smart water distribution network-activity-5

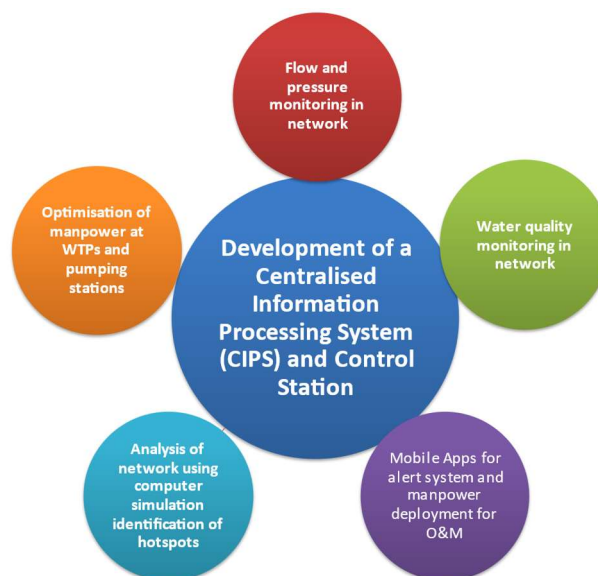


Figure 31. Conversion to a smart water distribution network-activity-6

2.13 MAPPING OF WATER SUPPLY ASSETS IN GEOGRAPHICAL INFORMATION SYSTEM

The Kochi Municipal Corporation comprises a total area of 94.88 km², which is divided into 19 zones as already mentioned. It is the most densely populated city in the state and has a population of 677,381 within that area. The GIS was used to analyse existing maps and data, to digitize the existing ward boundaries and to enter data about WTP and major pipelines. GIS has been proved to be an effective and powerful tool in the water distribution asset mapping. Once all the network information is stored in a GIS it makes the use of querying possible with ease and helps the engineers in better understanding of the water supply system and can act in an effective manner to any contingencies that may arise.

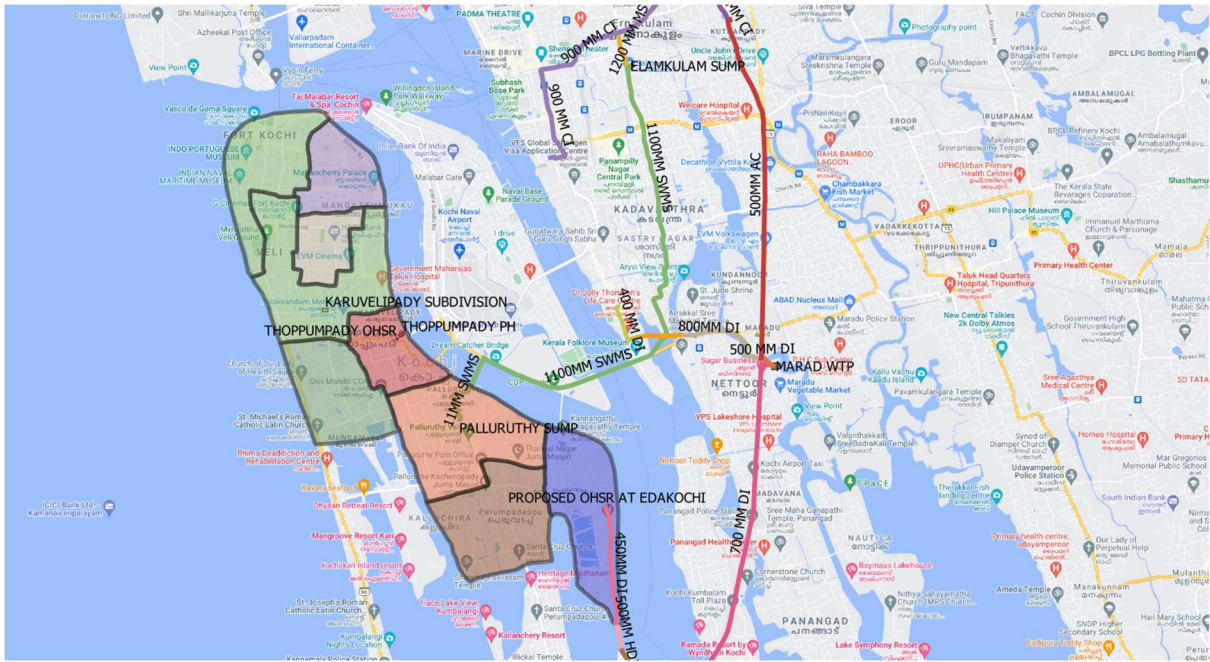


Figure 32. GIS Mapping of water supply zones in Western Kochi

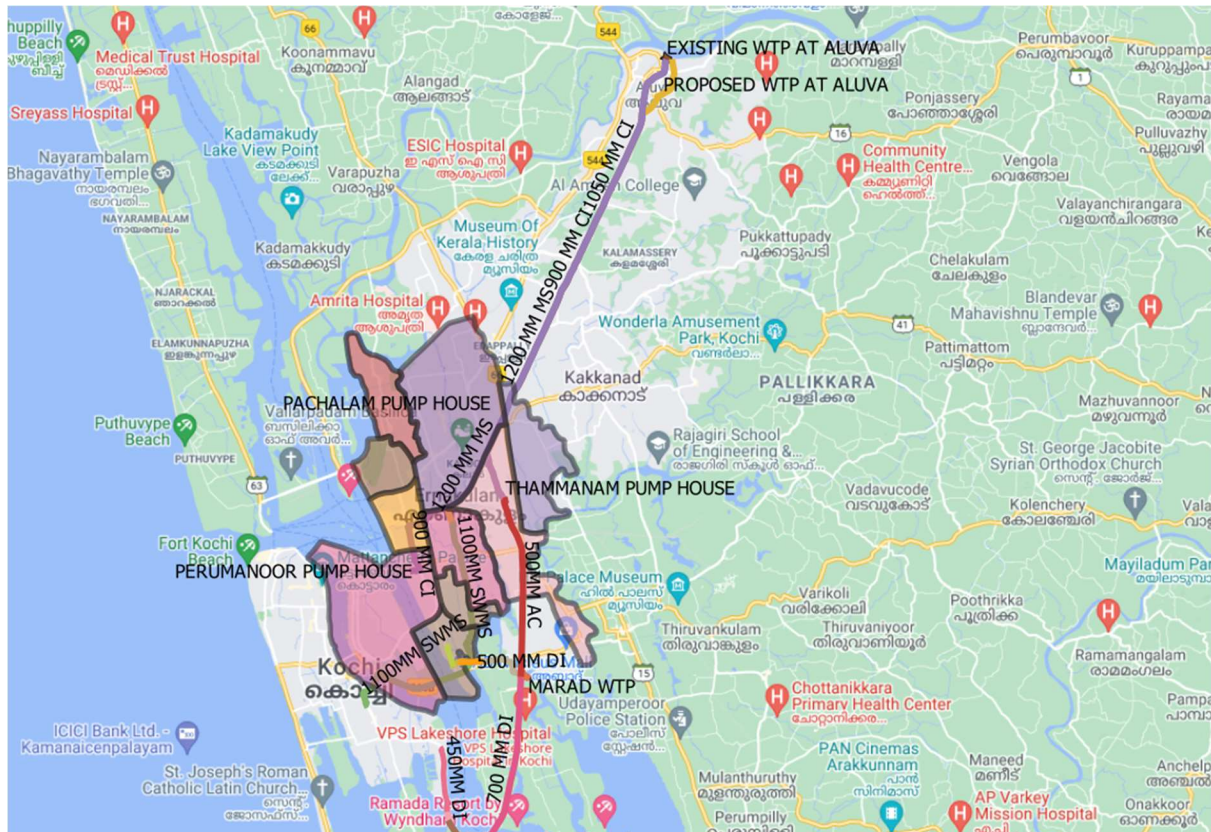


Figure 33. GIS Mapping of water supply zones in Mainland (Ernakulam of Kochi Corporation)

At present the available drawings of the existing pipelines are being converted into GIS using geo-referencing. For the zones other than Kochi Corporation, this work is to be started. The existing pipelines can be converted into digital model also using hydraulic analysis software like EPANET and this work is in progress. **Similar activity is also planned for other parts of the project area.**

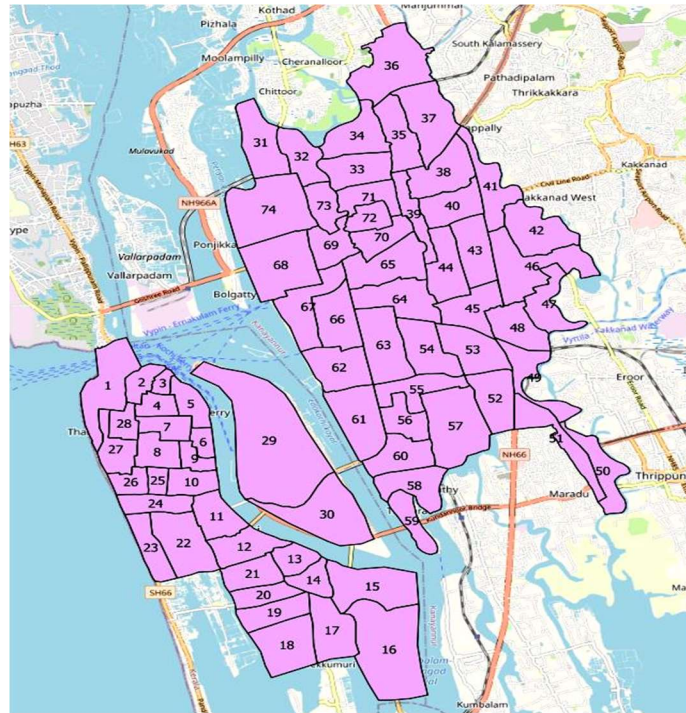


Figure 34. Map showing divisions of Kochi Corporation

2.14 OUTLINE OF PROJECT IMPLEMENTATION

The implementation of the project of construction of WTP and allied works depends upon careful and systematic planning of various activities involved in it. After the construction of WTP, there must be in-depth analysis of the existing water supply system of the project area for slowly switching over to the modified environment. Hence a simultaneous process of identification of hotspots of the existing system with respect to water shortage, recurring maintenance and water quality are to be performed. For the effective utilisation of the new WTP, strengthening of the distribution network is necessary and hence it may be noted that intelligent management of production components and distribution system are equally important for a successful water supply system.

2.15 INTEGRATION WITH OTHER PROJECTS

Planning and design of water supply schemes can be combined with other water resources projects also. This is since most of these projects are inter-related and environment sensitive. Hence the location of an WTP, pumping stations, service reservoirs and coverage of distribution networks in an area depends upon the water supply and sewerage system existing in that area, proximity of irrigation canals, water bodies and flood routing structures if any. The integration of different projects related to the water resources and conservation schemes greatly influence the successful establishment and operation of the water supply schemes in an area.

2.16 DESIGN OF PROPOSED PIPELINES ASSOCIATED WITH NEW WTP AT ALUVA

DESIGN OF MS PIPELINES FOR RE-ALIGNMENT OF EXISTING PIPELINE SYSTEM

It is required to re-route the old existing 900 mm and 1050 mm CI pipelines through a single equivalent 1626 mm MS pipeline and re-connect after 2.10 km along the HUDCO line stretch. However, the hydraulic analysis must be performed for the entire length of the two existing pipelines for determining the operating static pressure. The hydraulic simulation has been done using EPANET for the system and the results are used for analysis. The hydraulic parameters such as HW value and loss coefficients are adopted after several trials using the field observations of pressure and flow for a long period of time.

for the 1016 mm MS line to replace 900 mm old CI line

operating static pressure and water hammer pressure							
C, velocity of pressure wave travel in m/sec = $1425/\sqrt{1+(KD/E)}$							
k, bulk modulus of water						2.07E+08	kg/m ²
outside diameter of pipe						1016	mm
D, inside diameter of pipeline						0.95	m
E, modulus of elasticity of pipe material in kg/m ²						2.1E+10	
C						1025.1	
velocity in PM						0.91	m/sec
Hmax						95.09	m
						9.69	kg/cm ²
maximum operating static pressure						60.28	m
						6.14	kg/cm ²
maximum operating pressure with surge						15.84	kg/cm ²
internal design pressure is taken as the sum of maximum operating static							
pressure+surge since it is >1.5 x maximum static pressure						1.61	Mpa
nominal shell thickness							
as per IS: 5822 Code of practice for laying of steel pipes:							
nominal thickness, $t = P \times D / (2 \times a \times e \times f + P)$							
P = internal design pressure in Mpa							
D = outside diameter in mm							
a = design factor, 0.9 for design pressure including surge							
e = weld efficiency of joint, 0.80 for field welding							
f = specified minimum yield stress in Mpa							
grade of steel adopted						Fe 410	
hence specified minimum yield stress as per IS: 3589						235	Mpa
allowance for corrosion manufacturing tolerance of reduction in thickness						2.5	mm
hence, computed thickness t						7.32	mm
as per IS: 3589 provide minimum thickness						10	mm
hydraulic test pressure at factory							
hydraulic test pressure at factory as per IS:3589 is given by:							
$P = 2 \times S \times T / D$							
P = hydraulic test pressure in Mpa and limited to 5 Mpa							
S = stress, 60% of specified minimum yield stress							
D = outside diameter in mm							
T = specified thickness of the tube in mm							
hence, computed hydraulic test pressure at factory						2.78	Mpa
field test pressure						FTP	

in this case, maximum sustained operating pressure and maximum static pressure are taken as same			
condition 1			
FTP should not be less than 1.5 x maximum sustained operating pressure	90.42	m	
condition 2			
FTP should not be less than 1.5 x maximum static pressure	90.42	m	
condition 3			
FTP should not be less than maximum sustained operating pressure+surge	155.37	m	
condition 4			
FTP should not be less than maximum static pressure+surge	155.37	m	
condition 5 (clause 6.4.4.2 of water supply manual)			
FTP should not be less than 2/3 rd of factory test pressure			
factory test pressure determined earlier	2.78	Mpa	
	269.83	m	
2/3 rd. value of factory test pressure	179.89	m	ok
ratio	1.74		
hence adopted thickness of the pipeline	10	mm	
for the 1219 mm MS line to replace 1050 mm old CI line			
operating static pressure and water hammer pressure			
C, velocity of pressure wave travel in m/sec = $1425/\sqrt{1+(KD/E)}$			
k, bulk modulus of water	2.07E+08	kg/m ²	
outside diameter of pipe	1219	mm	
D, inside diameter of pipeline	1.14	m	
E, modulus of elasticity of pipe material in kg/m ²	2.1E+10		
C	1033.2		
velocity in PM	0.92	m/sec	
Hmax	96.90	m	
	9.88	kg/cm ²	
maximum operating static pressure	60.54	m	
	6.17	kg/cm ²	
maximum operating pressure with surge	16.05	kg/cm ²	
internal design pressure is taken as the sum of maximum operating static			
pressure+surge since it is >1.5 x maximum static pressure	1.64	Mpa	
nominal shell thickness			
as per IS: 5822 Code of practice for laying of steel pipes:			
nominal thickness, $t = P \times D / (2 \times a \times e \times f + P)$			
P = internal design pressure in Mpa			
D = outside diameter in mm			
a = design factor, 0.9 for design pressure including surge			
e = weld efficiency of joint, 0.80 for field welding			
f = specified minimum yield stress in Mpa			
grade of steel adopted	Fe 410		
hence specified minimum yield stress as per IS: 3589	235	Mpa	
allowance for corrosion+manufacturing tolerance of reduction in thickness	2.5	mm	
hence, computed thickness t	8.36	mm	
as per IS: 3589 provide minimum thickness	12.5	mm	

hydraulic test pressure at factory			
hydraulic test pressure at factory as per IS:3589 is given by:			
$P = 2 \times S \times T / D$			
P = hydraulic test pressure in Mpa and limited to 5 Mpa			
S = stress, 60% of specified minimum yield stress			
D = outside diameter in mm			
T = specified thickness of the tube in mm			
hence, computed hydraulic test pressure at factory	2.89	Mpa	
field test pressure	FTP		
in this case, maximum sustained operating pressure and maximum static pressure are taken as same			
condition 1			
FTP should not be less than 1.5 x maximum sustained operating pressure	90.81	m	
condition 2			
FTP should not be less than 1.5 x maximum static pressure	90.81	m	
condition 3			
FTP should not be less than maximum sustained operating pressure+surge	157.44	m	
condition 4			
FTP should not be less than maximum static pressure+surge	157.44	m	
condition 5 (clause 6.4.4.2 of water supply manual)			
FTP should not be less than 2/3 rd. of factory test pressure			
factory test pressure determined earlier	2.89	Mpa	
	281.12	m	
	2/3 rd. value of factory test pressure	187.42	m ok
	ratio	1.79	
hence adopted thickness of the pipeline	12.5	mm	
for the 1626 mm MS line for combined discharge			
operating static pressure and water hammer pressure			
C, velocity of pressure wave travel in m/sec = $1425/\sqrt{1+(KD/E)}$			
k, bulk modulus of water	2.07E+08	kg/m ²	
outside diameter of pipe	1616	mm	
D, inside diameter of pipeline	1.57	m	
E, modulus of elasticity of pipe material in kg/m ²	2.1E+10		
C	985.8		
velocity in PM	0.86	m/sec	
Hmax	86.42	m	
	8.81	kg/cm ²	
maximum operating static pressure	59.76	m	
	6.09	kg/cm ²	
maximum operating pressure with surge	14.90	kg/cm ²	
internal design pressure is taken as the sum of maximum operating static			
pressure+surge since it is >1.5 x maximum static pressure	1.52	Mpa	
nominal shell thickness			
as per IS: 5822 Code of practice for laying of steel pipes:			
nominal thickness, $t = P \times D / (2 \times a \times e \times f + P)$			
P = internal design pressure in Mpa			
D = outside diameter in mm			
a = design factor, 0.9 for design pressure including surge			

e = weld efficiency of joint, 0.80 for field welding			
f = specified minimum yield stress in Mpa			
grade of steel adopted	Fe 410		
hence specified minimum yield stress as per IS: 3589	235	Mpa	
allowance for corrosion+manufacturing tolerance of reduction in thickness	1	mm	
hence, computed thickness t	8.22	mm	
as per IS: 3589 provide minimum thickness	14.2	mm	
hydraulic test pressure at factory			
hydraulic test pressure at factory as per IS:3589 is given by:			
$P = 2 \times S \times T / D$			
P = hydraulic test pressure in Mpa and limited to 5 Mpa			
S = stress, 60% of specified minimum yield stress			
D = outside diameter in mm			
T = specified thickness of the tube in mm			
hence, computed hydraulic test pressure at factory	2.48	Mpa	
field test pressure	FTP		
in this case, maximum sustained operating pressure and maximum static pressure are taken as same			
condition 1			
FTP should not be less than 1.5 x maximum sustained operating pressure	89.64	m	
condition 2			
FTP should not be less than 1.5 x maximum static pressure	89.64	m	
condition 3			
FTP should not be less than maximum sustained operating pressure+surge	146.18	m	
condition 4			
FTP should not be less than maximum static pressure+surge	146.18	m	
condition 5 (clause 6.4.4.2 of water supply manual)			
FTP should not be less than 2/3 rd of factory test pressure			
factory test pressure determined earlier	2.48	Mpa	
	240.90	m	
	2/3 rd. value of factory test pressure	160.60	m ok
	ratio	1.65	
hence adopted thickness of the pipeline	14.2	mm	
for the 1422 mm MS line for Kalamassery			
operating static pressure and water hammer pressure			
C, velocity of pressure wave travel in m/sec = $1425/\sqrt{1+(KD/E)}$			
k, bulk modulus of water	2.07E+08	kg/m ²	
outside diameter of pipe	1422	mm	
D, inside diameter of pipeline	1.38	m	
E, modulus of elasticity of pipe material in kg/m ²	2.1E+10		
C	986.3		
velocity in PM	1	m/sec	
Hmax	100.54	m	
	10.25	kg/cm ²	
maximum operating static pressure	45	m	
	4.59	kg/cm ²	
maximum operating pressure with surge	14.84	kg/cm ²	
internal design pressure is taken as the sum of maximum operating			

static				
pressure+surge since it is > 1.5 x maximum static pressure	1.51	Mpa		
nominal shell thickness				
as per IS: 5822 Code of practice for laying of steel pipes:				
nominal thickness, $t = P \times D / (2 \times a \times e \times f + P)$				
P = internal design pressure in Mpa				
D = outside diameter in mm				
a = design factor, 0.9 for design pressure including surge				
e = weld efficiency of joint, 0.80 for field welding				
f = specified minimum yield stress in Mpa				
grade of steel adopted	Fe 410			
hence specified minimum yield stress as per IS: 3589	235	Mpa		
allowance for corrosion+manufacturing tolerance of reduction in thickness	2	mm		
hence, computed thickness t	8.33	mm		
as per IS: 3589 provide minimum thickness	12.5	mm		
hydraulic test pressure at factory				
hydraulic test pressure at factory as per IS:3589 is given by:				
$P = 2 \times S \times T / D$				
P = hydraulic test pressure in Mpa and limited to 5 Mpa				
S = stress, 60% of specified minimum yield stress				
D = outside diameter in mm				
T = specified thickness of the tube in mm				
hence, computed hydraulic test pressure at factor	2.48	Mpa		
field test pressure	FTP			
in this case, maximum sustained operating pressure and maximum static pressure are taken as same				
condition 1				
FTP should not be less than 1.5 x maximum sustained operating pressure	67.5	m		
condition 2				
FTP should not be less than 1.5 x maximum static pressure	67.5	m		
condition 3				
FTP should not be less than maximum sustained operating pressure+surge	145.54	m		
condition 4				
FTP should not be less than maximum static pressure+surge	145.54	m		
condition 5 (clause 6.4.4.2 of water supply manual)				
FTP should not be less than 2/3 rd of factory test pressure				
factory test pressure determined earlier	2.48	Mpa		
	240.99	m		
	2/3 rd. value of factory test pressure	160.66	m	ok
	ratio	1.66		
hence adopted thickness of the pipeline	12.5	mm		

CHAPTER 3

PLANNING AND DESIGNING OF PROPOSED WATER TREATMENT PLANT

3.1 GENERAL

During the process of planning and designing of a water treatment system, many aspects are to be considered simultaneously. The source of raw water with dependability of quantity during dry seasons and desirable quality is the first element to be considered. The raw water intake point and the project area must be as close as possible to eliminate unwanted transmission of raw water for a longer distance. It may also be noted that the location of the water treatment facilities must also be in a favourable zone to cater effectively to every part of the project area. As far as possible the site of the water treatment plant (WTP) must be in a place above the high flood level. This will also facilitate gravity transmission of purified water to water supply zones. For the design of the proposed WTP at Aluva, all these main factors have been considered.

3.2 COMPONENTS OF A WATER TREATMENT SYSTEM

The components of the water treatment system generally consist of the following elements:

Sl. No.	Type of element	Function
1	Intake structure	This structure consists of intake wells of various configuration from which the raw water is taken from a water body.
2	Raw water pipeline	Transfer of raw water from intake structure to the water treatment plant
3	Water treatment plant	This system consists of many units where raw water is subjected to a systematic process of unit operations and chemical reactions in a specially designed chamber. The outcome is pure water conforming to the stipulations defined by Indian Standard Codes of Practice.
4	Sludge disposal units	Sludge generated from the treatment units are separately collected in sludge pits, diluted and carried to a sludge disposal system. hence environmental pollution is eliminated.
5	Clear water transmission pipelines	The purified water is collected in a reservoir and disinfected. Using specially designed pipelines, the purified water is carried to the locations for subsequent supply to the distribution system.
6	Pumping station	When gravity flow of clear water is not adequate, clear water is pumped to the distribution locations. Similarly, raw water is also pumped to the aerator for the initial treatment processes.

Table 10. Components of a water treatment system

3.3 DESIGN OF A WATER TREATMENT PLANT

Various steps in the procedure of design of a water treatment plant is illustrated as follows:

1. For the required output of treated water, input value of raw water is determined considering losses in WTP operation (normally 3 – 5%) and time of WTP working (normally 23 to 23 ½ hours with idling time cleaning, back washing etc.).

2. From the input value of flow, sizes of aeration, channels, flocculation, clarification and filtration units are determined. For this analysis, principles of mass-balance, open channel flow, gravity settling theory, chemical reactions, theory of filtration etc. are employed for optimum results.
3. After obtaining the unit sizes, a hydraulic flow diagram fixed for the entire process. Using open channel flow principles, head loss during flow between different units are determined. Top water levels (TWL) in each unit are fixed.
4. The units are placed on the site in accordance with the site geometry and reduced levels to impart a most favourable configuration minimizing head loss. This will also generate an economical system.
5. The final step is to design the units for structural actions in accordance with all relevant Indian Standard Codes of Practice for safety and serviceability conditions.

3.3.1. SITE SELECTION

The selection of a favourable site for construction of a WTP is the most important part of the planning process. There are many factors to be considered for the site selection as outlined below:

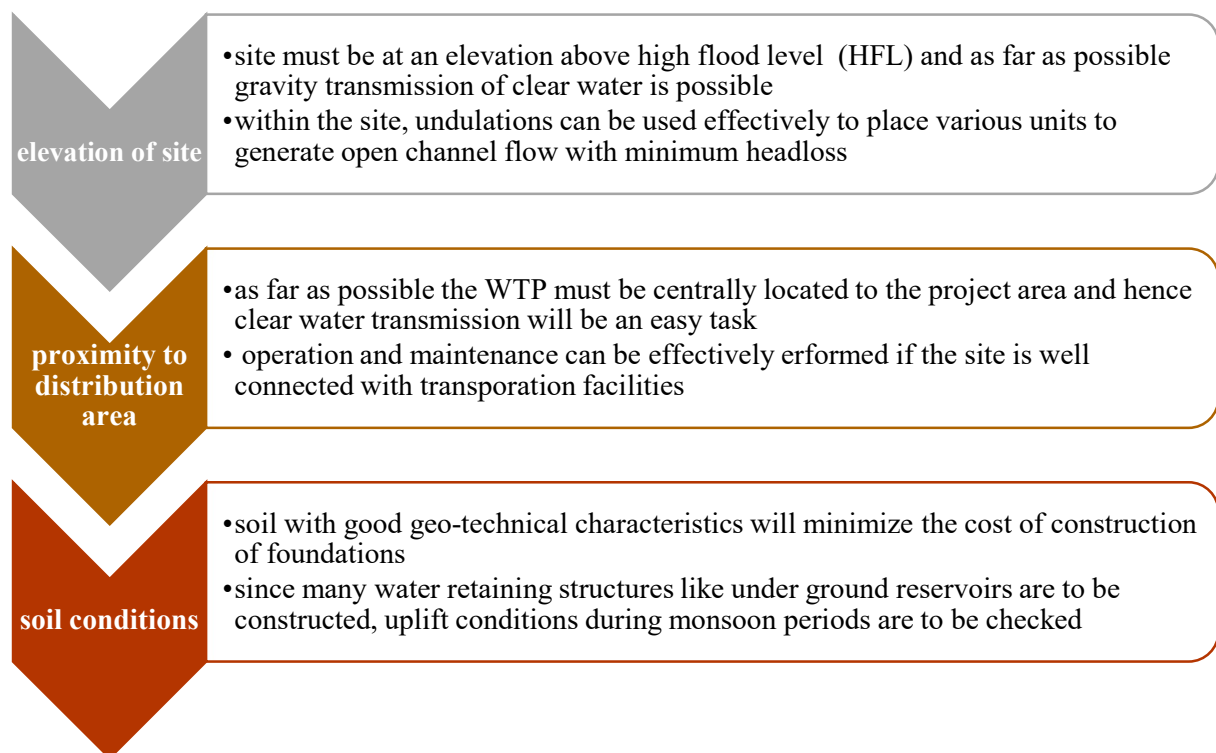


Figure 35. Aspects in selection of site for WTP

As already described in the previous sections, the site at Aluva for the proposed WTP is most favourable with respect to all these aspects and conditions.

3.3.2 PLANNING AND DESIGN ASPECTS

The layout of the proposed WTP has been fixed in accordance with the site conditions. The planning of the layout was a challenging activity due to the presence of overhead reservoirs. The proposed WTP is located at the most favourable location as far as the hydraulic, structural and administrative aspects are concerned. The aerator has been located at the entry point to the WTP to minimize the raw water pipeline length and the configuration has been given as a stepped tray. There are two stories in the aerator complex and parking, lobby, offices, museum etc. are accommodated beneath it. The raw water channel is designed as a balanced cantilever slab and walls supported by longitudinal and transverse beams and single columns are given to support the junction of these beams. This design will render minimum obstruction for passing underneath.



Figure 36. Existing land owned by KWA at Aluva-presence of existing pipelines, overhead reservoirs and old quarters posed issues for planning a new WTP

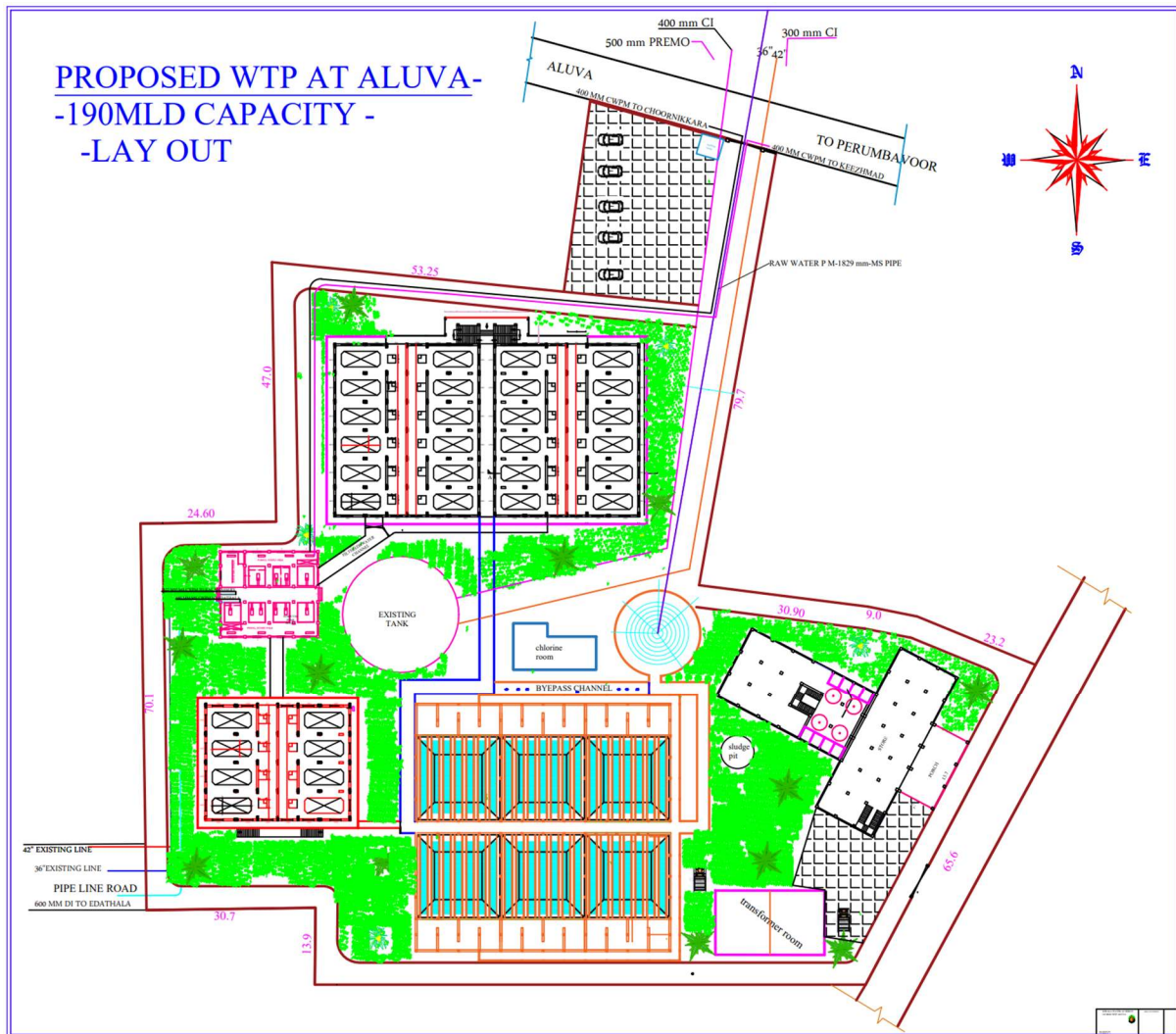


Figure 37. Layout of proposed 190 MLD WTP at Aluva Quarters compound

The raw water channel directed to baffled flocculators placed around the clarification units. There are 6 Nos. of clarifier and flocculator units. The clarifier units are designed as with hopper bottom units to enable sludge removal as well as the formation of a sludge blanket. Before entering the baffled flocculators, alum and lime dosing is given in the raw water channel at the point of turning to obtain maximum turbulence. Alum and lime dosing line is directed from the chemical house upper floor through gravity. There are mechanical rapid mixing units installed inside the baffled flocculator. There is a flow measuring unit installed in the raw water channel itself in the Parshall flume area. Baffled flocculators are placed above the ground level supported on raft floor slab extending from clarifier top portion. The clarifier units are divided into two vertical portions. The bottom portion is for additional flocculation and sludge blanket clarification process. Flocculated water from the baffled flocculator is transported to the clarifiers using 800 mm internal diameter pipelines. When the initially flocculated water is entered at the bottom of the trough shaped clarifier units through a dispersion box, water is directed upwards through a grid of pipes, the incoming velocity is drastically reduced. This will enable settling of flocs and at certain height from bottom a blanket of sludge will form. This will contribute for the clarification process also by trapping flocs. After this process, the partially clarified

water is travelled upwards to the top portion of the clarifier units where plate settlers are installed. The plate settlers are inclined 55° to horizontal and are made of stainless steel. The finer solid particles are subjected to contact with these plates and settled down subsequently. The inclined configuration of these plates renders lower value of surface overloading rates. The clarifier units are placed below ground level which is supported on a soil stratum of high bearing capacity. The detention time in the clarifiers are 1.5 hours for effectiveness of the treatment.

The clarified water is taken through channels to a series of filter units. There are 32 Nos. of filter units. These are arranged in three blocks comprising of 12 Nos. of beds in 1st and 2nd and eight beds in 3rd block. In each block of filter house, the filter units placed in two rows face to face. Hence 6 Nos. of beds are given in one side with 2 Nos. of pure water channels placed at central portion of the pipe gallery. The filter units are designed as dual media filters consisting of sand and anthracite coal supported on gravel. Better performance and control, separate control chambers are given outside filter beds. There are wash troughs and wash water gullet as per design stipulations. The wash water tank is placed in one filter block only with pipe network for transmission of water for washing of beds. There is air washing system also with blower units installed outside the building.

The filter blocks are designed as a vertical structure consisting of wash water tank/overhead reservoir at the top. Open space, office floors, operating platforms, filter beds and clear water reservoirs are placed beneath it. Laboratory, SCADA room, retiring room, toilets, data room etc. are placed in these blocks. From the clear water reservoir, an open channel is taken towards the pump house which consists of a smaller capacity sump inside it. Centrifugal submersible pump sets are planned to be installed for minimizing maintenance costs. The sludge disposal units are also provided for effective treatment and minimizing environmental pollution.

The WTP is planned to have fully automated functional units. There are IoT enabled sensors for flow and water quality parameter sensing at control points. These sensors are to be powered using solar energy. The WTP campus is to be converted to a green zone using special landscaping methodologies.

3.3.3 TREATMENT TECHNOLOGY ADOPTED

The proposed WTP consists of all modern approaches for the treatment of raw water especially when laden with higher levels of turbidity. From a departure from the conventional treatment methodologies, clarifiers are provided with up flow type process consisting of plate settlers at top. The filter units are provided with dual media filters comprising of sand and anthracite coal as media. The chemical dosing units using Alum and Lime are specially designed to generate uniform dispersion of the chemicals into raw water. The design aspects of unit operations and chemical processes are separately dealt with in the coming chapters.

3.3.4 HYDRAULIC SIMULATION OF WATER TREATMENT PROCESS

Hydraulic simulation of water treatment system was performed after collection of all basic input data like raw water inflow, expected flow routing in gravity mode, unit sizing based on retention time and other control parameters like surface overflow rates. A suitable peak factor to accommodate overflow of raw water is provided in the hydraulic analysis. The flow is expected to be carried out in gravity conditions through a network of channels and pipes. For all pipelines minimum slopes to generate gravity flow is given as per the recommendations of CPHEEO Manual of Water Treatment Systems.

The detailed hydraulic flow diagram and design is presented as follows:

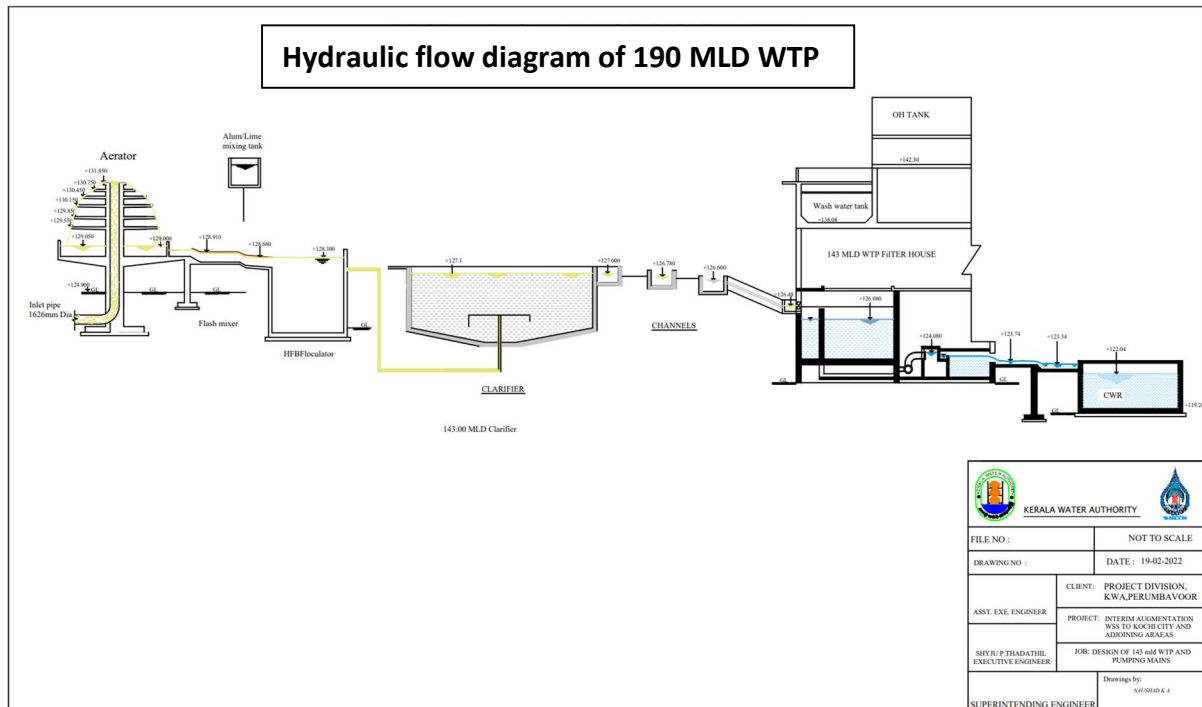


Figure 38. Hydraulic flow diagram for proposed WTP

DESIGN OF PIPES, CHANNELS AND HEAD LOSS CALCULATIONS			
lip level of aerator	131.05	m	
level of 1st tray	131.05	m	
level of 2nd tray	130.75	m	
level of 3rd tray	130.45	m	
level of 4th tray	130.15	m	
level of 5th tray	129.85	m	
level of 6th tray	129.55	m	
TWL in the collection tray	129.05	m	2.00
COLLECTION TRAY			
width of collection tray	2	m	
discharge	2.386	cumecs, normal	
diameter of collection tray	15.3	m	
mean diameter	13.3	m	
half-length of travel	20.88	m	
discharge in cumecs in half length	1.193	at normal	
width in m	2		

velocity in m/sec	0.75				
water height in m	0.8	at normal			
area in m ²	1.6				
wetted perimeter	3.6				
m value	0.444				
n value	0.013				
C value	67.01				
slope	0.0002789				
channel slope	0.0002789				
total depth	1.1	m, at normal			
IL at start	128.25	m, at normal			
fix IL of tray at start	128.25				
head loss	0.0	m, at normal			
fix head loss to safer side	0.05	m			
IL at end of tray & start of RWC	128.2	m, at normal			
fix IL at end of tray & before RWC	128.2				
TWL at the start of RWC	129	m, at normal			
RAW WATER CHANNEL (UP TO FLOW MEASUREMENT)					
drop to RWC at start	0.2	m			
IL of RWC at start	128				
discharge	2.386	normal in cumecs			
width of channel	3	m			
inner width of notch with 120 mm end contractions					
contractions	2.76	m			
b/B	0.92				
k value	4	mm (2.5 mm, 3 mm & 4 mm for b/B ranges of up to 0.4, 0.4 to 0.6 & 0.6 to 0.8 respectively)			
effective breadth, be	2.764	m			
Ce value from ISS	0.66				
depth of flow above weir	0.81	m, at normal			
height of sill level from channel	0.15	m			
water depth u/s	0.96	m, at normal			
velocity of flow at weir section	1.07	m/s, at normal			
discharge in cumecs in RWC u/s	2.386	at normal			
width in m	3				
velocity in m/sec	1	at normal			
water height in m	0.8	at normal			
area in m ²	2.4	at normal			
wetted perimeter	4.6	at normal			
m value	0.522	at normal			
n value	0.013	at normal			
C value	68.87	at normal			
slope	0.0003992	at normal			
channel slope	0.0003992				
distance of travel till Parshall flume	20	m, at normal			
head loss	0.01	m, at normal			
fix head losses to safer side	0.05	m			
IL of channel at position of notch	127.95	m, at normal			
fix IL of channel at position of notch	127.95				
sill level of notch	128.1	m, at normal			

fix sill level of notch	128.1				
TWL at start of RWC	128.8	m, at normal			
TWL at u/s of weir	128.91	m, at normal	OK		
drop from u/s TWL to d/s TWL	0.25	m			
RAW WATER CHANNEL (AFTER FLOW MEASUREMENT)					
discharge in cumecs in RWC d/s	2.386	at normal			
width in m	3				
velocity in m/sec	1	at normal			
water height in m	0.8	at normal			
area in m ²	2.4	at normal			
wetted perimeter	4.6	at normal			
m value	0.522	at normal			
n value	0.013	at normal			
C value	68.87	at normal			
slope	0.0003992	at normal			
channel slope	0.0003992				
distance of travel till HFBF	10	m, at normal			
head loss	0	m, at normal			
fix head loss to safer side	0.05	m			
IL of RWC at d/s at start	127.86	m, at normal			
fix IL of RWC at d/s at start	127.86				
TWL at d/s of notch in RWC	128.66	m, at normal			
IL of RWC near to HFBF	127.81	m, at normal			
fix IL of RWC near to HFBF	127.8	m			
TWL in RWC near to HFBF	128.6	m, at normal			
drop to HFBF	0.1	m			
TWL in channel at start of HFBF	128.5	m			
HORIZONTAL FLOW BAFFLED FLOCCULATOR					
normal inflow in m ³ /sec for half quantity to one direction	1.19				
width of channel through BF	1.5				
length of channel through BF	60				
actual horizontal velocity of flow in m/sec in flow channels	1.00				
water height in m	0.80				
area in m ²	1.2				
wetted perimeter	3.1				
m value	0.387				
n value	0.013				
C value	65.46				
Slope	0.000596				
Head loss	0.04				
fix head losses on safer side	0.2				
TWL in HFBF at end	128.3			2.75	
IL of HFBF	124.80				
HEAD LOSS BETWEEN HFBF AND CLARIFIER WITH PLATE SETTLER					
assumed velocity in pipe	0.8	m/s			
required diameter for this velocity	0.80	m			
assumed diameter of pipe	0.8	m			
length of travel	25	m			
discharge/clarifier	0.398				

loss of head due to contraction	0.016	m			
loss due to change in direction of flow	0.097	m			
loss due to friction of pipe	0.051	m			
velocity in the clarifier	0.6	m/s			
loss due to enlargement	0.002	m			
loss at exit	0.033	m			
total loss	0.2	m			
diameter of pipe required-from EPANET analysis	0.80	m			
fix total loss to clarifier	1.2	m	1.2		
TWL in the clarifier	127.1	m		3.95	
IL of clarifier	118.10	m			
drop to collection channel	0.1	m			
TWL at the start of collection channel of clarifier	127	m			
width of collection channel	2.3	m			
length of travel in central channel of clarifier	48	m			
discharge in cumecs	2.3392				
width in m	2.5				
velocity in m/sec	1				
water height in m	0.94				
area in m2	2.35				
wetted perimeter	4.38				
m value	0.537				
n value	0.013				
C value	69.21				
slope	0.0003852				
loss of head	0.02	m			
fix loss to safer side with drop	0.4				
TWL at end of collection channel	126.6	m		4.45	
CLARIFIED WATER CHANNEL-FROM CLARIFIER TO FILTER HOUSE					
discharge in cumecs in channel (Q)	2.386				
width in m	2.5				
velocity in m/sec	1				
water height in m	0.95				
area in m2	2.375				
wetted perimeter	4.4				
m value	0.54				
n value	0.013				
C value	69.27				
slope	0.0003895				
depth of channel	1.4	m			
IL of clarified water channel at start	125.65	m			
length of travel	50	m			
loss of head-including directional change	0.12	m			
IL of clarified water channel at end	125.53	m			
TWL in the clarified water channel at the end	126.48	m		4.57	
FILTER INLET CHANNEL					
number of channels around filter units	4	(Interconnected around but flow bifurcated			

		in two directions)			
discharge in cumecs(Q/2) in two directions (Q/4)	0.448				
width in m	1.2				
velocity in m/sec	1				
water height in m	0.37				
area in m ²	0.444				
wetted perimeter	1.94				
m value	0.229				
n value	0.013				
C value	59.87				
slope	0.0012412				
length of travel	90	m			
head loss	0.11	m			
head loss due to directional change	0.1	m			
total head loss	0.21	m			
fix head losses on safer side	0.3	m			
TWL in the filter inlet channel at end	126.18	m		4.87	
IL of filter inlet channel at end	125.81	m			
HEAD LOSS IN THE FILTER INLET PORTION					
filter inlet					
normal discharge	0.075	cumecs			
discharge at 100% overload	0.149	cumecs			
velocity of flow	0.3	m/s			
area required	0.5	m ²			
diameter required	0.798	m			
loss due to submergence	0.011	m			
exit loss	0.018	m			
loss due to fittings	0.007	m			
loss due to contraction	0.009	m			
total loss	0.05	m			
fix total loss to safer side	0.1	m			
TWL in filter shell	126.08	m		4.97	
IL of filter shell	123.23	m			
maximum head loss to measuring chamber	2	m			
TWL in the measuring chamber	124.08	m		6.97	
width of notch in the chamber	1.5	m			
discharge at 100% overload	0.149	cumecs			
depth of flow above notch	0.15	m			
TWL at the sill of notch	123.93	m		7.12	
drop to PWC from sill of notch	0.05	m			
TWL in the PWC at start	123.88	m		7.17	
PURE WATER CHANNEL					
length of travel till measuring weir	10	m			
width of weir	1.4	m			
discharge-excluding losses	0.448	cumecs			
depth of flow at weir	0.32	m			
velocity at weir section	1	m/s			
height of sill of weir from floor	0.35	m			

total depth of flow till weir	0.67	m			
IL of PWC at start	123.21	m			
discharge in cumecs	0.4481593	cumecs			
width in m	1.5	m			
velocity in m/sec	0.75	m/s			
water height in m	0.4	m			
area in m2	0.6				
wetted perimeter	2.3				
m value	0.261				
n value	0.013				
C value	61.22				
slope	0.0005703				
head loss till weir	0.01	m			
IL of PWC at notch	123.2	m			
sill level of notch	123.55	m			
TWL at notch in PWC- u/s	123.87	m		7.18	
drop from u/s TWL to d/s TWL	0.13	m			
TWL at d/s in the PWC	123.74	m		7.31	
IL of PWC d/s	123.34	m			
length of travel till CWR	15	m			
head loss	0.01	m			
fix head losses on safer side	0.1	m			
IL at the entry to CWR	123.24	m			
TWL at entry to CWR	123.64	m		7.41	
drop to TWL of CWR from IL of PWC	1.2	m			
TWL in the CWR	122.04	m		9.01	
depth of water in CWR	2.8	m			
IL of CWR	119.24	m			
TOTAL LOSS FROM LIP OF AERATOR TO CWR	9.01	m			

3.4 STRUCTURAL DESIGN OF WATER TREATMENT PLANT

Structural design of all components of the WTP has been performed in accordance with all principles of structural analysis and design. There are mainly reinforced concrete elements and few steel structural elements. Grade of reinforced concrete adopted is M30 conforming to the severe exposure conditions as per IS: 456 (2000). All water retaining elements are designed as uncracked sections as per the principles for working stress method for reinforced concrete. The grade of steel recommended is Fe 415. For all structures, seismic analysis has been performed as per the recommendations of all relevant Indian Standard Codes of practice. The liquid retaining structures are analysed for hydrodynamic conditions during seismic excitations. Since the soil conditions are observed to be extremely suitable for medium to heavy loaded structures, isolated type and beam-slab raft type footings are designed for most of the structural components. However, for the multi-storied filter blocks, piled raft is given in accordance with the soil analysis report.



Indian standard Codes of Practice referred for detailed analysis and design

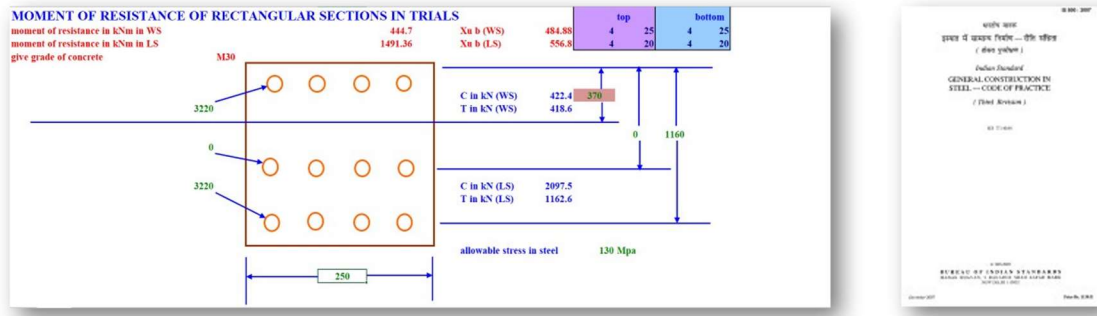


Figure 39. Indian Standard Codes of Practice referred for analysis and design

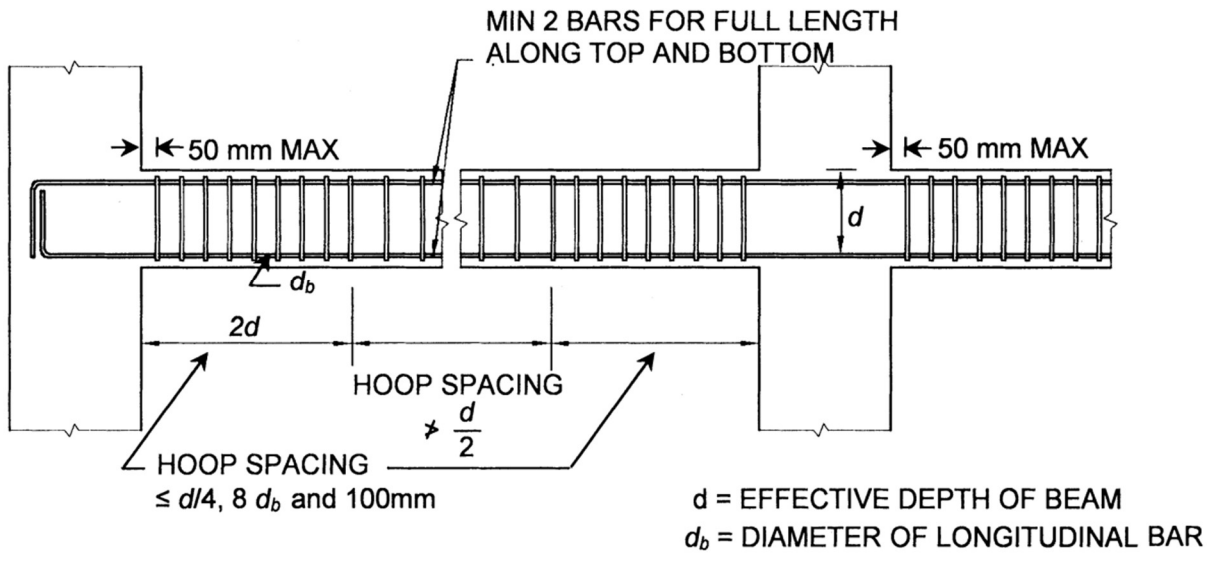


Figure 40. Reinforcement detailing aspects

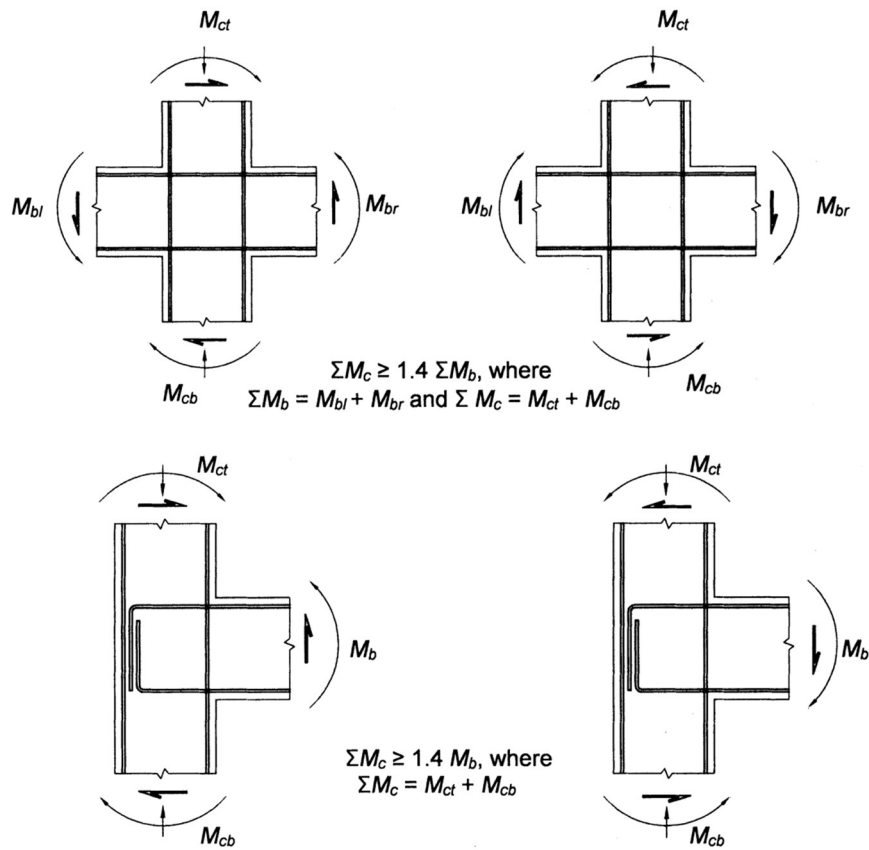


Figure 41. Strong-column weak-beam design philosophy for seismic design

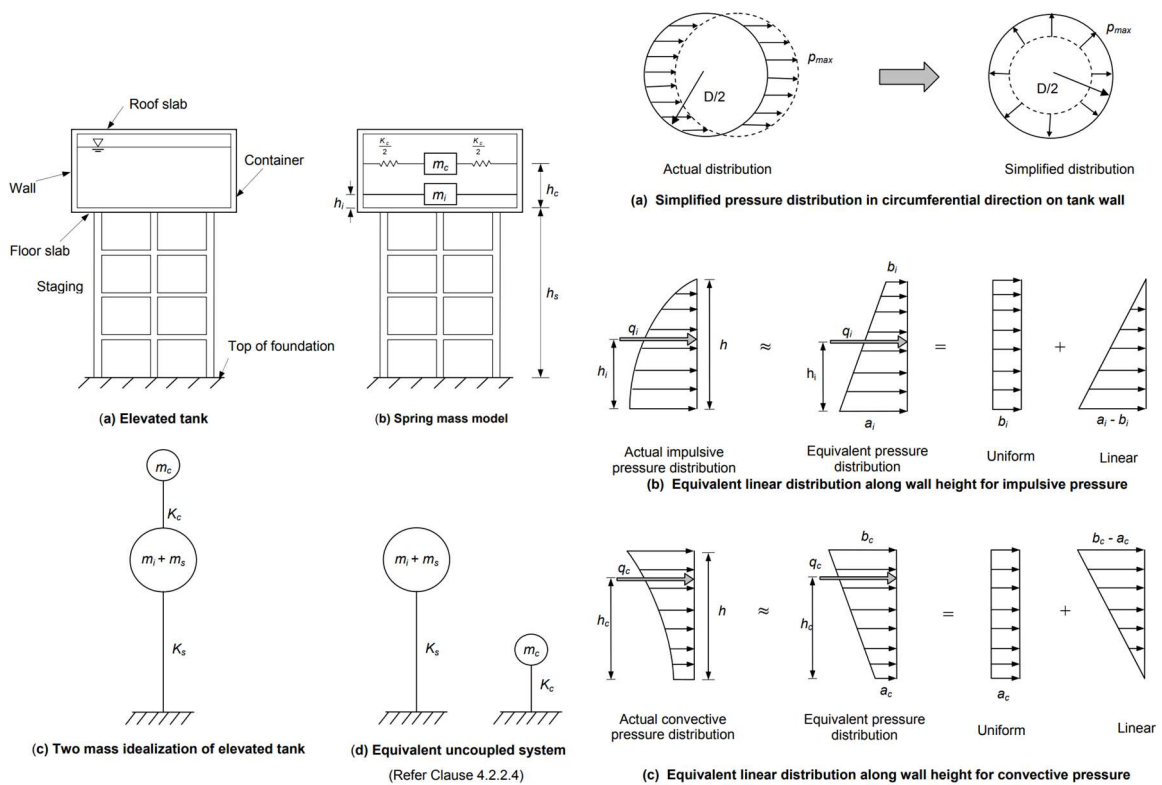


Figure 42. Hydrodynamic analysis of water retaining structures during seismic excitations

3.5 CONSTRUCTION OF STAFF QUARTERS

At the proposed WTP site there are 43 Nos. of independent staff quarters located. Most of the quarters were constructed in 1960s and 1970s. Out of these 24 Nos. are dilapidated and not inhabitable and 19 Nos. were occupied which were partially damaged. The inmates of the quarters have already been relocated. However, construction of a new residential quarter's facility as multi storied building system is proposed near Head Works campus at Aluva. An extent of 0.344 hectares of land is available over there. The staff quarters are proposed to be constructed as three blocks namely A, B and C. Block A contains 15 units in three floors a having plinth area of 100 m². Blocks B & C contains total of 30 units in three floors having plinth area of 80 m². The construction cost of the staff quarters is worked out to Rs.11.30 Crores and is in progress.

3.6 LAND ACQUISITION

The 1.57 Hectors of Aluva quarters land owned by KWA near the existing WTP is proposed for the construction of the new WTP. Rehabilitations of the occupied staffs and the shifting of the Division Store materials to convenient place are to be considered. KWA land near head works is available for constructing the staff quarters and pipeline road is sufficient for laying the new pipeline. **So, the land acquisition is not needed for this phase.**

3.7 CONCLUSIONS

In this Chapter various aspects of the planning and design of the proposed WTP has been described in detail. The salient features of the WTP are as follows:

1. Maximum utilisation of available space
2. Minimum head loss from aerator to clear water channel
3. Optimum detention time for flocculation and clarification
4. Double clarification using sludge blanket and plate settlers
5. Optimum rate of filtration
6. Dual media filtration
7. Vertical placing of units for minimising area
8. Green landscaping
9. Full automation for units
10. Solar power for sensors
11. IOT based smart system for control of operation

CHAPTER 4

DESIGN OF UNIT OPERATIONS AND TREATMENT PROCESS

4.1 GENERAL

The constituents of concern found in raw water are removed by physical and chemical methods. The individual methods usually are classified as physical unit operations and chemical 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.

From practical observations, the rates at which physical and chemical 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, and the type of process units. The fundamental basis for the analysis of the physical and chemical unit operations and processes used for water 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.

In the following sections, the design of unit operations and chemical unit processes are described. The sizes of the units and control parameters are determined.

4.2 COMPONENTS OF A WATER TREATMENT PLANT

The components of the water treatment system are described in the process flow chart separately attached. The components are listed as follows:

Sl. No.	Description unit	Nature of treatment
1	Raw water intake	Receive raw water and carry to treatment plant
2	Aerator	Removes bad odour and taste by oxygen contact
3	Flow channels	Gravity water flow open channels
4	Baffled flocculator	Treatment unit in which flocculation of impurities occur by chemical dosing and physical stirring action
5	Sludge blanket clarifier with plate settler	Clarification of chemically treated water using sludge blanket and plate settler units.
6	Dual media rapid sand filter	Filtration of clarified water using sand and anthracite coal dual media for better results
7	Chlorination units	Disinfection of filtered water
8	Clear water reservoir	This unit is used for holding filtered clear water
9	Sludge sump	Sludge from clarifier is collected and transferred to sludge treatment and disposal units

Table 11. Components of a water treatment plant

4.3 DESIGN OF AERATOR

Aeration is the treatment process whereby water is brought into intimate contact with air for the purpose of (a) increasing the oxygen content, (b) reducing the carbon dioxide content, and (c) removing hydrogen sulphide, methane and various volatile organic compounds responsible for bad taste and odour. The treatment results mentioned under (a) and (c) are always useful in the production of good drinking water. Reducing the carbon dioxide content, however, may shift the carbonate-bicarbonate equilibrium in the water so that deposits of calcium carbonate are formed which may cause problems. The atmospheric oxygen brought into the water through aeration will react with the dissolved ferrous and manganous compounds changing them into insoluble ferric and manganic oxide hydrates. Sedi-mentation or filtration can then remove these. It is important to note that the oxidation of the iron and manganese compounds in the water is not always readily achieved. Particularly when the water contains organic matter, the formation of iron and manganese precipitates through aeration is likely to be not very effective. The aerator is designed as a stepped tray type to generate maximum air contact (residence time on 1.5 seconds). The contact area is taken to provide adequate turbulence and hence plenty of oxygen supply.

4.3.1 UNIT OPERATIONS-HYDRAULIC ANALYSIS

required out put	190	MLD	(ULTIMATE)			
losses	4	%				
working hours	23	hours				
in put required	206.19	MLD	8591.2	m ³ /hour	2.386	m ³ /sec
			5			
velocity in raw water pipeline in m/sec	1					
inside diameter required for raw water pipeline in mm	1743					
pipe wall thickness in mm	14.20					
fix outside diameter on MS pipeline in mm	1829	lining thickness in mm	9			
actual inside diameter in mm	1782.6					
AERATOR						
number of units	1					
in put flow	8591.2	m ³ /hour, at Q				
	5					
requirement of area	0.01	m ² /m ³ /hour				
area required	85.91	m ²				
average velocity in the inlet shaft	0.75	m/s				
required area of c/s	3.181	m ²				
diameter of inlet shaft	2.013	m				
diameter of inlet shaft provided	2000	mm				
velocity inside shaft in m/s	0.76	at normal				
wall thickness	300	mm				
diameter of largest tray	10.65	m			5.65	
fix diameter	11.30	m			5.65	
number of trays (excluding	6					

collection tray)						
rise of trays	0.3	m				
treads	0.7750	m				
diameter of 6th tray	11.30	m				
diameter of 5th tray	9.750	m				
diameter of 4th tray	8.20	m				
diameter of 3rd tray	6.650	m				
diameter of 2nd tray	5.1	m				
diameter of 1st tray	3.550	m				
air contact time	1.48	sec	OK	> 1 sec		

4.3.2 STRUCTURAL DESIGN

DESIGN OF STEPPED AERATOR						
design of tread-riser slab						
assumed thickness of tread-riser waist slab in m	0.3					
udl in T/m ² from flowing water	0.15					
udl in T/m ² from finishes	0.10					
udl in T/m ² from live action	0.075					
tread in m	0.775					
rise in m	0.3					
thickness of slab in m	0.3					
size of haunch at top in m	0.45					
diameter of inlet shaft in m	2					
thickness of inlet shaft in m	0.3					
weight of horizontal shell in T-h1	1.14		h1r1	1.3		
weight of vertical shell in T- v1	4.59		h1r2	1.475		
weight of horizontal shell in T-h2	4.50		h2r1	1.775		
weight of vertical shell in T- v2	6.78		h2r2	2.25		
weight of horizontal shell in T-h3	6.24		h3r1	2.55		
weight of vertical shell in T- v3	8.97		h3r2	3.025		
weight of horizontal shell in T-h4	7.97		h4r1	3.325		
weight of vertical shell in T- v4	11.16		h4r2	3.8		
weight of horizontal shell in T-h5	9.70		h5r1	4.1		
weight of vertical shell in T- v5	13.35		h5r2	4.575		
weight of horizontal shell in T-h6	10.18		h6r1	4.875		
total self-weight of tread-riser slab in T	84.60		h6r2	5.300		
circular plan area in m ²	82.90			0.25		
udl on circular slab in T/m ² from self weight	1.021			5.65		
total udl from slab in T/m ²	1.346					
C/D ratio as per Table 21 of IS 3370	0.33					

radial moment in Tm/m	1.98	circumferential moment in Tm/m	0.567		
non-crack thickness in mm	248.9		133.1		
fix dia for top steel	12	spacing	120		
fix dia for bottom steel	12	spacing	120		
area of steel given in mm ²	top	942.48	0.38		
	bottom	942.48	0.38		
moment of resistance of section in ws	3.48	tm			
moment of resistance of section in LS	10	tm			
collection tray channel					
diameter of largest tray in m	11.3				
width of channel in m	2				
water depth in m	1.5				
assumed thickness of wall in m	0.2				
assumed thickness of floor in m	0.2				
assumed thickness of top slab in m	0				
projection of top slab in m	0				
projection of cross beam in m	1				
width of cross beam in m	0.45				
drop of cross beam at support in m	0.60				
width of longitudinal beam in m	0.45				
drop of longitudinal beam in m	0.6				
size of circular column in m	0.45				
number of columns	12				
spacing between columns in m	3.48				
square footing side in m	2.5				
depth of footing at support in m	0.75				
depth of footing at free end in m	0.35				
design of sidewall of channel					
bending moment on wall in Tm/m	0.5625				
non-crack thickness in mm	134.7				
fix thickness of wall in mm	200				
dia for steel-inner both ways in mm	10				
spacing in mm	200				
Ast for tension in mm ²	392.70	% Ast in surface zone	0.39		
dia for steel-outer both ways in mm	10				
spacing in mm	200				
Ast for compression in mm ²	392.70	% Ast in surface zone	0.39		
moment of resistance in Tm-WS	0.79				
moment of resistance in Tm-LS	2.59				
design of channel slab					
thickness of channel slab in mm	200				
spacing of columns in m	3.5				

loading in T/m ² for channel slab	2.00				
span in m	1.00	(Due to central beam)			
point load in T/m from side wall	0.75				
moment in Tm	1.0				
non-crack thickness in mm	179.6				
fix thickness of channel in mm	200				
dia for steel-tension in mm	12				
spacing in mm	150				
Ast for tension in mm ²	753.98	% Ast in surface zone		0.75	
dia for steel-compression in mm	12				
spacing in mm	150	% Ast in surface zone			
Ast for compression in mm ²	753.98		0.75		
moment of resistance in Tm-WS	1.45				
moment of resistance in Tm-LS	4.11				
design of longitudinal circular beam					
width in mm	450				
drop in mm	800				
udl from channel in T/m	4.85				
self weight in T/m	0.90				
total udl on beam in T/m	5.75				
design of curved beams					
radius of beam in m	6.65				
load intensity in t/m	5.53				
angle in degree	30				
total load on circular beam in t	230.9				
values of coefficients		0.0037	0.0014	0.0017	7
		M (-)	M (+)	T	
		5.68	2.15	2.61	
		SF		SF	
		9.62		5.13	
design moment in tm	5.68				
breadth of beam in mm	450				
depth of beam in mm	800		k value	0.89	
torque in tm	2.61				
torsion from slab if any in tm	1.00				
seismic moment in Tm	1.87				
Meq in tm	13.45				
no. of columns	angle	negative	positive	maximu m	angular
		moment at	momen t at	torque	distance
		support	centre of spans		for maximu m
		K1	K2	K3	torsion
4	90	0.0342	0.0176	0.0053	19
5	60	0.0148	0.0075	0.0015	12
8	45	0.0083	0.0041	0.0006	9
10	36	0.0054	0.0023	0.0003	7
12	30	0.0037	0.0014	0.0017	7
design moment in Tm	13.45				

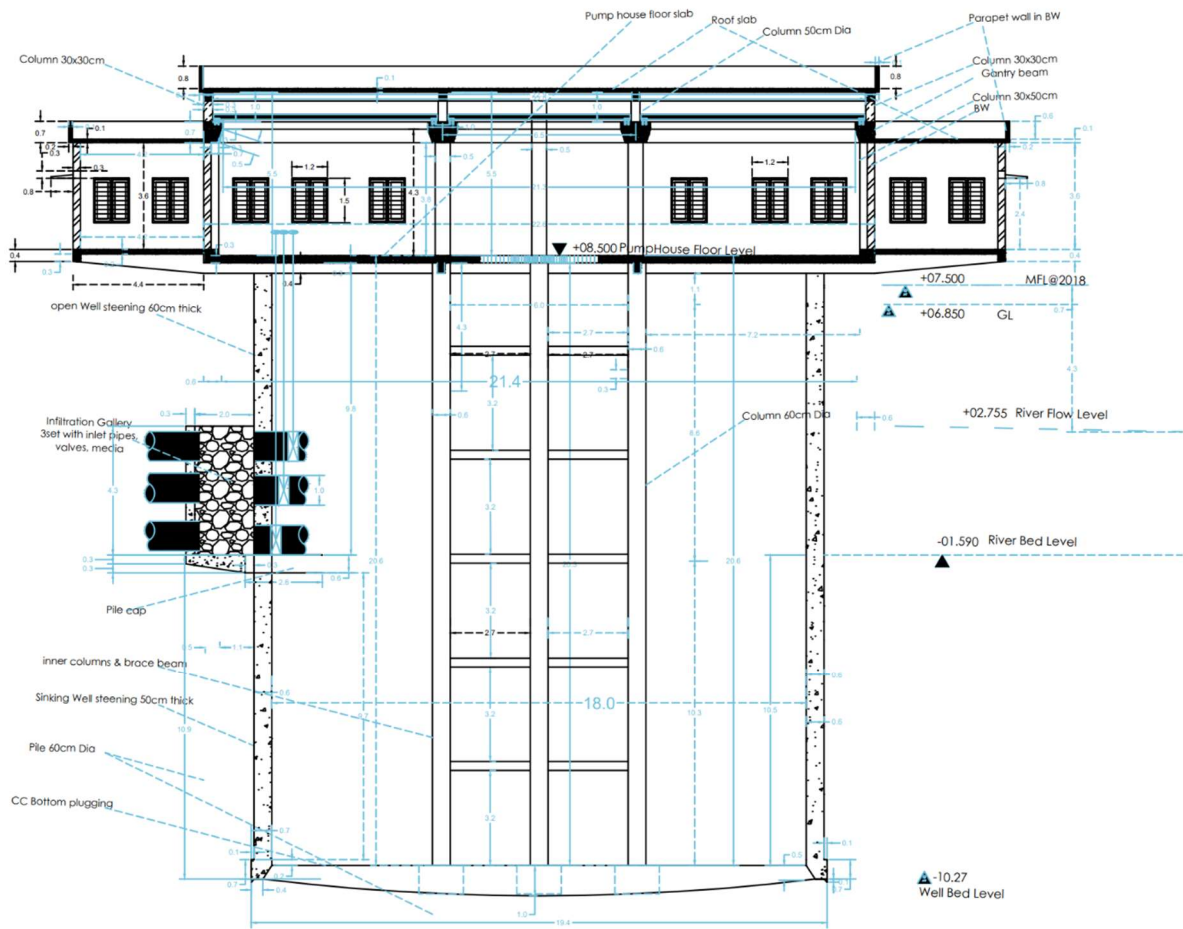
dia for steel-tension in mm	20				
numbers	5				
Ast for tension in mm ²	1570.80				
dia for steel-compression in mm	20				
numbers	5				
Ast for compression in mm ²	1570.80				
moment of resistance in Tm-WS	14				
moment of resistance in Tm-LS	40				
shear force in T	9.62				
shear force from torsion in T	5.13				
shear force equivalent in T	18.31				
shear stress in Mpa	0.53				
area of tension reinforcement	0.46				
allowable shear stress in Mpa	0.3				
number of legs	2				
diameter of shear bars in mm	10				
spacing of shear reinforcement in mm	199				
fix spacing in mm	150	fix spacing at joints for 2d			100
design of sidewall as beam					
width in mm	350				
total depth in mm	1700				
load from stepped tray in T/m	1.68				
self-weight of beam in T/m	1.49				
total udl in T/m	3.16				
design of curved beams					
radius of beam in m	5.825				
load intensity in t/m	3.16				
angle in degree	30				
total load on circular beam in t	115.6				
values of coefficients		0.0037	0.0014	0.0017	7
		M(-)	M(+)	T	
		2.49	0.94	1.14	
		SF		SF	
		4.82		2.57	
design moment in tm	2.49				
breadth of beam in mm	350				
depth of beam in mm	1700		k value	0.95	
torque in tm	1.14				
torsion from slab if any in tm	0.00				
seismic moment in Tm	0.82				
Meq in tm	7.24				
no.of columns	angle	negative	positive	maximum	angular
		moment at	moment at	torque	distance
		support	centre of spans		for maximum
		K1	K2	K3	torsion
4	90	0.0342	0.0176	0.0053	19

5	60	0.0148	0.0075	0.0015	12
8	45	0.0083	0.0041	0.0006	9
10	36	0.0054	0.0023	0.0003	7
12	30	0.0037	0.0014	0.0017	7
design moment in Tm	7.24				
dia for steel-tension in mm	16				
numbers	4				
Ast for tension in mm ²	804.25				
dia for steel-compression in mm	16				
numbers	4				
Ast for compression in mm ²	804.25				
moment of resistance in Tm-WS	16.5				
moment of resistance in Tm-LS	47				
shear force in T	4.82				
shear force from torsion in T	2.57				
shear force equivalent in T	7.39				
shear stress in Mpa	0.13				
area of tension reinforcement	0.14				
allowable shear stress in Mpa	0.2				
number of legs	2				
diameter of shear bars in mm	8				
spacing of shear reinforcement in mm	-499				
fix spacing in mm	200	fix spacing at joints for 2d			100
design of tie-beams at top and bottom					
breadth of beam in mm	350				
total depth in mm	800		5.65		
self-weight in T/m	0.70				
total span in m	5.65				
left span in m	1.00				
right span in m	4.65				
point load in T from sidewall	11.0				
moment from point load in Tm	7.46				
dia for steel-tension in mm	16				
numbers	4				
Ast for tension in mm ²	804.25				
dia for steel-compression in mm	16				
numbers	4				
Ast for compression in mm ²	804.25				
moment of resistance in Tm-WS	16.5				
moment of resistance in Tm-LS	47				
shear force in T	8.81				
shear stress in Mpa	0.33				
area of tension reinforcement	0.30				
allowable shear stress in Mpa	0.2				
number of legs	2				
diameter of shear bars in mm	8				
spacing of shear reinforcement in mm	294				
fix spacing in mm	200	fix spacing at joints for 2d			100

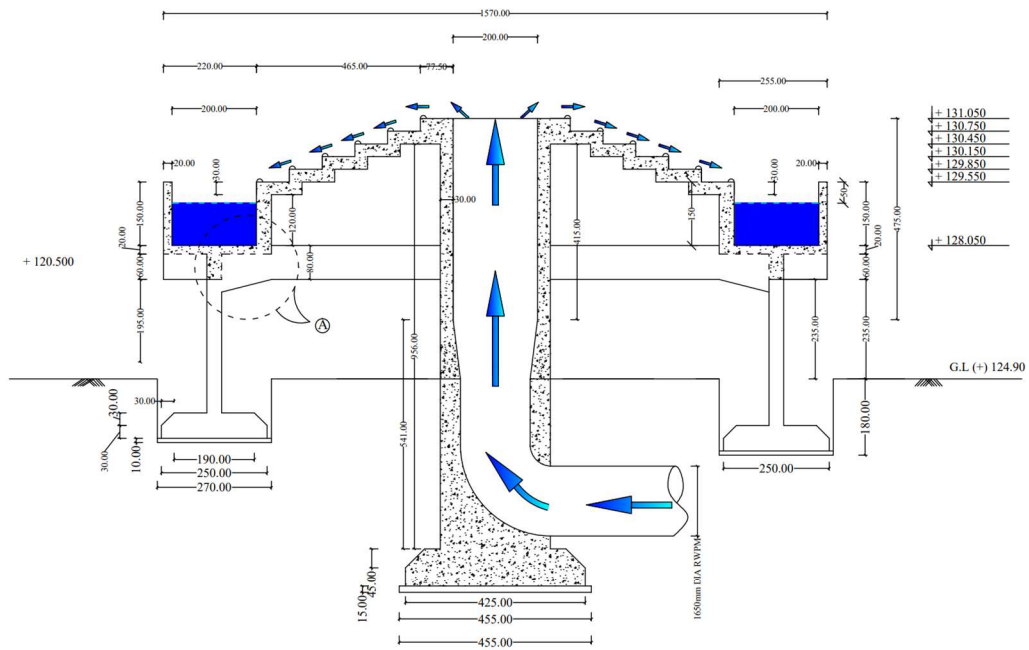
design of column					
size of circular column in m	0.45				
height of square column in m	4.5				
axial load in t	38.0				
factored axial load in t	57				
static moment in tm	1.43				
seismic moment in tm	3.42				
size of the column adopted in mm	450				
dia of steel bars 1	25				
numbers	8				
dia of steel bars 2	12				
numbers	0				
total area of steel in mm ²	3927				
% steel	2.47				
axial load capacity in t	264.31				
ratio	0.22				
unsupported length in m	4.5				
L/d ratio	10				
Pu/fckd ²	0.11				
p/fck	0.099				
d'/D	0.09				
Mu/fck d ³ from chart	0.09				
<i>seismic force in X direction</i>					
Mux l	205031250				
Mux	57096878.13				
Muy l	205031250				
Muy	57096878.13				
Puz in t	301.15				
Pu/Puz	0.19				
alfa n	1				
check	0.56				
<i>seismic force in Y direction</i>					
Mux l	205031250				
Mux	57096878.13				
Muy l	205031250				
Muy	57096878.13				
Puz in t	301.15				
Pu/Puz	0.19				
alfa n	1				
check	0.56				
design of isolated footing					
size of column in mm	450				
axial load from column in t	38				
moment at column base in tm	2				
SBC value of soil in t/m ²	12				
area of footing in m ²	3.49				
side of square footing in m	1.87				
fix side of square footing	2.5				
upward thrust in t/m ²	6.7				
factored axial load in kN	447.82				

factored moment in kNm	23.54			
eccentricity in mm	45.71			
maximum stress in kN/m ²	91.44			
minimum stress in kN/m ²	73.36			
enhanced SBC value in kN/m ²	180			
thickness of footing based on shear				
factored net soil pressure kN/m ² -max	80.69			
factored net soil pressure kN/m ² -min	62.61			
trial footing thickness in mm	750			
effective depth in mm	705			
factored soil pressure at deff	78.38			
average soil pressure in kN/m ²	79.54			
bearing area in m ²	0.8			
shear in kN	63.63			
shear stress in N/mm ²	0.04			
assumed steel percentage	0.2			
allowable shear stress in N/mm ²	0.325			
factored two-way shear				
average soil pressure in kN/m ²	71.65			
two-way shear in kN	352.23			
two-way shear stress in N/mm ²	0.11			
limiting shear stress in Mpa	0.8			
check for maximum soil pressure				
depth of footing in m	1.25			
q max in kN/m ²	121.19			
enhanced SBC value in kN/m ²	180			
design of flexural reinforcement				
cantilever projection in m	1.025			
width in m	2.5			
d eff in m	0.705			
qu at footing edge in kN/m ²	91.44			
qu at face of column in kN/m ²	84.03			
moment at column base in kNm	116.88			
required depth at limit state in mm	218.9			
Ast required for bal section in mm ²	573.66			
pt for one way shear	0.20			
Ast required in mm ²	3525			
select dia of bars	16			
numbers	17.53			
fix numbers	18			
spacing in mm	134			
development length required	784			
design of central shaft				
inner dia of the central shaft in m	2.25	outer diameter of the central shaft in m	2.85	
height of central shaft in m	7			
wall thickness in m	0.3			

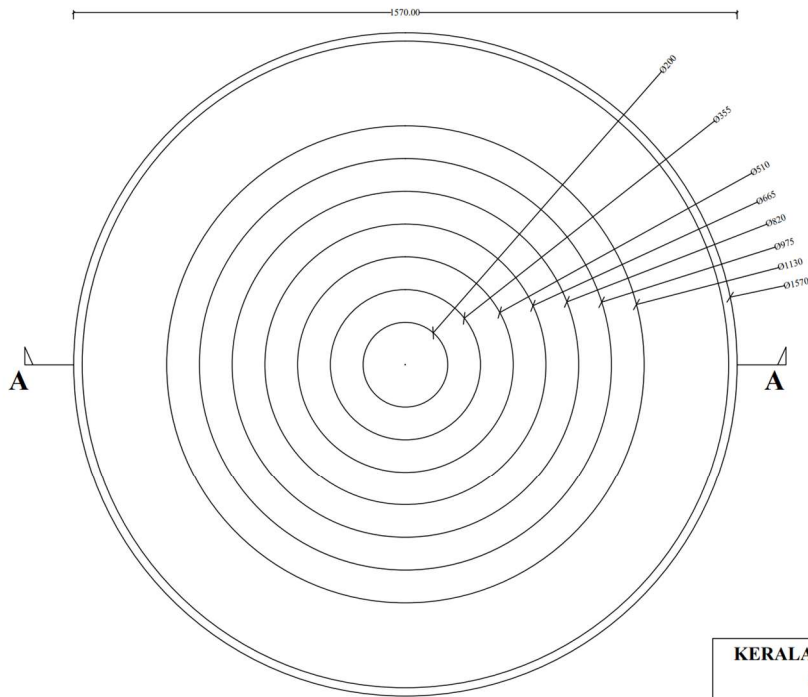
H ² /Dt	72.59				
I _{xx} of the shell section in mm ⁴	3.16878E+13				
hoop tension in T/m	7.875				
hoop stress in Mpa	0.2575				
dia for hoop steel in mm	12	spacing in mm	200		
A _{st} in mm ² -in double layer	1130.976				
tensile stress in steel bars in Mpa	68.31				
design of foundation					
height of central shaft in m	7.45				
inner dia of the central shaft in m	2				
wall thickness in m	0.3				
outer dia of central shaft in m	2.6				
load from central shaft concrete in T	40.37				
load from water in T	23.40				
load from stepped tray in T	32.23				
load from pipe in T	21.14				
total load on foundation slab in T	131.55				
SBC value of soil in t/m ²	10.00				
required foundation slab area in m ²	13.16				
required diameter of foundation raft slab in m	4.09				
fix dia of foundation raft slab in m	4.25				
offset to central shaft in m	0.825				
upward thrust in t/m ²	9.27				
moment at edge of foundation slab in tm/m	3.16				
depth of slab in mm	900	at ends	600		
dia of top steel in mm	16	spacing in mm			200
dia of bottom steel in mm	16	spacing in mm			200
moment of resistance in Tm	10				
% Area of tension steel	0.12				
punching shear in Mpa	0.12				



SECTION - 18m Dia INTAKE WELL CUM PUMP HOUSE FOR 190MLD WTP AT ALUVA



SECTION A-A



AERATOR-15.70m OUTER DIA.

KERALA WATER AUTHORITY
 PROJECT DIVISION
 PERUMBAVOOR
 NAME OF PROJECT-AUGMENTATION
 OF WSS TO KOCHI CITY AND
 ADJOINING AREAS

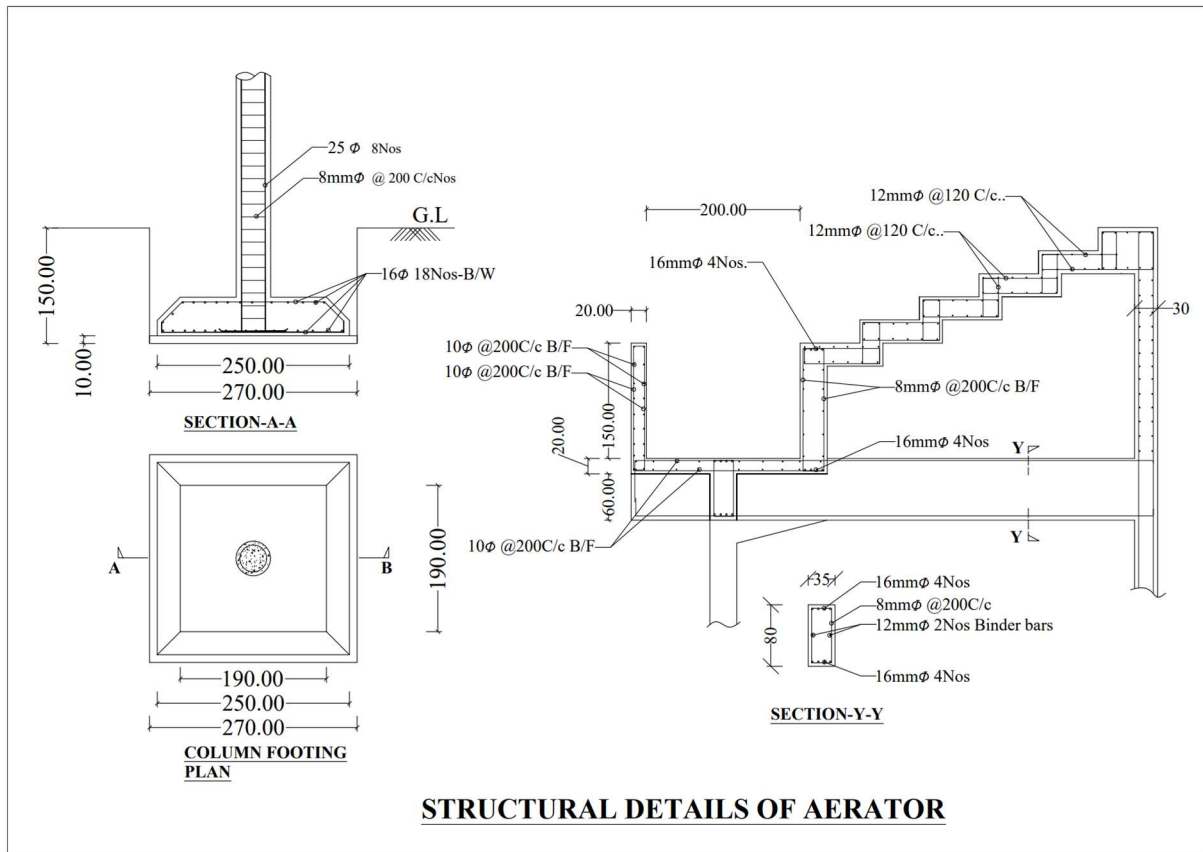


Figure 43. Components of stepped tray type aerator

4.4. DESIGN OF RAW WATER AND OTHER CHANNELS

The raw water channel is designed to carry the required quantity water in gravitational flow from aerator to baffled flocculator units. There is a Parshall flume installed in between the flow to measure accurately the quantity of flow. There are bypass arrangements for the channels. The channels are designed to generate open channel flow in accordance with the slope provided. Manning’s equation for open channel flow is taken for analysis with “n” value as 0.013 for concrete surfaces. There are sufficient drops provided at every change in units. Sufficient freeboard has been given and the channel flow is checked for an overload of 50%.

4.4.1 UNIT OPERATIONS-HYDRAULIC ANALYSIS

DESIGN OF PIPES, CHANNELS AND HEAD LOSS CALCULATIONS					
lip level of aerator	131.05	m			
level of 1st tray	131.05	m			
level of 2nd tray	130.75	m			
level of 3rd tray	130.45	m			
level of 4th tray	130.15	m			
level of 5th tray	129.85	m			
level of 6th tray	129.55	m			
TWL in the collection tray	129.05	m			2.00
COLLECTION TRAY					
width of collection tray	2	m			
discharge	2.386	cumecs, normal			
diameter of collection tray	15.3	m			

mean diameter	13.3	m			
half length of travel	20.88	m			
discharge in cumec in half length	1.193	at normal			
width in m	2				
velocity in m/sec	0.75				
water height in m	0.8	at normal			
area in m ²	1.6				
wetted perimeter	3.6				
m value	0.444				
n value	0.013				
C value	67.01				
slope	0.0002789				
channel slope	0.0002789				
total depth	1.1	m, at normal			
IL at start	128.25	m, at normal			
fix IL of tray at start	128.25				
head loss	0.0	m, at normal			
fix head loss to safer side	0.05	m			
IL at end of tray & start of RWC	128.2	m, at normal			
fix IL at end of tray & before RWC	128.2				
TWL at the start of RWC	129	m, at normal			
RAW WATER CHANNEL (UP TO FLOW MEASUREMENT)					
drop to RWC at start	0.2	m			
IL of RWC at start	128				
discharge	2.386	normal in cumecs			
width of channel	3	m			
inner width of notch with 120 mm end					
contractions	2.76	m			
b/B	0.92				
k value	4	mm (2.5 mm, 3 mm & 4 mm for b/B ranges of up to 0.4, 0.4 to 0.6 & 0.6 to 0.8 respectively)			
effective breadth, be	2.764	m			
Ce value from ISS	0.66				
depth of flow above weir	0.81	m, at normal			
height of sill level from channel	0.15	m			
water depth u/s	0.96	m, at normal			
velocity of flow at weir section	1.07	m/s, at normal			
discharge in cumec in RWC u/s	2.386	at normal			
width in m	3				
velocity in m/sec	1	at normal			
water height in m	0.8	at normal			
area in m ²	2.4	at normal			
wetted perimeter	4.6	at normal			
m value	0.522	at normal			
n value	0.013	at normal			
C value	68.87	at normal			
slope	0.0003992	at normal			
channel slope	0.0003992				
distance of travel till parshall flume	20	m, at normal			
head loss	0.01	m, at normal			

fix head losses to safer side	0.05	m			
IL of channel at position of notch	127.95	m, at normal			
fix IL of channel at position of notch	127.95				
sill level of notch	128.1	m, at normal			
fix sill level of notch	128.1				
TWL at start of RWC	128.8	m, at normal			
TWL at u/s of weir	128.91	m, at normal	OK		
drop from u/s TWL to d/s TWL	0.25	m			
RAW WATER CHANNEL (AFTER FLOW MEASUREMENT)					
discharge in cumecs in RWC d/s	2.386	at normal			
width in m	3				
velocity in m/sec	1	at normal			
water height in m	0.8	at normal			
area in m ²	2.4	at normal			
wetted perimeter	4.6	at normal			
m value	0.522	at normal			
n value	0.013	at normal			
C value	68.87	at normal			
slope	0.0003992	at normal			
channel slope	0.0003992				
distance of travel till HFBF	10	m, at normal			
head loss	0	m, at normal			
fix head loss to safer side	0.05	m			
IL of RWC at d/s at start	127.86	m, at normal			
fix IL of RWC at d/s at start	127.86				
TWL at d/s of notch in RWC	128.66	m, at normal			
IL of RWC near to HFBF	127.81	m, at normal			
fix IL of RWC near to HFBF	127.8	m			
TWL in RWC near to HFBF	128.6	m, at normal			
drop to HFBF	0.1	m			
TWL in channel at start of HFBF	128.5	m			
HORIZONTAL FLOW BAFFLED FLOCCULATOR					
normal inflow in m ³ /sec for half quantity to one direction	1.19				
width of channel through BF	1.5				
length of channel through BF	60				
actual horizontal velocity of flow in m/sec in flow channels	1.00				
water height in m	0.80				
area in m ²	1.2				
wetted perimeter	3.1				
m value	0.387				
n value	0.013				
C value	65.46				
Slope	0.000596				
Head loss	0.04				
fix head losses on safer side	0.2				
TWL in HFBF at end	128.3			2.75	
IL of HFBF	124.80				
HEAD LOSS BETWEEN HFBF AND CLARIFIER WITH PLATE SETTLER					
assumed velocity in pipe	0.8	m/s			

required diameter for this velocity	0.80	m			
assumed diameter of pipe	0.8	m			
length of travel	25	m			
discharge/clarifier	0.398				
loss of head due to contraction	0.016	m			
loss due to change in direction of flow	0.097	m			
loss due to friction of pipe	0.051	m			
velocity in the clarifier	0.6	m/s			
loss due to enlargement	0.002	m			
loss at exit	0.033	m			
total loss	0.2	m			
diameter of pipe required-from EPANET analysis	0.80	m			
fix total loss to clarifier	1.2	m	1.2		
TWL in the clarifier	127.1	m		3.95	
IL of clarifier	118.10	m			
drop to collection channel	0.1	m			
TWL at the start of collection channel of clarifier	127	m			
width of collection channel	2.3	m			
length of travel in central channel of clarifier	48	m			
discharge in cumecs	2.3392				
width in m	2.5				
velocity in m/sec	1				
water height in m	0.94				
area in m ²	2.35				
wetted perimeter	4.38				
m value	0.537				
n value	0.013				
C value	69.21				
slope	0.0003852				
loss of head	0.02	m			
fix loss to safer side with drop	0.4				
TWL at end of collection channel	126.6	m		4.45	
CLARIFIED WATER CHANNEL-FROM CLARIFIER TO FILTER HOUSE					
discharge in cumecs in channel (Q)	2.386				
width in m	2.5				
velocity in m/sec	1				
water height in m	0.95				
area in m ²	2.375				
wetted perimeter	4.4				
m value	0.54				
n value	0.013				
C value	69.27				
slope	0.0003895				
depth of channel	1.4	m			
IL of clarified water channel at start	125.65	m			
length of travel	50	m			
loss of head-including directional change	0.12	m			

IL of clarified water channel at end	125.53	m			
TWL in the clarified water channel at the end	126.48	m		4.57	
FILTER INLET CHANNEL					
number of channels around filter units	4	(Interconnected around but flow bifurcated in two directions)			
discharge in cumecs(Q/2) in two directions (Q/4)	0.448				
width in m	1.2				
velocity in m/sec	1				
water height in m	0.37				
area in m ²	0.444				
wetted perimeter	1.94				
m value	0.229				
n value	0.013				
C value	59.87				
slope	0.0012412				
length of travel	90	m			
head loss	0.11	m			
head loss due to directional change	0.1	m			
total head loss	0.21	m			
fix head losses on safer side	0.3	m			
TWL in the filter inlet channel at end	126.18	m		4.87	
IL of filter inlet channel at end	125.81	m			
HEAD LOSS IN THE FILTER INLET PORTION					
filter inlet					
normal discharge	0.075	cumecs			
discharge at 100% overload	0.149	cumecs			
velocity of flow	0.3	m/s			
area required	0.5	m ²			
diameter required	0.798	m			
loss due to submergence	0.011	m			
exit loss	0.018	m			
loss due to fittings	0.007	m			
loss due to contraction	0.009	m			
total loss	0.05	m			
fix total loss to safer side	0.1	m			
TWL in filter shell	126.08	m		4.97	
IL of filter shell	123.23	m			
maximum head loss to measuring chamber	2	m			
TWL in the measuring chamber	124.08	m		6.97	
width of notch in the chamber	1.5	m			
discharge at 100% overload	0.149	cumecs			
depth of flow above notch	0.15	m			
TWL at the sill of notch	123.93	m		7.12	
drop to PWC from sill of notch	0.05	m			
TWL in the PWC at start	123.88	m		7.17	
PURE WATER CHANNEL					
length of travel till measuring weir	10	m			
width of weir	1.4	m			

discharge-excluding losses	0.448	cumecs			
depth of flow at weir	0.32	m			
velocity at weir section	1	m/s			
height of sill of weir from floor	0.35	m			
total depth of flow till weir	0.67	m			
IL of PWC at start	123.21	m			
discharge in cumecs	0.4481593	cumecs			
width in m	1.5	m			
velocity in m/sec	0.75	m/s			
water height in m	0.4	m			
area in m2	0.6				
wetted perimeter	2.3				
m value	0.261				
n value	0.013				
C value	61.22				
slope	0.0005703				
head loss till weir	0.01	m			
IL of PWC at notch	123.2	m			
sill level of notch	123.55	m			
TWL at notch in PWC- u/s	123.87	m		7.18	
drop from u/s TWL to d/s TWL	0.13	m			
TWL at d/s in the PWC	123.74	m		7.31	
IL of PWC d/s	123.34	m			
length of travel till CWR	15	m			
head loss	0.01	m			
fix head losses on safer side	0.1	m			
IL at the entry to CWR	123.24	m			
TWL at entry to CWR	123.64	m		7.41	
drop to TWL of CWR from IL of PWC	1.2	m			
TWL in the CWR	122.04	m		9.01	
depth of water in CWR	2.8	m			
IL of CWR	119.24	m			
TOTAL LOSS FROM LIP OF AERATOR TO CWR	9.01	m			

4.4.2 STRUCTURAL DESIGN

DESIGN OF CHANNELS ON COLUMNS				
raw water channel				
width of channel in m	3			
water depth in m	1.5			
assumed thickness of wall in m	0.2			
assumed thickness of floor in m	0.23			
assumed thickness of top slab in m	0.15			
projection of top slab in m	0.45			
projection of cross beam in m	0.9			
width of cross beam in m	0.8			
drop of cross beam at support in m	0.7			
width of longitudinal beam in m	0.3			
drop of longitudinal beam in m	0.5			

diameter of column in m	0.6		
spacing between columns in m	4.6		
square footing side in m	2.5		
depth of footing at support in m	0.75		
depth of footing at free end in m	0.3		
design of sidewall of channel			
bending moment on wall in Tm/m	0.5625		
non-crack thickness in mm	134.7		
fix thickness of wall in mm	200		
dia for steel-inner both ways in mm	10		
spacing in mm	200		
Ast for tension in mm ²	392.70	% Ast in surface zone	0.39
dia for steel-outer both ways in mm	10		
spacing in mm	200		
Ast for compression in mm ²	392.70	% Ast in surface zone	0.39
moment of resistance in Tm-WS	0.79		
moment of resistance in Tm-LS	2.59		
design of channel slab			
thickness of channel slab in mm	200		
spacing of columns in m	4.6		
span in m	3		
ratio Ly/Lx	1.53		
loading in T/m ² for channel slab	2.00	moment in Tm	
Mx(-)	0.068	1.22	
Mx(+)	0.068	1.22	
My(-)	0.045	0.81	
My(+)	0.035	0.63	
non-crack thickness in mm	198.7		
fix thickness of channel in mm	230		
dia for steel-tension in mm	12		
spacing in mm	200		
Ast for tension in mm ²	565.49	% Ast in surface zone	0.49
dia for steel-compression in mm	12		
spacing in mm	200	% Ast in surface zone	
Ast for compression in mm ²	565.49		0.49
moment of resistance in Tm-WS	1.31		
moment of resistance in Tm-LS	4.11		
design of top slab			
loading in T/m ² for top slab	0.73		
cantilever span in m	0.45		
moment in cantilever slab in Tm	0.073		
non-crack thickness in mm	0.00		
fix thickness of channel top slab in mm	150		
dia for steel-tension in mm	10		
spacing in mm	200		
Ast for tension in mm ²	392.70	% Ast in surface zone	0.5
dia for steel-compression in mm	10		

spacing in mm	200	% Ast in surface zone	
Ast for compression in mm ²	392.70		0.5
moment of resistance in Tm-WS	0.54		
moment of resistance in Tm-LS	1.88		
design of longitudinal beam			
udl on composite channel section in T/m	10.08		
udl for a single beam in T/m	5.04		
bending moment for longitudinal single beam in Tm	10.66		
dia for steel-tension in mm	25		
numbers	3		
Ast for tension in mm ²	1472.63		
dia for steel-compression in mm	25		
numbers	3		
Ast for compression in mm ²	1472.63		
moment of resistance in Tm-WS	11.5		
moment of resistance in Tm-LS	38.5		
shear force in T	13.91		
shear stress in Mpa	0.66		
area of tension reinforcement	0.72		
allowable shear stress in Mpa	0.37		
number of legs	2		
diameter of shear bars in mm	10		
spacing of shear reinforcement in mm	212		
fix spacing in mm	200	fix spacing at joints for 2d	100
design of transverse beam			
point load on beam in T from long beam	23.184	spacing from centre in m	0.6
point load on beam in T from wall	7.1415	spacing from centre in m	1.6
point load on beam in T from long beam	1.725	spacing from centre in m	0.6 5
udl on beam from slab and water in T/m	10.945	udl span in m	1.5
case-1			
bending moment about central column in Tm	15.07		
case-2			
bending moment about central column in Tm	24.86		
design moment in Tm	24.86		
dia for steel-tension in mm	25	dia for steel-tension in mm	20
numbers	6	numbers	0
Ast for tension in mm ²	2945.25		
dia for steel-compression in mm	20	dia for steel-compression in mm	20
numbers	6	numbers	0
Ast for compression in mm ²	1884.96		
moment of resistance in Tm-WS	27		
moment of resistance in Tm-LS	92		
shear force in T	18.72		
shear stress in Mpa	0.35		
area of tension reinforcement	0.42		
allowable shear stress in Mpa	0.23		
number of legs	4		

diameter of shear bars in mm	10		
spacing of shear reinforcement in mm	1555		
fix spacing in mm	200	fix spacing at joints for 2d	100
design of column			
size of circular column in m	0.6		
height of circular column in m	8.5		
axial load in t	57.1		
factored axial load in t	86		
static moment in tm	1		
seismic moment in tm	5.14		
size of the column adopted in mm	600		
dia of steel bars 1	25		
numbers	8		
dia of steel bars 2	12		
numbers	0		
total area of steel in mm ²	3927		
% steel	1.39		
axial load capacity in t	388.01		
ratio	0.22		
unsupported length in m	7		
L/d ratio	11.67		
$P_u/f_{ck} d^2$	0.1		
p/f_{ck}	0.056		
d'/D	0.07		
$M_u/f_{ck} b D^2$ from chart	0.07		
<i>seismic force in X direction</i>			
Mux l	3780000		
Mux	7230677		
Muy l	3780000		
Muy	7230677		
Puz in t	440.31		
P_u/P_{uz}	0.19		
alfa n	1		
check	0.38		
<i>seismic force in Y direction</i>			
Mux l	3780000		
Mux	7230677		
Muy l	3780000		
Muy	7230677		
Puz in t	440.31		
P_u/P_{uz}	0.19		
alfa n	1		
check	0.38		
design of isolated footing			

axial load from column in t	57		
moment at column base in tm	1.00		
SBC value of soil in t/m ²	12		
area of footing in m ²	5.24		
side of square footing in m	2.29		
fix side of square footing	2.5		
upward thrust in t/m ²	10.06		
factored axial load in kN	672.61		
factored moment in kNm	11.77		
eccentricity in mm	15.22		
maximum stress in kN/m ²	128.28		
minimum stress in kN/m ²	119.24		
enhanced SBC value in kN/m ²	180		
thickness of footing based on shear			
factored net soil pressure kN/m ² - max	112.14		
factored net soil pressure kN/m ² -min	103.1		
trial footing thickness in mm	750		
effective depth in mm	705		
factored soil pressure at deff	110.17		
average soil pressure in kN/m ²	111.16		
bearing area in m ²	1.362067 8		
shear in kN	151.41		
shear stress in N/mm ²	0.09		
assumed steel percentage	0.2		
allowable shear stress in N/mm ²	0.325		
factored two way shear			
average soil pressure in kN/m ²	107.62		
two way shear in kN	619.08		
two way shear stress in N/mm ²	0.31		
limiting shear stress in Mpa	1.25		
check for maximum soil pressure			
depth of footing in m	1.5		
q max in kN/m ²	159.39		
enhanced SBC value in kN/m ²	180		
<i>design of flexural reinforcement</i>			
cantilever projection in m	1.25		
width in m	2.5		
d eff in m	0.705		
qu at footing edge in kN/m ²	128.28		
qu at face of column in kN/m ²	123.76		
moment at column base in kNm	247.57		
required depth at limit state in mm	318.58		
Ast required for bal section in mm ²	1215.1		
pt for one way shear	0.2		
Ast required in mm ²	3525		
select dia of bars	16		
numbers	17.53		
fix numbers	18		
spacing in mm	134		
development length required	784		

clear water channel from clarifier to filter house supported on cross pedestal			
width of channel in m	2.5		
water depth in m	1.5		
assumed thickness of wall in m	0.2		
assumed thickness of floor in m	0.2		
assumed thickness of top slab in m	0.15		
width of top slab in m	2.9		
projection of cross pedestal in m	0.6		
width of cross pedestal in m	0.75		
height of cross pedestal at support in m	1		
width of longitudinal beam in m	0.3		
drop of longitudinal beam in m	0.45		
spacing between columns in m	3.75		
depth of footing at support in m	0.75		
depth of footing at free end in m	0.75		
design of sidewall of channel			
bending moment on wall in Tm/m	0.5625		
non-crack thickness in mm	134.7		
fix thickness of wall in mm	200		
dia for steel-inner both ways in mm	10		
spacing in mm	200		
Ast for tension in mm ²	392.70	% Ast in surface zone	0.39
dia for steel-outer both ways in mm	10		
spacing in mm	200		
Ast for compression in mm ²	392.70	% Ast in surface zone	0.39
moment of resistance in Tm-WS	0.79		
moment of resistance in Tm-LS	2.59		
design of channel slab			
thickness of channel slab in mm	200		
spacing of columns in m	3.75		
span in m	2.5		
ratio Ly/Lx	1.50		
loading in T/m ² for channel slab	2.00	moment in Tm	
Mx(-)	0.068	0.85	
Mx(+)	0.068	0.85	
My(-)	0.045	0.56	
My(+)	0.035	0.44	
non-crack thickness in mm	165.6		
fix thickness of channel in mm	200		
dia for steel-tension in mm	12		
spacing in mm	200		
Ast for tension in mm ²	565.49	% Ast in surface zone	0.57
dia for steel-compression in mm	12		
spacing in mm	200	% Ast in surface zone	
Ast for compression in mm ²	565.49		0.57
moment of resistance in Tm-WS	1.1		

moment of resistance in Tm-LS	3.4		
design of top slab			
thickness of top slab in mm	150		
spacing of columns in m	3.75		
span in m	2.5		
ratio Ly/Lx	1.50		
loading in T/m ² for channel slab	0.73	moment in Tm	
Mx(-)	0.068	0.31	
Mx(+)	0.089	0.40	
My(-)	0.045	0.20	
My(+)	0.056	0.25	
non-crack thickness in mm	114.1		
fix thickness of channel in mm	150		
dia for steel-tension in mm	10		
spacing in mm	200		
Ast for tension in mm ²	392.70	% Ast in surface zone	0.52
dia for steel-compression in mm	10		
spacing in mm	200	% Ast in surface zone	
Ast for compression in mm ²	392.70		0.52
moment of resistance in Tm-WS	0.79		
moment of resistance in Tm-LS	2.59		
design of longitudinal beam			
udl on composite channel section in T/m	9.19		
udl for a single beam in T/m	4.59		
bending moment for longitudinal single beam in Tm	6.46		
dia for steel-tension in mm	25		
numbers	3		
Ast for tension in mm ²	1472.63		
dia for steel-compression in mm	25		
numbers	3		
Ast for compression in mm ²	1472.63		
moment of resistance in Tm-WS	6.67		
moment of resistance in Tm-LS	19.11		
shear force in T	10.34		
shear stress in Mpa	0.56		
area of tension reinforcement	0.81		
allowable shear stress in Mpa	0.39		
number of legs	2		
diameter of shear bars in mm	8		
spacing of shear reinforcement in mm	218		
fix spacing in mm	200	fix spacing at joints for 2d	100
design of transverse pedestal (as per IS 456 B 3.1)			
axial load in t	34.5		
factored axial load in t	52		
static moment in tm	1		
seismic moment in tm	3.10		
width of pedastal in mm	750		

length of pedestal in mm	2900		
dia of longitudinal (vertical) steel bars in mm	16	spacing in mm	200
diameter of lateral ties in mm	8	spacing in mm	200
Ast given on each zone	0.40		
permissible stress in concrete in direct compression in Mpa	8.00		
cross sectional area of concrete excluding steel in mm ²	2175000.00		
Ast total in mm ²	7338.78		
permissible compressive stress for column bars in Mpa	190.00		
axial load permissible on pedestal in T	1915.84	ratio	0.018
design of isolated footing			
offset to footing in m	0.60		
width of footing in m	1.95		
length of pedestal footing in m	4.10		
stress at footing slab in T/m ²	4.99		
bending moment in Tm at face of pedestal-factored	5.52		
fix thickness of footing slab in mm	750		
dia for steel-tension in mm	16		
spacing in mm	150		
Ast for tension in mm ²	1340.42	% Ast in surface zone	0.20
dia for steel-compression in mm	12		
spacing in mm	150	% Ast in surface zone	
Ast for compression in mm ²	753.98		0.11
moment of resistance in Tm-LS	14.58		
shear force in T-factored	18.41		
shear stress in Mpa	0.27		
allowable shear stress in Mpa	0.33		
filter inlet channel supported on cantilever beams projected from columns			
width of channel in m	1.2		
water depth in m	1		
assumed thickness of wall in m	0.2		
assumed thickness of floor in m	0.2		
width of cantilever beam in m	0.35		
drop of cantilever beam in m	0.6		
assumed thickness of top slab in m	0.125		
width of top slab in m	1.4		
design of sidewall of channel			
bending moment on wall in Tm/m	0.17		
non-crack thickness in mm	73.3		
fix thickness of wall in mm	200		
dia for steel-inner both ways in mm	10		
spacing in mm	200		
Ast for tension in mm ²	392.70	% Ast in surface zone	0.39
dia for steel-outer both ways in mm	10		
spacing in mm	200		
Ast for compression in mm ²	392.70	% Ast in surface zone	0.39

		zone	
moment of resistance in Tm-WS	0.79		
moment of resistance in Tm-LS	2.59		
design of channel slab			
thickness of channel slab in mm	200		
spacing of cantilever beams in m	5.1		
short span in m	1.2		
ratio Ly/Lx	4.25	designed as one-way slab	
loading in T/m ² for channel slab	1.50		
bending moment Tm/m	0.22		
non-crack thickness in mm	83.5		
fix thickness of channel in mm	200		
dia for steel-tension in mm	10		
spacing in mm	200		
Ast for tension in mm ²	392.70	% Ast in surface zone	0.39
dia for steel-compression in mm	10		
spacing in mm	200	% Ast in surface zone	
Ast for compression in mm ²	392.70		0.39
moment of resistance in Tm-WS	0.76		
moment of resistance in Tm-LS	2.8		
design of top slab			
thickness of top slab in mm	125		
spacing of cantilever beams in m	5.1		
short span in m	1.2		
ratio Ly/Lx	4.25	designed as one-way slab	
loading in T/m ² for channel slab	0.46		
bending moment Tm/m	0.07		
non-crack thickness in mm	46.4		
fix thickness of channel in mm	125		
dia for steel-tension in mm	8		
spacing in mm	200		
Ast for tension in mm ²	251.33	% Ast in surface zone	0.40
dia for steel-compression in mm	8		
spacing in mm	200	% Ast in surface zone	
Ast for compression in mm ²	251.33		0.40
moment of resistance in Tm-WS	0.3		
moment of resistance in Tm-LS	1.09		
design of cross cantilever support beams			
udl on cantilever beam in T/m	7.65		
point load on cantilever beam in T from side wall	3.97		
bending moment for longitudinal single beam in Tm	11.62		
dia for steel-tension in mm	25		
numbers	3		
Ast for tension in mm ²	1472.63		
dia for steel-compression in mm	25		
numbers	3		

Ast for compression in mm ²	1472.63		
moment of resistance in Tm-WS	13.3		
moment of resistance in Tm-LS	45.2		
shear force in T	13.91		
shear stress in Mpa	0.52		
% of tension reinforcement	0.56		
allowable shear stress in Mpa	0.31		
number of legs	2		
diameter of shear bars in mm	8		
spacing of shear reinforcement in mm	320		
fix spacing in mm	100	fix spacing at joints for 2d	100
design of sidewall as beam supported on cantilever beams			
load per m run from channel slab in T/m	0.95		
load per m run from top slab in T/m	0.32		
load per m run from side wall in T/m	0.50		
bending moment for sidewall in Tm	4.61		
dia for steel-tension in mm	20		
numbers	2		
Ast for tension in mm ²	628.32		
dia for steel-compression in mm	20		
numbers	2		
Ast for compression in mm ²	628.32		
moment of resistance in Tm-WS	7.25		
moment of resistance in Tm-LS	25.1		
shear force in T	5.43		
shear stress in Mpa	0.23		
% of tension reinforcement	0.27		
allowable shear stress in Mpa	0.23		
number of legs	2		
diameter of shear bars in mm	8		
spacing of shear reinforcement in mm	-24		
fix spacing in mm	100	fix spacing at joints for 2d	100

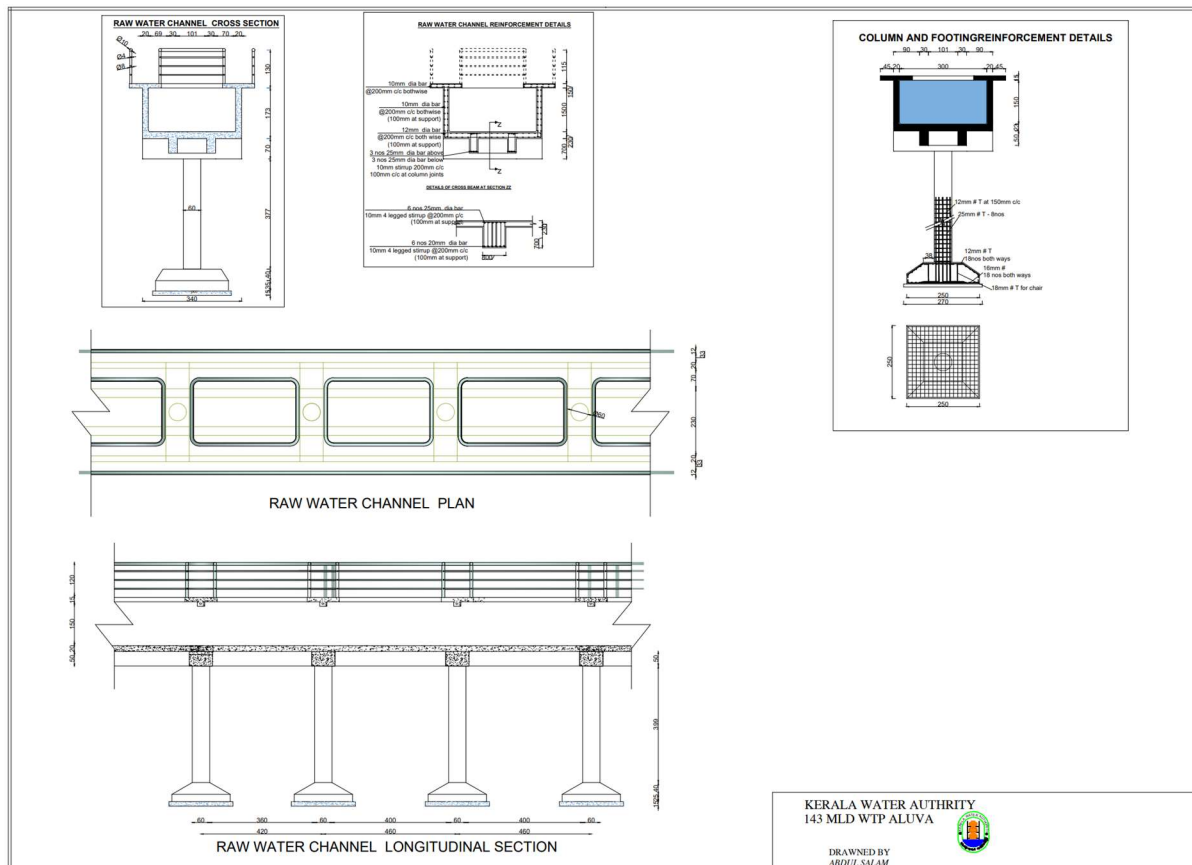


Figure 44. Raw water and other channels

4.5 DESIGN OF HORIZONTAL FLOW BAFFLED FLOCCULATOR

The terms coagulation and flocculation are often used indiscriminately to describe the process of removing turbidity caused by fine suspensions, colloids, and organic color. Coagulation describes the effect produced by the addition of a chemical to a colloidal dispersion, resulting in particle destabilization. Operationally this is achieved by the addition of appropriate chemical and rapid intense mixing for obtaining uniform dispersion of the chemical. Flocculation is the second stage of the formation of settleable particles or flocs from destabilized colloidal sized particles and is achieved by gentle and prolonged mixing. Although there is some relation between turbidity of the raw water and the proper coagulant dosage, the exact quantity can be determined only by trial.

In the case of coagulation with Alum, the control over alkalinity is very important. A consideration of the reaction involved shows that one molecule on “filter Alum” requires three molecules of calcium bicarbonate for complete reaction. If alkalinity is expressed in terms of calcium carbonate, the theoretical requirement of 666 parts of filter Alum works out to 300 parts of alkalinity i.e., approximately in the ratio of 2:1. By rapid mixing operation, the coagulant is rapidly and uniformly dispersed throughout the volume of water to create a homogenous single or multi phased system. This helps in the formation of micro flocs and results in proper utilization of chemical coagulant preventing localization of concentration. The chemical coagulant is normally introduced at some points of high turbulence in the water.

The horizontal flow baffled flocculator consists of several around-the-end baffles with in between spacing not less than 0.45 m to permit cleaning. The detention time is 15-20 minutes. In the present

design the baffled flocculator units are provided for each clarifier separately and slow mixing mechanical stirrers are also provided to address worst conditions.

INFORMATION ON WATER QUALITY BASED ON TURBIDITY					
Year	Month	Maximum Turbidity value in NTU		Minimum Turbidity value in NTU	
2018	August	340			
2018	December			9.89	
2019	August	454			
2019	March			3.95	
2020	August	275			
2020	December			4.96	
2021	October	172			
2021	March			3.68	

Table 12. Water quality data of raw water from Periyar River

4.5.1 UNIT OPERATIONS

HORIZONTAL FLOW BAFFLED FLOCCULATOR (slow mixing) with rapid and slow mechanical mixers					
number of units	6				
normal inflow in m ³ /sec	0.2985				
spacing between baffles in m	3.45				
clear distance between end of baffle and wall in m	1.5	>=	1.5		
detention time in minutes	15	900	seconds		
required volume in m ³	268.65				
water height in m	3.5				
velocity of water adopted in m/sec	0.1	range 0.1 to 0.3 m/sec			
thickness of baffle in m	0.35				
length of baffle in m	3.9				
number of baffles on one side	2				
total number of flow channels	4				
total length of flocculator in m	14.85				
breadth of flocculator in m	5.5				
total volume in m ³	271.53				
actual detention time in minutes	15.16	OK			
actual horizontal velocity of flow in m/sec in flow channels	0.0247	OK	range 0.1 to 0.3 m/sec		

4.5.2 STRUCTURAL DESIGN

FLOCCULATOR					
TYPICAL WALL-FLOCCULATOR					
width	7.6	vertical haunch height in m	0.65		
height	3.5	ratio haunch/wall	0.19		
b/a	2.17	horizontal haunch	0.60		

		height in m		
assumed thickness in mm	350	ratio haunch/wall	0.08	
coefficients as per IS: 3370 for the case of spanning between columns-maximum condition				
Mx-	0.078	moment in tm	3.34	
Mx- at haunch	0.057	moment in tm	2.44	
Mx+	0.015	moment in tm	0.64	
My-	0.06	moment in tm	2.57	
My- at haunch	0.055	moment in tm	2.36	
My+	0.027	moment in tm	1.16	
design moment in tm-vertical	3.34	non-crack depth in mm	323.1	
design moment in tm-vertical above haunch	2.44	non-crack depth in mm	276.1	
design moment in tm-horizontal at ends	2.57	non-crack depth in mm	283.4	
design moment in tm-horizontal at middle	1.16	non-crack depth in mm	190.4	
design moment in tm-horizontal at haunch	2.36	non-crack depth in mm	271.6	
fix wall thickness in mm	350	effective depth in mm	320	
fix continous haunch width	300	height	600	
haunch bars vertical	12	spacing in mm	150	
fix dia for inner steel vertical	12	spacing in mm	150	
fix dia for outer steel vertical	12	spacing in mm	200	
fix dia for inner steel horizontal	12	spacing in mm	150	
fix dia for outer steel horizontal	12	spacing in mm	200	
		Ast	753.98	
		Ast	565.49	
		Ast	753.98	
		Ast	565.49	
wall as cantilever				
height of liquid in m (considering overflow)	2.85			
total wall height in m	4			
density of liquid in t/m ³	1			
height from top where moment is required in m	3.35			
total load per metre width of wall in t	4.06			
bending moment in tm	3.86			
non-crack thickness in mm	347.23			
width of haunch at bottom in mm	300			
height of haunch at bottom in mm	600			
size of vertical haunch in mm	600			
fix wall thickness above haunch in mm	250			
TYPICAL TOP BEAM-INTERIOR SHORT				
loading on slab in T/m ²	0.575			
breadth in m	0.3			
total depth in m	0.6			
span in m	5.1			
span in m left	3.65			
span in m right	3.65			
loading intensity in t/m-bending moment	2.135			
loading intensity in t/m-for column loads	1.798			

fix breadth of beam in mm	350			
design moment for trial in tm	5.55			
cracked effective depth in mm	378.04			
depth for trial in mm	600			
static moment	5.55			
seismic moment	1.83			
design moment in tm	8.86			
cracked effective depth in mm	435.94			
effective depth at limit state in mm	270.49			
fix total depth in mm	600			
Ast for negative moment				
Mdes -ve in tm (LSM)	8.86			
Mdes -ve in tm (WSM)	7.38			
Ast-bal required in mm ²	757.5			
Ast-bal at limit state in mm ²	537.85			
dia of steel bar 1 in mm	25			
numbers	2			
dia of steel bar 2 in mm	20			
numbers	1			
area provided in mm ² -at top	1295.91			
M- resistance of section in tm	8.48			
M- resistance of section at limit state	24.25			
area provided in mm ² -at bottom	1295.91			
Ast for positive moment				
Mdes +ve in tm	5.05			
Ast-bal required in mm ²	756.86			
Ast-bal at limit state	551.54			
dia of steel bar 1	25			
numbers	2			
dia of steel bar 2	20			
numbers	1			
area provided in mm ² -at bottom	1295.91			
M- resistance of section	6.49			
M- resistance of section at limit state	18.46			
shear force in T	6.53			
shear stress in Mpa	0.33			
area of tension reinforcement	0.67			
allowable shear stress in Mpa	0.37			
number of legs	2			
diameter of shear bars in mm	8			
spacing of shear reinforcement in mm	-1647			
fix spacing in mm	200	fix spacing at joints for	100	
		2d		
TYPICAL FLOOR SLAB				
assumed thickness in m	0.35			
long span in m	3.8			
short span in m	2.7			
live load in t/m ²	3.5			
finishes in t/m ²	0.1			
total load in t/m ²	4.475			

Ly/Lx	1.41			
condition as per IS: 456 (2000)	two adjacent edges discontinuous			
Mx-	0.071	moment in tm	2.32	
Mx+	0.053	moment in tm	1.73	
My-	0.047	moment in tm	1.53	
My+	0.035	moment in tm	1.14	
design moment	2.32	non-crack depth in mm	273.6	
		cracked section	144.6	
fix depth of floor slab in mm	350	effective depth in mm	320	
Ast for negative moment in mm ²	424			
Ast for positive moment in mm ²	467			
minimum steel area in mm ²	525			
fix dia for top steel	12	spacing	160	
fix dia for bottom steel	12	spacing	160	
area of steel given in mm ²	top	706.86	0.20	
	bottom	706.86	0.20	
L/d ratio	8.44			
fs	159.02			
modification factor	2	OK		
moment of resistance of section in ws	2.35	tm		
moment of resistance of section in LS	7.32	tm		
TYPICAL FLOOR BEAM-INTERIOR-LONG				
loading on slab in T/m ²	4.475			
wall thickness in m	0			
wall height in m	2.6			
wall material density in T/m ³	2.5			
breadth in m	0.35			
total depth in m	0.95			
span in m	3.8			
span in m left	2.7			
span in m right	2.7			
loading intensity in t/m-bending moment	10.26			
loading intensity in t/m-for column loads	8.32			
fix breadth of beam in mm	350			
design moment for trial in tm	16.47			
cracked effective depth in mm	651.02			
depth for trial in mm	950			
static moment	16.47			
seismic moment	5.43			
design moment in tm	26.28			
cracked effective depth in mm	750.8			
effective depth at limit state in mm	465.84			
fix total depth in mm	950			
Ast for negative moment				
Mdes -ve in tm (LSM)	26.28			
Mdes -ve in tm (WSM)	21.90			
steel at top		steel at bottom		
dia of steel bar 1 in mm	20	dia of steel bar 1 in mm	20	
numbers	4	numbers	4	

dia of steel bar 2 in mm	20	dia of steel bar 2 in mm	20	
numbers	4	numbers	0	
area provided in mm ² -at top	2513.28	area provided in mm ² -at bottom	1256.64	
M- resistance of section in tm	26.5			
M- resistance of section at limit state	82.4			
Ast for positive moment				
Mdes +ve in tm	14.82			
steel at bottom		steel at top		
dia of steel bar 1	20	dia of steel bar 1	20	
numbers	2	numbers	4	
dia of steel bar 2	20	dia of steel bar 2	20	
numbers	4	numbers	0	
area provided in mm ² -at bottom	1884.96	area provided in mm ² -at top	1256.64	
M- resistance of section	20.1			
M- resistance of section at limit state	65.5			
shear force in T	23.40			
shear stress in Mpa	0.72			
area of tension reinforcement	0.79			
allowable shear stress in Mpa	0.37			
number of legs	2			
diameter of shear bars in mm	8			
spacing of shear reinforcement in mm	186			
fix spacing in mm	200	fix spacing at joints for 2d	100	
analysis of T/L-beam for stress stipulation				
slab depth in m	0.3	slab depth in mm	300	
span in m	3.8	span in mm	3800	
depth of web in m	0.65	depth of web in mm	650	
width of web in m	0.35	width of web in mm	350	
Ast top in mm ²	2513			
Ast bottom in mm ²	1256			
bending moment in tm	21.41			
T-beam				
effective flange width in mm	2783			
fix flange width	2700			
equivalent area in mm ²	1075114.62			
cg from top in mm	256.52			
cg from bottom in mm	693.48			
MI in mm ⁴	6.0723E+10			
stess at top in Mpa	0.89			
stress at bottom in Mpa	2.40			
TYPICAL FLOOR BEAM-EXTERIOR-LONG				
loading on slab in T/m ²	4.475			
wall thickness in m	0.35			
wall height in m	4			
wall material density in T/m ³	2.5			
breadth in m	0.35			

total depth in m	0.95			
span in m	3.8			
span in m left	2.7			
span in m right	0			
loading intensity in t/m-bending moment	8.94			
loading intensity in t/m-for column loads	7.96			
fix breadth of beam in mm	350			
design moment for trial in tm	12.91			
cracked effective depth in mm	576.36			
depth for trial in mm	950			
static moment	12.91			
seismic moment	1.29			
torsional moment/m from slab in Tm	2.25			
moment in beam from torsion in Tm	18.68			
design moment in tm	39.45			
cracked effective depth in mm	919.89			
effective depth at limit state in mm	570.76			
fix total depth in mm	950			
Ast for negative moment				
Mdes -ve in tm (LSM)	39.45			
Mdes -ve in tm (WSM)	32.88			
steel at top		steel at bottom		
dia of steel bar 1 in mm	25	dia of steel bar 1 in mm	20	
numbers	4	numbers	4	
dia of steel bar 2 in mm	20	dia of steel bar 2 in mm	20	
numbers	4	numbers	0	
area provided in mm2-at top	3220.14	area provided in mm2-at bottom	1256.64	
M- resistance of section in tm	33.57			
M- resistance of section at limit state	96.7			
Ast for positive moment				
Mdes +ve in tm	30.41			
steel at bottom		steel at top		
dia of steel bar 1	25	dia of steel bar 1	20	
numbers	4	numbers	4	
dia of steel bar 2	20	dia of steel bar 2	20	
numbers	4	numbers	0	
area provided in mm2-at bottom	3220.14	area provided in mm2-at top	1256.64	
M- resistance of section	33.57			
M- resistance of section at limit state	96.7			
shear from torsion in T	39.09			
shear force in T	59.46			
shear stress in Mpa	1.84			
area of tension reinforcement	1.02			
allowable shear stress in Mpa	0.41			
number of legs	2			
diameter of shear bars in mm	12			
spacing of shear reinforcement in mm	104			

fix spacing in mm	100	fix spacing at joints for 2d	100	
analysis of T/L-beam for stress stipulation				
slab depth in m	0.3	slab depth in mm	300	
span in m	3.8	span in mm	3800	
depth of web in m	0.65	depth of web in mm	650	
width of web in m	0.35	width of web in mm	350	
Ast top in mm ²	3220			
Ast bottom in mm ²	1256			
bending moment in tm	33			
		L-beam		
		effective flange width in mm	1567	
		fix flange width	1500	
		equivalent area in mm ²	722170.5	
		cg from top in mm	307.40	
		cg from bottom in mm	642.60	
		MI in mm ⁴	5.24E+10	
		stess at top in Mpa	1.90	
		stress at bottom in Mpa	3.97	
TYPICAL FLOOR BEAM-INTERIOR-SHORT				
loading on slab in T/m ²	4.475			
wall thickness in m	0.35			
wall height in m	4			
wall material density in T/m ³	2.5			
breadth in m	0.35			
total depth in m	0.95			
span in m	2.7			
span in m left	3.8			
span in m right	3.8			
loading intensity in t/m-bending moment	11.62			
loading intensity in t/m-for column loads	10.11			
fix breadth of beam in mm	350			
design moment for trial in tm	9.41			
cracked effective depth in mm	492.22			
depth for trial in mm	950			
static moment	9.41			
seismic moment	3.11			
design moment in tm	15.02			
cracked effective depth in mm	567.61			
effective depth at limit state in mm	352.18			
fix total depth in mm	950			
Ast for negative moment				
Mdes -ve in tm (LSM)	15.02			
Mdes -ve in tm (WSM)	12.52			
steel at top		steel at bottom		
dia of steel bar 1 in mm	20	dia of steel bar 1 in mm	20	
numbers	4	numbers	4	

dia of steel bar 2 in mm	20	dia of steel bar 2 in mm	20	
numbers	0	numbers	0	
area provided in mm ² -at top	1256.64	area provided in mm ² -at bottom	1256.64	
M- resistance of section in tm	13.65			
M- resistance of section at limit state	39			
Ast for positive moment				
Mdes +ve in tm	9.41			
steel at bottom		steel at top		
dia of steel bar 1	20	dia of steel bar 1	20	
numbers	3	numbers	3	
dia of steel bar 2	20	dia of steel bar 2	20	
numbers	0	numbers	0	
area provided in mm ² -at bottom	942.48	area provided in mm ² -at top	942.48	
M- resistance of section	10.3			
M- resistance of section at limit state	29.4			
shear force in T	18.82			
shear stress in Mpa	0.58			
area of tension reinforcement	0.40			
allowable shear stress in Mpa	0.29			
number of legs	2			
diameter of shear bars in mm	8			
spacing of shear reinforcement in mm	225			
fix spacing in mm	200	fix spacing at joints for 2d	100	
analysis of T/L-beam for stress stipulation				
slab depth in m	0.3	slab depth in mm	300	
span in m	2.7	span in mm	2700	
depth of web in m	0.65	depth of web in mm	650	
width of web in m	0.35	width of web in mm	350	
Ast top in mm ²	1256			
Ast bottom in mm ²	1256			
bending moment in tm	11.22			
T-beam				
effective flange width in mm	2600			
fix flange width	2600			
equivalent area in mm ²	1032570			
cg from top in mm	262.36			
cg from bottom in mm	687.64			
MI in mm ⁴	5.9479E+10			
stess at top in Mpa	0.49			
stress at bottom in Mpa	1.27			
TYPICAL FLOOR BEAM-EXTERIOR-SHORT				
loading on slab in T/m ²	4.475			
wall thickness in m	0.35			
wall height in m	4			
wall material density in T/m ³	2.5			
breadth in m	0.35			

total depth in m	0.95			
span in m	2.7			
span in m left	3.8			
span in m right	0			
loading intensity in t/m-bending moment	7.84			
loading intensity in t/m-for column loads	7.09			
fix breadth of beam in mm	350			
design moment for trial in tm	5.72			
cracked effective depth in mm	383.66			
depth for trial in mm	950			
static moment	5.72			
seismic moment	0.57			
torsional moment/m from slab in Tm	2.25			
moment in beam from torsion in Tm	13.27			
design moment in tm	23.48			
cracked effective depth in mm	709.68			
effective depth at limit state in mm	440.33			
fix total depth in mm	950			
Ast for negative moment				
Mdes -ve in tm (LSM)	23.48			
Mdes -ve in tm (WSM)	19.57			
steel at top		steel at bottom		
dia of steel bar 1 in mm	25	dia of steel bar 1 in mm	25	
numbers	4	numbers	4	
dia of steel bar 2 in mm	20	dia of steel bar 2 in mm	20	
numbers	0	numbers	0	
area provided in mm2-at top	1963.5	area provided in mm2-at bottom	1963.5	
M- resistance of section in tm	21			
M- resistance of section at limit state	60			
Ast for positive moment				
Mdes +ve in tm	18.47			
steel at bottom		steel at top		
dia of steel bar 1	25	dia of steel bar 1	25	
numbers	4	numbers	4	
dia of steel bar 2	20	dia of steel bar 2	20	
numbers	0	numbers	0	
area provided in mm2-at bottom	1963.5	area provided in mm2-at top	1963.5	
M- resistance of section	21			
M- resistance of section at limit state	60			
shear from torsion in T	27.8			
shear force in T	40.48			
shear stress in Mpa	1.25			
area of tension reinforcement	0.62			
allowable shear stress in Mpa	0.34			
number of legs	2			
diameter of shear bars in mm	10			
spacing of shear reinforcement in mm	113			

fix spacing in mm	200	fix spacing at joints for 2d	100	
analysis of T/L-beam for stress stipulation				
slab depth in m	0.3	slab depth in mm	300	
span in m	3.65	span in mm	3650	
depth of web in m	0.65	depth of web in mm	650	
width of web in m	0.35	width of web in mm	350	
Ast top in mm ²	1963			
Ast bottom in mm ²	1256			
bending moment in tm	11.81			
		L-beam		
		effective flange width in mm	1554	
		fix flange width	1500	
		equivalent area in mm ²	709625.6	
		cg from top in mm	312.30	
		cg from bottom in mm	637.70	
		MI in mm ⁴	5.14E+10	
		stress at top in Mpa	0.70	
		stress at bottom in Mpa	1.44	
design of column-inner				
size of square column in m	0.45			
height of square column in m	5			
axial load in t	61.4			
factored axial load in t	92			
static moment in tm	2.30			
seismic moment in tm	5.53			
size of the column adopted in mm	450			
dia of steel bars 1	25			
numbers	8			
dia of steel bars 2	12			
numbers	0			
total area of steel in mm ²	3927			
% steel	2.47			
axial load capacity in t	264.31			
ratio	0.35			
unsupported length in m	5			
L/d ratio	11.11			
Pu/fckbd	0.18			
p/fck	0.099			
d'/D	0.09			
Mu/fck bd ² from chart	0.15			
seismic force in X direction				
Mux1	341718750			
Mux	92195188.1			
Muy1	341718750			
Muy	92195188.1			
Puz in t	301.15			
Pu/Puz	0.31			

alfa n	1.18			
check	0.43			
seismic force in Y direction				
Muxl	341718750			
Mux	92195188.1			
Muyl	341718750			
Muy	92195188.1			
Puz in t	301.15			
Pu/Puz	0.31			
alfa n	1.18			
check	0.43			
design of isolated/strip footing				
size of column in mm	450			
axial load from column in t	61			
moment at column base in tm	2			
SBC value of soil in t/m2	12			
area of footing in m2	5.63			
side of square footing in m	2.37			
fix side of square footing	2.5			
upward thrust in t/m2	10.81			
factored axial load in kN	723.1			
factored moment in kNm	23.54			
eccentricity in mm	28.31			
maximum stress in kN/m2	142.09			
minimum stress in kN/m2	124.01			
enhanced SBC value in kN/m2	180			
thickness of footing based on shear				
factored net soil pressure kN/m2- max	124.74			
factored net soil pressure kN/m2-min	106.66			
trial footing thickness in mm	750			
effective depth in mm	705			
factored soil pressure at deff	122.43			
average soil pressure in kN/m2	123.59			
bearing area in m2	0.8			
shear in kN	98.87			
shear stress in N/mm2	0.06			
assumed steel percentage	0.2			
allowable shear stress in N/mm2	0.325			
factored two way shear				
average soil pressure in kN/m2	115.7			
two-way shear in kN	568.78			
two-way shear stress in N/mm2	0.17			
limiting shear stress in Mpa	0.8			
check for maximum soil pressure				
depth of footing in m	1.25			
q max in kN/m2	165.24			
enhanced SBC value in kN/m2	180			
design of flexural reinforcement				
cantilever projection in m	1.025			
width in m	2.5			

d eff in m	0.705		
qu at footing edge in kN/m ²	142.09		
qu at face of column in kN/m ²	134.68		
moment at column base in kNm	183.39		
required depth at limit state in mm	274.19		
Ast required for bal section in mm ²	900.1		
pt for one way shear	0.20		
Ast required in mm ²	3525		
select dia of bars	16		
numbers	17.53		
fix numbers	18		
spacing in mm	134		
development length required	784		

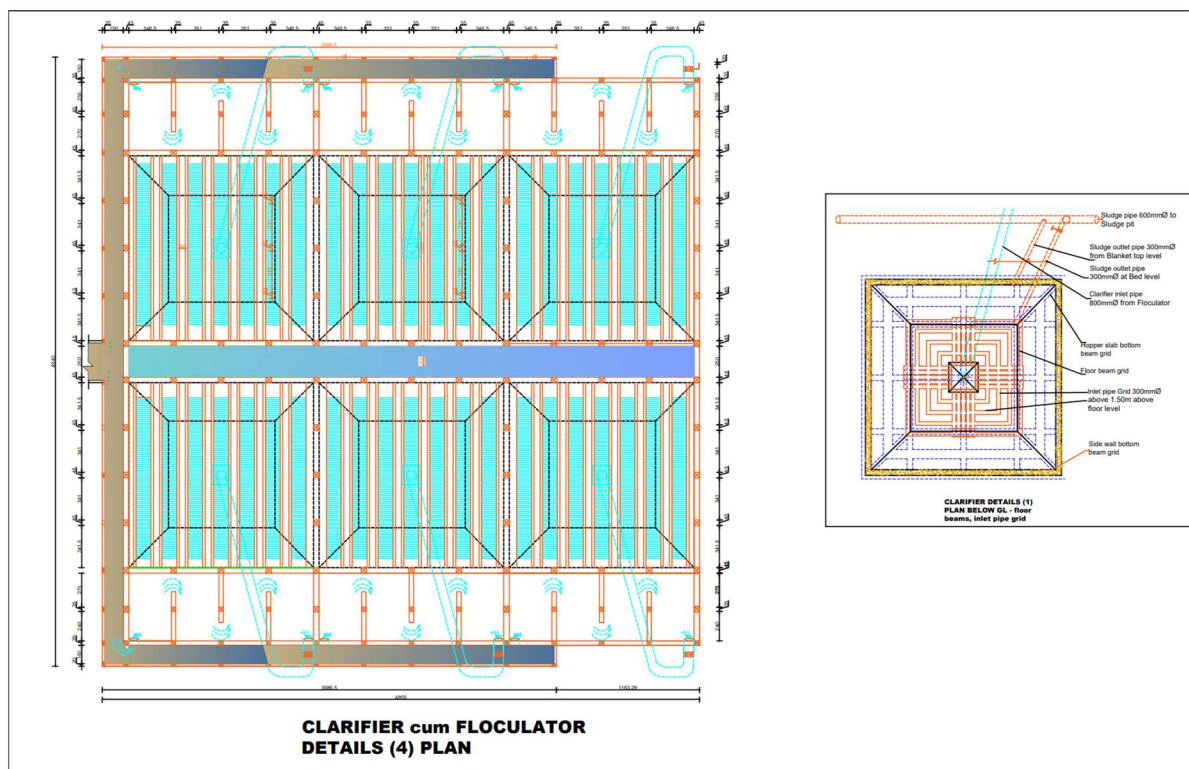


Figure 45. Horizontal flow baffled flocculator with clarifiers

4.6 DESIGN OF SLUDGE BLANKET CLARIFIER WITH PLATE SETTLER

The sludge blanket clarifier includes both flocculation and clarification. In the present system, flocculation occurs in the baffled flocculators initially. However, the presence of vertical flow type sludge blanket clarifier makes the unit operation more effective by the provision of additional flocculation beneath blanket portion ion of due to reversal and rotation of flow through pipe grid arrangement. Through a large pipeline, water with flocs is entered at the bottom of the clarifier through a central dispersion box and travels upwards. During that process, velocity drops and flocs are settled down and at distance above the floor a blanket of sludge is formed. This blanket is effective in clarification process of water too. The clarified water is slowly travelled upwards through a system of plate settlers at top. The plate settlers consist of a battery of parallel steel plates inclined at an angle of 55° to the horizontal. This special configuration will trap fine flocs in the water and make the outflow

water extremely clarified. In this clarifier a detention time of one hour is given with surface overflow rate less than 120. For the plate settler portion, the surface overflow rate is less than 15. The gravity settling principles for particles are employed in the analysis and design. For maintaining the sludge blanket, hydraulic means can also be employed if observed necessary.

4.6.1 UNIT OPERATIONS

Secondary Clarifier with Plate/Tube Settler						
Average output required from tube settler in MLD	142.55	5939.58	m ³ /hour	1649.88	LPS	
Number of batteries	6					
Average design flow as input in MLD/unit	23.76	989.93	m ³ /hour	274.98	LPS	
Width of plates in mm	1200	space plates	between	70	mm	85.48
Length of plates adopted in m	1.8					
Angle of inclination of tubes adopted in deg.	55	0.96	rad			
Relative length of settler (dimensionless) $L_r = L/d$	25.7					
Relative length is changed by $L' = 0.058 \times [V_o \times d/v]$						
Where V_o is velocity of flow along tube settler						
v is kinematic viscosity of water						
Effective relative length of tube, $L = L_r - [0.058 \times V_o \times d/v]$						
Kinematic viscosity of water in m/day	0.087264					
	25.7	(-)	0.047	V_o		
Effective relative length of tube/plate, L	11.87					
<i>desirable value of relative length =</i>	<i>around 20 but below 40</i>					
for one unit:						
Vertical water height in chamber in m	3.5					
Height of chamber in hopper portion in m	5.5					
Side of large square in m	15					
Side of small square in m	8.65					
h_3 in m (height of the truncated cone)	7.49					
Angle of inclination of hopper side to vertical	0.524	30.01	degree	59.99	<i>deg. with hor.</i>	
Larger inclined length L_i of slanting slab in m	15.00	area in m ²	112.51			
Smaller inclined length l_i of slanting slab in m	8.65	area in m ²	37.42			
Contact area in m ²	300.39					
SOR in m ³ /m ² /day for upflow clarifier	79.09	<	80	(due to dual clarification)		
Trial volume in m ³ of one unit	1567.17	volume of hopper in m ³			779.6	
Detention time in hours	1.58	in square	0.80	in hopper	0.79	hours

Fix volume	1502	m ³			
Performance parameter of tube settler $S = V_s/V_o \times [\sin\theta + L \times \cos\theta]$					
For laminar flow regime, critical performance parameter value for complete removal of particle,					
Critical value of performance parameter, $Sc =$	1.333	circular			
	1.375	square			
	1	parallel plates			
Particle size in mm	0.025				
Settling velocity of particle in m/sec, V_s (laminar)	0.0006	m/sec	48.08	m/d	
Reynolds number, Nr	0.014				
Trial value of flow along plate settler V_o in m/day	297.5				
Shape of cross section of tubes	plates	(square, circular, or plates)			
Critical of performance parameter obtained, Sc	$[(V_s/V_o) \times (\sin\theta + L\cos\theta)]$				
	1.23				
Plate entrance area/one unit	76.53	m ²			
Number of modules of plates	6				
Number of plates required/module	151.85				
Fix number of plates required/module	151				
Length/module of tray holding plates	13200	mm			
Thickness of plate	2	mm			
Number of plates configured in one module	151.89	OK			
Height of plate module for 1m length of tubes inclined:	0.82				
Hence height of tube module	1.47	m			
Fix length of plate module	1.8	m			
Fix height of plate module	1.2	m			
Fix number of plates required per module	151				
Angle of inclination	55	degree to horizontal			
Contact area	1956.96	m ²			
SOR in m ³ /m ² /day for plate settler	11.63	<	40		
Total plate entrance area	76.55	m ²			
Actual velocity of flow in m/day	297.43	<i>now correct velocity</i>			

4.6.2 STRUCTURAL DESIGN

CLARIFIER TOP			
TYPICAL WALL			
width	15	vertical haunch height in m	0.90
height	3.5	ratio haunch/water column	0.26
b/a	4.29	horizontal haunch height in	0.60

		m	
assumed thickness in mm	450	ratio haunch/wall	0.04
density of liquid in t/m ³	1.00		
coefficients as per IS: 3370 for the case of spanning between columns-maximum condition			
Mx-	0.126	moment in tm	5.40
Mx- at haunch	0.045	moment in tm	1.93
Mx+	0.01	moment in tm	0.43
My-	0.082	moment in tm	3.52
My- at haunch	0.08	moment in tm	3.43
My+	0.025	moment in tm	1.07
design moment in tm-vertical	5.40	non-crack depth in mm	410.8
design moment in tm-vertical above haunch	1.93	non-crack depth in mm	245.6
design moment in tm-horizontal at ends	3.52	non-crack depth in mm	331.7
design moment in tm-horizontal at middle	1.07	non-crack depth in mm	182.9
design moment in tm-horizontal at haunch	3.43	non-crack depth in mm	327.4
fix wall thickness in mm	450	effective depth in mm	420
haunch bars vertical	16	spacing in mm	175
haunch bars horizontal	12	numbers	5
fix dia for inner steel vertical	16	spacing in mm	175
fix dia for outer steel vertical	16	spacing in mm	175
fix dia for inner steel horizontal	16	spacing in mm	175
fix dia for outer steel horizontal	16	spacing in mm	175
		Ast	1148.9
		Ast	1148.9
		Ast	1148.9
		Ast	1148.9
wall as propped cantilever			
height of liquid in m (considering overflow)	3.5		
total wall height in m	4		
density of liquid in t/m ³	1		
height from top where moment is required in m	4		
total load per metre width of wall in t	6.13		
axial pull on t-beam at top in t	0.97		
axial pull on t-beam at bottom in t	5.16		
bending moment in tm	-3.28		
non-crack thickness in mm	320.01		
width of haunch at bottom in mm	600		
height of haunch at bottom in mm	750		
size of vertical haunch in mm	600		
fix wall thickness above haunch in mm	450		
wall as simple cantilever			
height of liquid in m (considering overflow)	3.5		
total wall height in m	4		
density of liquid in t/m ³	1		
height from top where moment is required in m	4		
total load per metre width of wall in t	6.13		
bending moment in tm-bottom	7.15		

non-crack thickness in mm	472.55		
bending moment in tm-above haunch	2.93		
non-crack thickness in mm	302.56		
width of haunch at bottom in mm	600		
height of haunch at bottom in mm	900		
size of vertical haunch in mm	600		
fix wall thickness above haunch in mm	450		
moment of resistance of section in ws	4.24	tm	
moment of resistance of section in LS	12.17	tm	

CLARIFIER HOPPER

total superimposed weight from clarifier tanks with hopper bottom-single shell typical

thickness of vertical wall in m	0.35		
thickness of floor slab in m	0.45		
inner length in m (square side)	15		
height of vertical wall in m	4		
side of inside small square in m	8.65		
height of water column in m	3.5		
depth of channel deep beam in m	1	inner breadth of channel beam in m	0.6
thickness of channel deep beam in m	0.3		
weight from vertical walls in T	214.9		
weight from bottom square slab in T	84.18		
length of inclined portion of slab in m	6.35		
weight from trapezoidal slabs in T	337.9		
inner length of central dispersion box in m	1.5		
weight of central dispersion box in T	6.56		
width of beam in m	0.45		
raft beam drops in m	0.60		
weight of beam drops in T	113.4		
weight of water in T	1567.17		
weight of plate settler modules in T	30.72		
weight of steel beams in T	22.1		
weight of deep beam trays in T	195		
load from horizontal haunch in T	40.5		
weight from horizontal haunch in T	30.68		
total superimposed load in T-water full	2643.05		
total superimposed load in T-empty	1075.88		
outer projection of footing slab in m	0.60		
total projected area in m ²	525.355		
stress upward in T/m ² -water full	5.03		
net stress upwards in T/m ² - empty	2.05		
design of bottom floor slab-raft slab on T beams			
assumed thickness of raft slab in m	0.375		
net stress upwards in T/m ² - water full	5.03	downward water stress in T/m ² mid	10.125

equivalent upward stress in T/m ² middle	-5.09	downward water stress in T/m ² edge	7.375
equivalent upward stress in T/m ³ edge	-2.34		
net stress upwards in T/m ² - empty	2.05		
net stress downwards in T/m ² - for mid	5.09		
net stress downwards in T/m ² - for edge	2.34		
net stress upwards in T/m ² - for design	2.05		
TYPICAL FLOOR SLAB-MIDDLE PORTION			
assumed thickness in m	0.45		
long span in m	4.325		
short span in m	4.325		
live load in t/m ²	5.09		
finishes in t/m ²	0.1		
total load in t/m ²	5.19		
Ly/Lx	1.00		
condition as per IS: 456 (2000)	interior panel		
Mx-	0.032	moment in tm	3.11
Mx+	0.024	moment in tm	2.33
My-	0.032	moment in tm	3.11
My+	0.024	moment in tm	2.33
design moment	3.11	non-crack depth in mm	316.7
		cracked section	167.4
fix depth of floor slab in mm	450	effective depth in mm	420
Ast for negative moment in mm ²	433		
Ast for positive moment in mm ²	479		
minimum steel area in mm ²	675		
fix dia for top steel	16	spacing	200
fix dia for bottom steel	16	spacing	200
area of steel given in mm ²	top	1005.31	0.22
	bottom	1005.31	0.22
L/d ratio	10.3		
fs	114.69		
modification factor	2	OK	
moment of resistance of section in ws	4.94	tm	
moment of resistance of section in LS	14.15	tm	
TYPICAL FLOOR BEAM-INTERIOR			
loading on slab in T/m ²	5.19		
wall thickness in m	0		
wall height in m	2.6		
wall material density in T/m ³	2.5		
breadth in m	0.45		
total depth in m	0.975		
span in m	4.325		
span in m left	4.325		

span in m right	4.325		
loading intensity in t/m-bending moment	14.62		
loading intensity in t/m-for column loads	11.81		
fix breadth of beam in mm	450		
design moment for trial in tm	30.39		
cracked effective depth in mm	779.95		
depth for trial in mm	975		
static moment	30.39		
seismic moment	10.03		
design moment in tm	48.5		
cracked effective depth in mm	899.52		
effective depth at limit state in mm	558.12		
fix total depth in mm	975		
Ast for negative moment			
Mdes -ve in tm (LSM)	48.5		
Mdes -ve in tm (WSM)	40.42		
steel at top		steel at bottom	
dia of steel bar 1 in mm	25	dia of steel bar 1 in mm	25
numbers	5	numbers	5
dia of steel bar 2 in mm	25	dia of steel bar 2 in mm	25
numbers	4	numbers	4
area provided in mm2-at top	4417.88	area provided in mm2-at bottom	4417.88
M- resistance of section in tm	47.86		
M- resistance of section at limit state	139.2		
Ast for positive moment			
Mdes +ve in tm	27.35		
steel at bottom		steel at top	
dia of steel bar 1	25	dia of steel bar 1	25
numbers	7	numbers	7
dia of steel bar 2	20	dia of steel bar 2	20
numbers	0	numbers	0
area provided in mm2-at bottom	3436.13	area provided in mm2-at top	3436.13
M- resistance of section	37.5		
M- resistance of section at limit state	93		
shear force in T	37.94		
shear stress in Mpa	0.89		
area of tension reinforcement	1.06		
allowable shear stress in Mpa	0.37		
number of legs	4		
diameter of shear bars in mm	10		
spacing of shear reinforcement in mm	309		
fix spacing in mm	200	fix spacing at joints for 2d	100
analysis of T/L-beam for stress stipulation			
slab depth in m	0.375	slab depth in mm	375

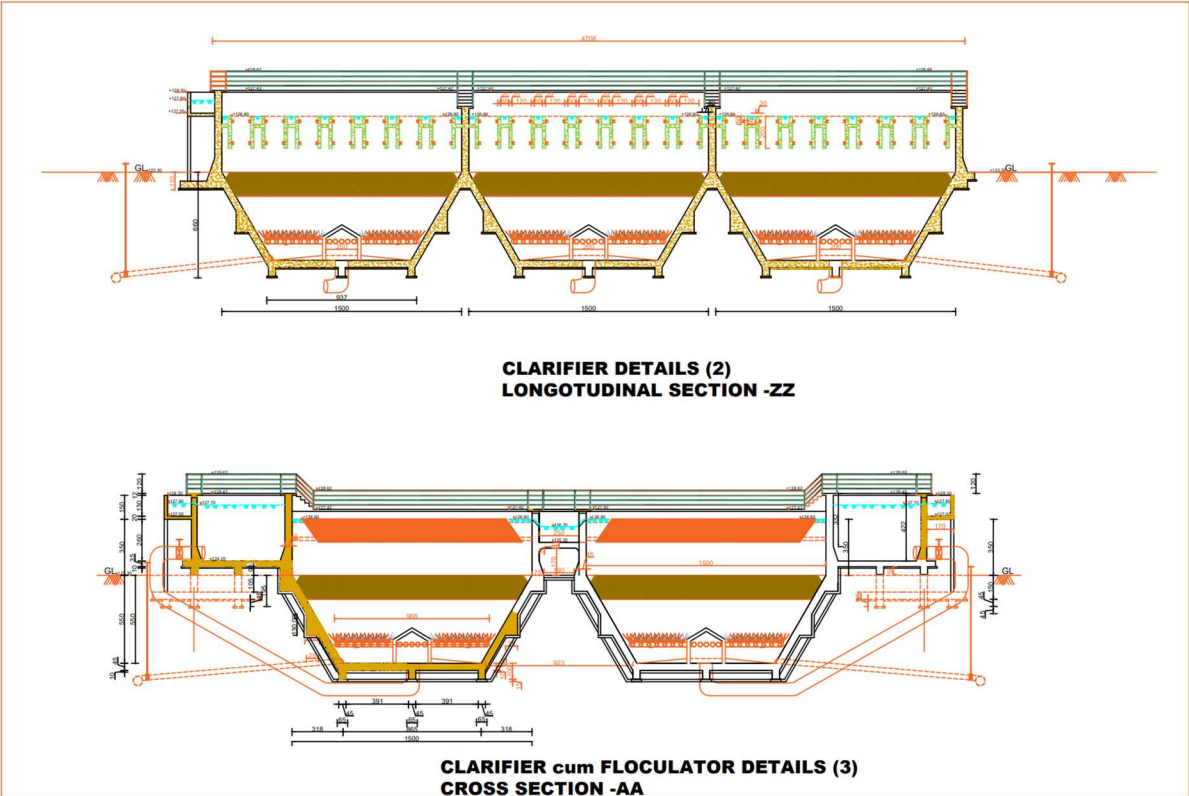
span in m	4.325	span in mm	4325
depth of web in m	0.6	depth of web in mm	600
width of web in m	0.45	width of web in mm	450
Ast top in mm ²	4418		
Ast bottom in mm ²	4418		
bending moment in tm	40.28		
T-beam			
effective flange width in mm	3421		
fix flange width	3400		
equivalent area in mm ²	1633183.28		
cg from top in mm	283.89		
cg from bottom in mm	691.11		
MI in mm ⁴	97437137450		
stress at top in Mpa	1.15		
stress at bottom in Mpa	2.80		
TYPICAL FLOOR SLAB-EDGE PORTION			
assumed thickness in m	0.375		
long span in m	4.325		
short span in m	3.175		
live load in t/m ²	5.09		
finishes in t/m ²	0.1		
total load in t/m ²	5.19		
Ly/Lx	1.36		
condition as per IS: 456 (2000)	two adjacent edges discontinuous		
Mx-	0.071	moment in tm	3.71
Mx+	0.053	moment in tm	2.77
My-	0.047	moment in tm	2.46
My+	0.035	moment in tm	1.83
design moment	3.71	non-crack depth in mm	345.9
		cracked section	182.8
fix depth of floor slab in mm	375	effective depth in mm	345
Ast for negative moment in mm ²	629		
Ast for positive moment in mm ²	694		
minimum steel area in mm ²	562.5		
fix dia for top steel	16	spacing	200
fix dia for bottom steel	16	spacing	200
area of steel given in mm ²	top	1005.31	0.27
	bottom	1005.31	0.27
L/d ratio	9.2		
fs	166.16		
modification factor	2	OK	
moment of resistance of section in ws	3.69	tm	
moment of resistance of section in LS	10.67	tm	
TYPICAL FLOOR BEAM-EXTERIOR			
loading on slab in T/m ²	2.29		
wall thickness in m	0.35		
wall height in m	4		

wall material density in T/m ³	2.5		
breadth in m	0.45		
total depth in m	0.975		
span in m	4.325		
span in m left	3.175		
span in m right	0		
loading intensity in t/m-bending moment	7.14		
loading intensity in t/m-for column loads	6.56		
fix breadth of beam in mm	450		
design moment for trial in tm	13.35		
cracked effective depth in mm	516.93		
depth for trial in mm	975		
static moment	13.35		
seismic moment	3.34		
torsional moment/m from slab in Tm	3.68		
moment in beam from torsion in Tm	29.65		
design moment in tm	55.6		
cracked effective depth in mm	963.12		
effective depth at limit state in mm	597.58		
fix total depth in mm	975		
Ast for negative moment			
Mdes -ve in tm (LSM)	55.6		
Mdes -ve in tm (WSM)	46.33		
steel at top		steel at bottom	
dia of steel bar 1 in mm	25	dia of steel bar 1 in mm	25
numbers	9	numbers	9
dia of steel bar 2 in mm	20	dia of steel bar 2 in mm	20
numbers	0	numbers	0
area provided in mm2-at top	4417.88	area provided in mm2-at bottom	4417.88
M- resistance of section in tm	47.86		
M- resistance of section at limit state	139.3		
Ast for positive moment			
Mdes +ve in tm	41.78		
steel at bottom		steel at top	
dia of steel bar 1	25	dia of steel bar 1	25
numbers	9	numbers	9
dia of steel bar 2	20	dia of steel bar 2	20
numbers	0	numbers	0
area provided in mm2-at bottom	4417.88	area provided in mm2-at top	4417.88
M- resistance of section	47.86		
M- resistance of section at limit state	139.3		
shear from torsion in T	56.59		
shear force in T	75.11		
shear stress in Mpa	1.76		

area of tension reinforcement	1.06		
allowable shear stress in Mpa	0.41		
number of legs	4		
diameter of shear bars in mm	12		
spacing of shear reinforcement in mm	171		
fix spacing in mm	170	fix spacing at joints for 2d	100
analysis of T/L-beam for stress stipulation			
slab depth in m	0.375	slab depth in mm	375
span in m	4.325	span in mm	4325
depth of web in m	0.6	depth of web in mm	600
width of web in m	0.45	width of web in mm	450
Ast top in mm ²	4418		
Ast bottom in mm ²	4418		
bending moment in tm	42		
		L-beam	
		effective flange width in mm	1935
		fix flange width	1900
		equivalent area in mm ²	1070683.28
		cg from top in mm	334.53
		cg from bottom in mm	640.47
		MI in mm ⁴	82873864917
		stress at top in Mpa	1.66
		stress at bottom in Mpa	3.18
design of steel beam for plate settler modules			
number of steel beams at top/module	2	number of steel beams at bottom/module	2
weight from plate settler modules in kN/m	1.84		
self-weight assumed in kN/m	0.88		
live load from standing people in kN/m	1.13		
total factored load in kN/m	5.77	working load in kN/m	3.85
effective span in m	15.15	(ends built-in with partial fixity)	
design bending moment in kNm	147.16		
design shear force in kN	52.45		
section modulus required in mm ³	647500.13		
trial steel section	ISMB 500		
Z _{xx} in mm ³	1808700	Z _p in mm ³	2080005
depth of section h in mm	500.00		
width of flange b in mm	180.00		
sectional area A in mm ²	11074.00		
thickness of flange in mm	17.20		
thickness of web in mm	10.20		
depth of web in mm	431.20		
moment of inertia I _{xx} in mm ⁴	452183000.00		
outstanding leg of compression flange in mm	90.00		

section classification, €	1.00		
leg length/thickness of flange	5.23	<9.4€	
depth of web/thickness of web	42.27	<84€	
section is classified as plastic section		IS 800 clause 3.7.2 and 2.7.4	
weight of the section in kN/m	0.87	OK	
check for shear strength			
design shear force in kN	52.45		
design shear strength of the section in kN	669.20	ratio	12.76
check for 0.6 V	401.52	ratio	7.65
check for moment capacity			
depth/thickness of web	42.3	<67€	
moment capacity at plastic stage in kNm	472.73	ratio	3.21
moment capacity at elastic condition in kNm	493.3	ratio	3.35
check for deflection			
maximum deflection in mm	29.18	permissible deflection	50.5
design of channel beam			
assumed overall depth of beam in m	2.00		
effective span in m	15.15		
width of beam in m	0.25		
width of channel in m	0.45		
thickness of channel slab in m	0.25		
ratio of L/d	7.58		
weight of beams in T/m	2.50		
weight of channel slab in T/m	0.28		
weight of water in T/m	0.45		
live load from standing people in T/m	0.03		
total load on beam in N/mm	32.03		
total load on beam in T/m	3.27		
bending moment in Tm	83.27	for single beam in Tm	41.63
I_{xx} of the single section neglecting channel slab in mm^4	390125834785	I_{xx} of the single section neglecting channel slab in mm^4	195062917393
deflection in mm at centre	2.06		
permissible deflection in mm	50.50		
top steel dia in each beam in mm	25	number	4
	20	number	4
bottom steel dia in each beam in mm	25	number	4
	20	number	4
A_{st} -tension in %	0.67	area of steel top	3220
		area of steel bottom	3220
moment of resistance of the composite section in Tm in ws	89.00		
shear in T/beam	14.84		
shear stress in Mpa	0.30		
allowable shear stress in Mpa	0.36		

number of legs	2		
diameter of shear bars in mm	8		
spacing of shear reinforcement in mm	-1587		
fix spacing in mm	200	fix spacing at joints for 2d	100
stress at bottom/top in Mpa	2.09		



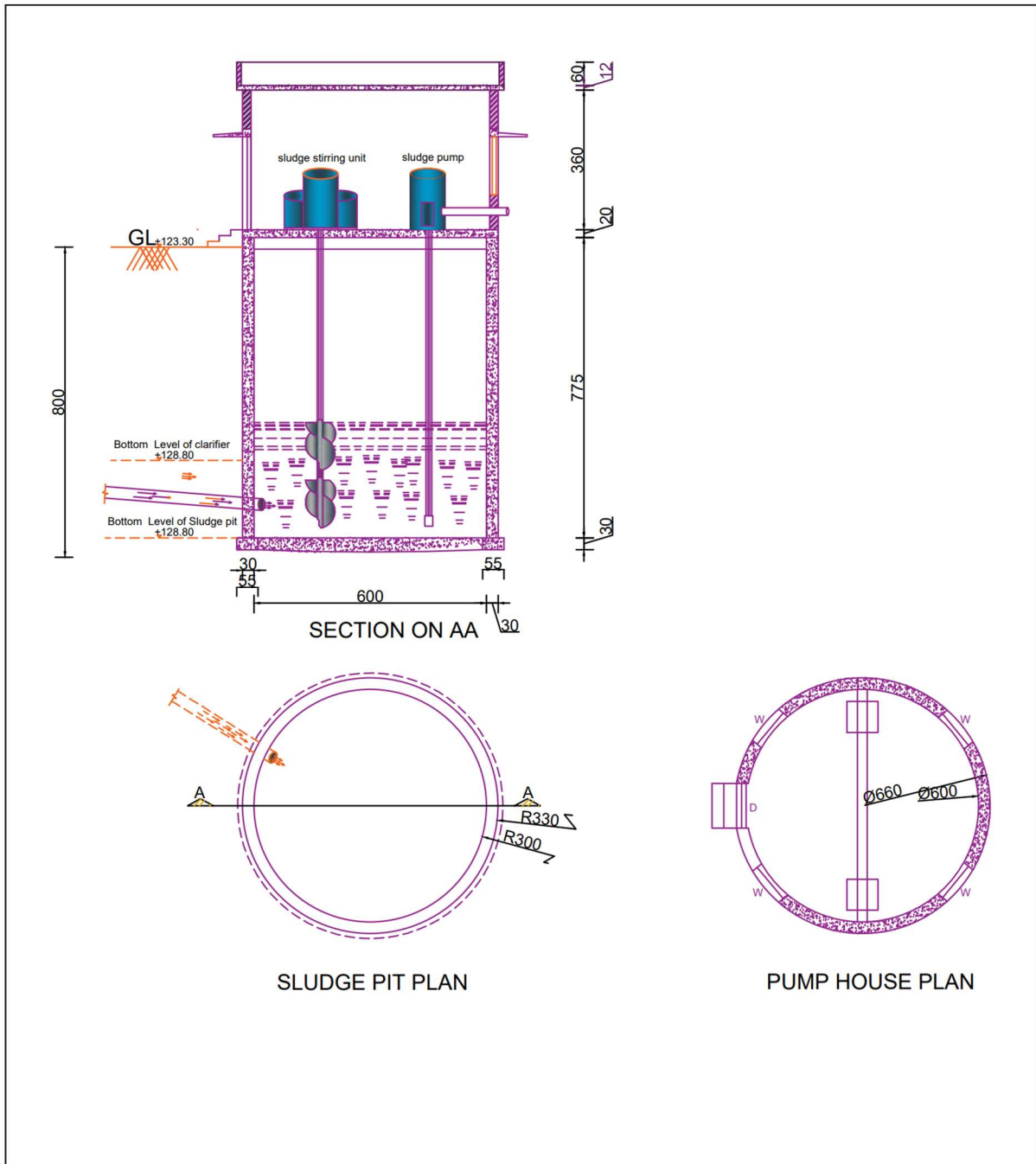


Figure 46. Sludge blanket clarifier with plate settler and sludge pit

4.7 DESIGN OF DUAL MEDIA FILTER UNITS

Filtration is a process of separating suspended and colloidal impurities from water by passage through a porous medium or porous media. Filtration with or without pre-treatment has been employed for treatment of water to effectively remove turbidity, color, microorganisms, precipitated hardness from chemically softened waters and precipitated iron and manganese from aerated waters.

The rapid sand filter consists of a bed of sand serving as a single medium granular matrix supported on gravel overlaying an under-drainage system. When water containing suspended matter is applied to top of filter bed, suspended and colloidal matter is left behind in the granular medium matrix. Gravel is placed between sand and under drainage system to prevent sand particles entering under drainage system and to uniformly distributing wash water. For the present system dual media filter consisting

of sand and anthracite coal is adopted for enhancing rate of filtration and to provide better quality of treatment.

4.7.1 UNIT OPERATIONS

FILTER SHELL						
number of units	24					
rate of filtration adopted	120	lpm/m ²	0.0020	cumec/m ²		
design inflow	1.77	cumec				
total filter area required	887	m ²				
area of one filter bed	36.96	m ²				
ratio of length to breadth	1.3					
breadth	5.33	m	fix	4.80	m	
length	7.7	m	fix	7.70	m	
ratio of length to breadth	1.6	area of one bed	36.96	OK		
filter gravel depth	0.5	m				
filter sand depth	0.25	m				
filter anthracite coal depth	0.6		2.85			
standing water depth	1.5	m				
free board	0.15	m				
for inlet channel	1.25	m				
total depth	4.25	m				
FILTER UNDER DRAINAGE SYSTEM						
plan area of each filter shell	36.96	m ²				
rate of application of wash water	700	lpm/m ²	0.43	cumecs		
velocity of application	3	m/s				
area of perforation required	0.14	m ²				
diameter of perforation	10	mm				
total number of perforations required	1830.07	fix	1840			
spacing for laterals	140	mm				
length perpendicular to laterals	8.60	m				
number of laterals per bed-one side	61.43		fix	70		
actual spacing of laterals	120	mm				
total number of laterals per bed	140					
spacing of perforations	130	mm				
approximate width of manifold	800	mm				
dimension of bed parallel to laterals	4.3	m				
length of lateral- one side	1650	mm				
total number of perforations per lateral	12.69	fix	14			
total number of perforations per bed	1960	OK				
actual spacing of perforations	117.86	mm				
total area of perforations	0.154	m ²				
total c/s area of laterals	0.308	m ²	2 times area of perforations			
c/s area of one lateral	0.0022	m ²				
diameter of lateral required	52.93	mm				

OD of PVC pipe	75	mm	67	mm	ID	
area of central manifold	0.74	m				
width of manifold	0.8	m	fix	0.8	m	
depth	0.925	m	fix	1.00	m	
ratio of total area of perforations to						
total c/s area of laterals	0.31					
ratio of total area of perforations to						
entire filter area	0.0042	OK				
FILTER INLET						
design inflow to single shell-double Q	0.149	cumecs				
velocity	0.3	m/s				
required area	0.50	m ²				
required diameter if pipe is given	0.80	m	fix	0.80	m	
required side if square opening is given	0.71	m	fix	0.75	m	
velocity at double discharge	0.59	m/s, in pipe	0.531	m/s, opening	0.6, limit	
FILTER OUTLET						
design flow	0.149	cumecs				
velocity	0.6	m/s				
required area	0.249	m ²				
required diameter if pipe is given	0.56	m	fix	0.7	m	
velocity at double discharge	0.78	m/s, in pipe	1.2, limit			
WASH WATER PIPE						
rate of application of wash water	600	lpm/m ²	0.37	cumecs, one shell		
velocity of inflow	3	m/s				
area of c/s required	0.123	m ²				
diameter of pipe required	0.40	m	fix	0.5	m	
AIR WASH PIPE						
rate of application of air	750	lpm/m ²	0.462	cumecs, one shell		
velocity of flow	12.8	m/s				
area of c/s required	0.0361	m ²				
diameter of pipe required	0.214	m	fix	0.3	m	
WASH WATER TROUGH						
quantity of wash water in one shell	0.37	cumecs				
number of wash water troughs	2					
quantity in each trough	0.185	cumecs				
width of trough	0.6	m				
depth of flow	0.37	m				
fix total height	0.45	m				
WASTEWATER OUTLET						
rate of flow	0.37	cumecs				
velocity adopted	2.5	m/s				
required diameter	0.43	m	fix	0.50	m	
GULLET						
discharge from filter inlet	0.112	cumecs	at double			

			discharge			
rate of wash water flow	0.431	cumecs				
breadth of gullet	1.00	m				
depth of flow	0.46	m				
fix total depth	0.80	m				

4.7.2 STRUCTURAL DESIGN

FILTER HOUSE			
TYPICAL WALL-LARGER			
width	7.7		
height	3.35	(After flooding)	
b/a	2.3		
assumed thickness in mm	350		
density of liquid in t/m ³	1.03		
coefficients as per IS: 3370 for the case of spanning between columns-maximum condition			
M _x -	0.097	moment in tm	3.76
M _x +	0.013	moment in tm	0.51
M _y -	0.067	moment in tm	2.60
M _y +	0.027	moment in tm	1.05
design moment in tm-vertical	3.76	non-crack depth in mm	343
design moment in tm-horizontal at ends	2.60	non-crack depth in mm	285
design moment in tm-horizontal at middle	1.05	non-crack depth in mm	181.3
fix wall thickness in mm	350	effective depth in mm	320
fix dia for inner steel vertical	12	spacing in mm	100
fix dia for outer steel vertical	12	spacing in mm	150
fix dia for inner steel horizontal	12	spacing in mm	100
fix dia for outer steel horizontal	12	spacing in mm	150
		A _{st}	1130.98
		A _{st}	753.98
		A _{st}	1130.98
		A _{st}	753.98
wall as propped cantilever		wall as simple cantilever	
height of liquid in m - normal	2.85	height of liquid in m - normal	2.85
total wall height in m	4.25	total wall height in m	4.25
density of liquid in t/m ³	1	density of liquid in t/m ³	1
height from top where moment is required in m	4.25	height from top where moment is required in m	4.25
total load per metre width of wall in t	4.06	total load per metre width of wall in t	4.06
axial pull on t-beam at top in t	0.40		
axial pull on t-beam at bottom in t	3.67		
bending moment in tm	-2.18	bending moment in tm	3.86
non-crack thickness in mm	260.89	non-crack thickness in mm	347.23
fix wall thickness in mm	350	fix wall thickness above haunch in mm	350
TYPICAL WALL-SMALLER			
width	4.8		

height	3.35		
b/a	1.43		
assumed thickness in mm	350		
density of liquid in t/m ³	1.03		
coefficients as per IS: 3370 for the case of spanning between columns-maximum condition			
Mx-	0.06	moment in tm	2.33
Mx+	0.016	moment in tm	0.62
My-	0.044	moment in tm	1.70
My+	0.021	moment in tm	0.81
design moment in tm-vertical	2.33	non-crack depth in mm	269.9
design moment in tm-horizontal at ends	1.70	non-crack depth in mm	230.6
design moment in tm-horizontal at middle	0.81	non-crack depth in mm	159.6
fix wall thickness in mm	350	effective depth in mm	320
haunch bars vertical	12	spacing in mm	120
fix dia for inner steel vertical	12	spacing in mm	120
fix dia for outer steel vertical	12	spacing in mm	120
fix dia for inner steel horizontal	12	spacing in mm	120
fix dia for outer steel horizontal	12	spacing in mm	120
		Ast	942.48
		Ast	942.48
		Ast	942.48
		Ast	942.48
wall as simple cantilever			
height of liquid in m - normal	2.85		
total wall height in m	4.25		
density of liquid in t/m ³	1		
height from top where moment is required in m	4.25		
total load per metre width of wall in t	4.06		
bending moment in tm	3.86		
non-crack thickness in mm	347.23		
fix wall thickness in mm	350		
moment of resistance of section in ws	4.23	tm	
moment of resistance of section in LS	13.5	tm	
TYPICAL FLOOR SLAB			
assumed thickness in m	0.35		
long span in m	4		
short span in m	2		
live load in t/m ²	4.765		
finishes in t/m ²	0.1		
total load in t/m ²	5.74		
Ly/Lx	2.00		
condition as per IS: 456 (2000)	two adjacent edges discontinuous		
Mx-	0.091	moment in tm	2.09
Mx+	0.069	moment in tm	1.58
My-	0.047	moment in tm	1.08
My+	0.035	moment in tm	0.8
design moment	2.09	non-crack depth in mm	259.7

		cracked section	137.2
fix depth of floor slab in mm	350	effective depth in mm	320
fix dia for top steel	12	spacing	150
fix dia for bottom steel	12	spacing	150
area of steel given in mm ²	top	753.98	0.22
	bottom	753.98	0.22
moment of resistance of section in ws	2.86	tm	
moment of resistance of section in LS	9.3	tm	
MANIFOLD CHANNEL TOP SLAB-PLACED ON FILTER FLOOR			
assumed thickness in m	0.2		
long span in m	4		
short span in m	1.15		
live load in t/m ²	4.765		
finishes in t/m ²	0.1		
total load in t/m ²	5.365		
Ly/Lx	3.48		
design moment	0.79	non-crack depth in mm	159.4
fix depth of slab in mm	200	effective depth in mm	170
fix dia for top steel	12	spacing	150
fix dia for bottom steel	12	spacing	150
area of steel given in mm ²	top	753.98	0.38
	bottom	753.98	0.38
moment of resistance of section in ws	0.42	tm	
moment of resistance of section in LS	1.42	tm	
MANIFOLD CHANNEL SLAB			
assumed thickness in m	0.35		
long span in m	4		
short span in m	1.15		
live load in t/m ²	0.8		
finishes in t/m ²	0.1		
total load in t/m ²	1.775		
Ly/Lx	3.48		
design moment	0.32	non-crack depth in mm	100.8
fix depth of slab in mm	350	effective depth in mm	320
fix dia for top steel	12	spacing	200
fix dia for bottom steel	12	spacing	200
area of steel given in mm ²	top	565.49	0.16
	bottom	565.49	0.16
moment of resistance of section in ws	1.08	tm	
moment of resistance of section in LS	3.4	tm	
TYPICAL LONG BEAM ON FILTER FLOOR SLAB			
loading on slab in T/m ²	5.74		
wall thickness in m	0		
wall height in m	3.75		
wall material density in T/m ³	2.2		
breadth in m	0.35		
total depth in m	1.15		
span in m	3.91		
span in m left	2		

span in m right	0		
channel loading/m run in T/m	3.0525	for one beam loading in T/m	1.52625
slab loading/m run for other side in T/m	8.61	for one beam loading in T/m	4.305
loading intensity in t/m-bending moment	11.87		
loading intensity in t/m-for column loads	10.80		
fix breadth of beam in mm	350		
design moment for trial in tm	20.17		
cracked effective depth in mm	720.46		
depth for trial in mm	1150		
static moment	20.17		
seismic moment	3.23		
design moment in tm	28.07		
cracked effective depth in mm	775.95		
effective depth at limit state in mm	481.45		
fix total depth in mm	1150		
Ast for negative moment			
Mdes -ve in tm (LSM)	28.07		
Mdes -ve in tm (WSM)	23.39		
steel at top		steel at bottom	
dia of steel bar 1 in mm	25	dia of steel bar 1 in mm	25
numbers	3	numbers	4
dia of steel bar 2 in mm	25	dia of steel bar 2 in mm	25
numbers	3	numbers	0
area provided in mm ² -at top	2945.25	area provided in mm ² -at bottom	1963.5
M- resistance of section in tm	33.45		
M- resistance of section at limit state	97.2		
Ast for positive moment			
Mdes +ve in tm	22.69		
steel at bottom		steel at top	
dia of steel bar 1	25	dia of steel bar 1	25
numbers	6	numbers	6
dia of steel bar 2	25	dia of steel bar 2	25
numbers	0	numbers	0
area provided in mm ² -at bottom	2945.25	area provided in mm ² -at top	2945.25
M- resistance of section	33.5		
M- resistance of section at limit state	97.24		
shear force in T	27.85		
shear stress in Mpa	0.71		
area of tension reinforcement	0.76		
allowable shear stress in Mpa	0.41		
number of legs	2		
diameter of shear bars in mm	12		
spacing of shear reinforcement in mm	501		
fix spacing in mm	200	fix spacing at joints for 2d	100
analysis of T/L-beam for stress stipulation			
slab depth in m	0.35	slab depth in mm	350
span in m	4	span in mm	4000

depth of web in m	0.65	depth of web in mm	650
width of web in m	0.35	width of web in mm	350
Ast top in mm ²	3220		
Ast bottom in mm ²	2513		
bending moment in tm	26		
		L-beam	
		effective flange width in mm	1733
		fix flange width	1700
		equivalent area in mm ²	879715.3
		cg from top in mm	321.24
		cg from bottom in mm	678.76
		MI in mm ⁴	6.81E+10
		stress at top in Mpa	1.20
		stress at bottom in Mpa	2.54
TYPICAL FLOOR BEAM ON FILTER-INTERIOR-SHORT			
loading on slab in T/m ²	5.74		
wall thickness in m	0		
wall height in m	1.6		
wall material density in T/m ³	2.5		
breadth in m	0.35		
total depth in m	1.15		
span in m	2		
span in m left	3.91		
span in m right	3.91		
loading intensity in t/m-bending moment	7.88		
loading intensity in t/m-for column loads	6.44		
fix breadth of beam in mm	350		
design moment for trial in tm	3.50		
cracked effective depth in mm	300.15		
depth for trial in mm	1150		
static moment	3.50		
seismic moment	1.16		
design moment in tm	5.59		
cracked effective depth in mm	346.27		
effective depth at limit state in mm	214.85		
fix total depth in mm	1150		
Ast for negative moment			
Mdes -ve in tm (LSM)	5.59		
Mdes -ve in tm (WSM)	4.66		
steel at top		steel at bottom	
dia of steel bar 1 in mm	16	dia of steel bar 1 in mm	16
numbers	4	numbers	2
dia of steel bar 2 in mm	20	dia of steel bar 2 in mm	20
numbers	0	numbers	0
area provided in mm ² -at top	804.25	area provided in mm ² -at bottom	402.12
M- resistance of section in tm	10.82		
M- resistance of section at limit state	36.28		
Ast for positive moment			

Mdes +ve in tm	3.94		
steel at bottom		steel at top	
dia of steel bar 1	16	dia of steel bar 1	16
numbers	4	numbers	2
dia of steel bar 2	20	dia of steel bar 2	20
numbers	0	numbers	0
area provided in mm ² -at bottom	804.25	area provided in mm ² -at top	402.12
M- resistance of section	10.82		
M- resistance of section at limit state	36.28		
shear force in T	9.45		
shear stress in Mpa	0.24		
area of tension reinforcement	0.21		
allowable shear stress in Mpa	0.33		
number of legs	2		
diameter of shear bars in mm	8		
spacing of shear reinforcement in mm	-732		
fix spacing in mm	200	fix spacing at joints for 2d	100
analysis of T/L-beam for stress stipulation			
slab depth in m	0.35	slab depth in mm	350
span in m	2	span in mm	2000
depth of web in m	0.8	depth of web in mm	800
width of web in m	0.35	width of web in mm	350
Ast top in mm ²	804		
Ast bottom in mm ²	402		
bending moment in tm	5.03		
T-beam			
effective flange width in mm	2783		
fix flange width	2700		
equivalent area in mm ²	1237036		
cg from top in mm	307.23		
cg from bottom in mm	842.77		
MI in mm ⁴	9.9166E+10		
stess at top in Mpa	0.15		
stress at bottom in Mpa	0.42		
pure water channel from filter beds to CWR			
width of channel in m	1.5		
water depth in m	1.25		
live load in t/m ²	1.25		
assumed thickness of wall in m	0.2		
assumed thickness of floor in m	0.25		
assumed thickness of top slab in m	0.15		
width of top slab in m	1.9		
design of sidewall of channel			
bending moment on wall in Tm/m	0.33		
non-crack thickness in mm	102.5		
fix thickness of wall in mm	200		
dia for steel-inner both ways in mm	10		
spacing in mm	200		

Ast for tension in mm ²	392.70	% Ast in surface zone	0.39
dia for steel-outer both ways in mm	10		
spacing in mm	200		
Ast for compression in mm ²	392.70	% Ast in surface zone	0.39
moment of resistance in Tm-WS	0.79		
moment of resistance in Tm-LS	2.59		
design of channel and pipe gallery slab			
thickness of channel slab in mm	0.25		
Ly	5.15		
Lx	3.68		
ratio Ly/Lx	1.40		
loading in T/m ² for channel slab	3.13	moment in Tm	
Mx(-)	0.055	2.33	
Mx(+)	0.041	1.74	
My(-)	0.037	1.57	
My(+)	0.028	1.18	
non-crack thickness in mm	274		
fix thickness of /gallery slab in mm	350		
dia for steel-tension in mm	12		
spacing in mm	125		
Ast for tension in mm ²	904.78	% Ast in surface zone	0.52
dia for steel-compression in mm	12		
spacing in mm	125	% Ast in surface zone	
Ast for compression in mm ²	904.78		0.52
moment of resistance in Tm-WS	2.91		
moment of resistance in Tm-LS	8.47		
design of top slab			
thickness of top slab in mm	0.125		
spacing between walls	1.5		
span in m	1.5		
ratio Ly/Lx	1.00		
loading in T/m ² for channel slab	0.73	moment in Tm	
Mx(-)	0.1	0.16	
non-crack thickness in mm	72.5		
fix thickness of channel in mm	125		
dia for steel-tension in mm	10		
spacing in mm	200		
Ast for tension in mm ²	392.70	% Ast in surface zone	0.63
dia for steel-compression in mm	10		
spacing in mm	200	% Ast in surface zone	
Ast for compression in mm ²	392.70		0.63
moment of resistance in Tm-WS	0.79		
moment of resistance in Tm-LS	2.59		
TYPICAL FLOOR BEAM BELOW GALLERY SLAB-INTERIOR-LONG			
loading on slab in T/m ²	3.13		
wall thickness in m	0		
wall height in m	1.8		
wall material density in T/m ³	2.5		

breadth in m	0.35		
total depth in m	0.95		
span in m	5.15		
span in m left	3.68		
span in m right	3.68		
loading intensity in t/m-bending moment	6.69		
loading intensity in t/m-for column loads	4.85		
fix breadth of beam in mm	350		
design moment for trial in tm	19.73		
cracked effective depth in mm	712.6		
depth for trial in mm	950		
static moment	19.73		
seismic moment	6.51		
design moment in tm	31.49		
cracked effective depth in mm	821.86		
effective depth at limit state in mm	509.93		
fix total depth in mm	950		
Ast for negative moment			
Mdes -ve in tm (LSM)	31.49		
Mdes -ve in tm (WSM)	26.24		
steel at top		steel at bottom	
dia of steel bar 1 in mm	25	dia of steel bar 1 in mm	25
numbers	4	numbers	3
dia of steel bar 2 in mm	25	dia of steel bar 2 in mm	20
numbers	2	numbers	0
area provided in mm2-at top	2945.25	area provided in mm2-at bottom	1472.63
M- resistance of section in tm	30.86		
M- resistance of section at limit state	89.4		
Ast for positive moment			
Mdes +ve in tm	22.19		
steel at bottom		steel at top	
dia of steel bar 1	25	dia of steel bar 1	25
numbers	6	numbers	3
dia of steel bar 2	20	dia of steel bar 2	20
numbers	0	numbers	0
area provided in mm2-at bottom	2945.25	area provided in mm2-at top	1472.63
M- resistance of section	30.86		
M- resistance of section at limit state	89.4		
shear force in T	20.69		
shear stress in Mpa	0.64		
area of tension reinforcement	0.93		
allowable shear stress in Mpa	0.48		
number of legs	2		
diameter of shear bars in mm	8		
spacing of shear reinforcement in mm	411		
fix spacing in mm	200	fix spacing at joints for 2d	100
analysis of T/L-beam for stress stipulation			
slab depth in m	0.3	slab depth in mm	300

span in m	5.15	span in mm	5150
depth of web in m	0.65	depth of web in mm	650
width of web in m	0.35	width of web in mm	350
Ast top in mm ²	2945		
Ast bottom in mm ²	1472		
bending moment in tm	26		
T-beam			
effective flange width in mm	3008		
fix flange width	3000		
equivalent area in mm ²	1171581.66		
cg from top in mm	248.69		
cg from bottom in mm	701.31		
MI in mm ⁴	6.3475E+10		
stress at top in Mpa	1.00		
stress at bottom in Mpa	2.82		
TYPICAL FLOOR BEAM BELOW GALLERY SLAB-INTERIOR-SHORT			
loading on slab in T/m ²	3.13		
wall thickness in m	0		
wall height in m	1.6		
wall material density in T/m ³	2.5		
breadth in m	0.35		
total depth in m	0.95		
span in m	3.68		
span in m left	5.15		
span in m right	5.15		
loading intensity in t/m-bending moment	7.76		
loading intensity in t/m-for column loads	6.32		
fix breadth of beam in mm	350		
design moment for trial in tm	11.67		
cracked effective depth in mm	548.1		
depth for trial in mm	950		
static moment	11.67		
seismic moment	3.85		
design moment in tm	18.63		
cracked effective depth in mm	632.15		
effective depth at limit state in mm	392.22		
fix total depth in mm	950		
Ast for negative moment			
Mdes -ve in tm (LSM)	18.63		
Mdes -ve in tm (WSM)	15.53		
steel at top		steel at bottom	
dia of steel bar 1 in mm	20	dia of steel bar 1 in mm	20
numbers	6	numbers	3
dia of steel bar 2 in mm	20	dia of steel bar 2 in mm	20
numbers	0	numbers	0
area provided in mm ² -at top	1884.96	area provided in mm ² -at bottom	942.48
M- resistance of section in tm	16.58		
M- resistance of section at limit state	47.71		
Ast for positive moment			

Mdes +ve in tm	13.13		
steel at bottom		steel at top	
dia of steel bar 1	20	dia of steel bar 1	20
numbers	6	numbers	3
dia of steel bar 2	20	dia of steel bar 2	20
numbers	0	numbers	0
area provided in mm ² -at bottom	1884.96	area provided in mm ² -at top	942.48
M- resistance of section	16.58		
M- resistance of section at limit state	47.71		
shear force in T	17.13		
shear stress in Mpa	0.53		
area of tension reinforcement	0.60		
allowable shear stress in Mpa	0.33		
number of legs	2		
diameter of shear bars in mm	8		
spacing of shear reinforcement in mm	330		
fix spacing in mm	200	fix spacing at joints for 2d	100
analysis of T/L-beam for stress stipulation			
slab depth in m	0.3	slab depth in mm	300
span in m	3.68	span in mm	3680
depth of web in m	0.65	depth of web in mm	650
width of web in m	0.35	width of web in mm	350
Ast top in mm ²	1884		
Ast bottom in mm ²	942		
bending moment in tm	12.78		
T-beam			
effective flange width in mm	2763		
fix flange width	2700		
equivalent area in mm ²	1065703		
cg from top in mm	255.94		
cg from bottom in mm	694.06		
MI in mm ⁴	5.9083E+10		
stress at top in Mpa	0.54		
stress at bottom in Mpa	1.47		
TYPICAL FLOOR BEAM-BELOW GALLERY SLAB-EXTERIOR-SHORT			
loading on slab in T/m ²	3.13		
wall thickness in m	0.2		
wall height in m	3.75		
wall material density in T/m ³	2		
breadth in m	0.35		
total depth in m	0.95		
span in m	3.68		
span in m left	5.15		
span in m right	0		
loading intensity in t/m-bending moment	2.43		
loading intensity in t/m-for column loads	1.71		
fix breadth of beam in mm	350		
design moment for trial in tm	3.28		

cracked effective depth in mm	290.74		
depth for trial in mm	950		
static moment	3.28		
seismic moment	1.08		
torsional moment/m from slab in Tm	1.57		
moment in beam from torsion in Tm	12.62		
design moment in tm	20.39		
cracked effective depth in mm	661.34		
effective depth at limit state in mm	410.33		
fix total depth in mm	950		
Ast for negative moment			
Mdes -ve in tm (LSM)	20.39		
Mdes -ve in tm (WSM)	16.99		
steel at top		steel at bottom	
dia of steel bar 1 in mm	20	dia of steel bar 1 in mm	20
numbers	7	numbers	4
dia of steel bar 2 in mm	20	dia of steel bar 2 in mm	20
numbers	0	numbers	0
area provided in mm2-at top	2199.12	area provided in mm2-at bottom	1256.64
M- resistance of section in tm	19.5		
M- resistance of section at limit state	55.53		
Ast for positive moment			
Mdes +ve in tm	16.73		
steel at bottom		steel at top	
dia of steel bar 1	20	dia of steel bar 1	20
numbers	7	numbers	4
dia of steel bar 2	20	dia of steel bar 2	20
numbers	0	numbers	0
area provided in mm2-at bottom	2199.12	area provided in mm2-at top	1256.64
M- resistance of section	19.5		
M- resistance of section at limit state	55.53		
shear from torsion in T	26.4		
shear force in T	31.77		
shear stress in Mpa	0.98		
area of tension reinforcement	0.69		
allowable shear stress in Mpa	0.39		
number of legs	2		
diameter of shear bars in mm	10		
spacing of shear reinforcement in mm	174		
fix spacing in mm	100	fix spacing at joints for 2d	100
analysis of T/L-beam for stress stipulation			
slab depth in m	0.3	slab depth in mm	300
span in m	3.68	span in mm	3680
depth of web in m	0.65	depth of web in mm	650
width of web in m	0.35	width of web in mm	350
Ast top in mm ²	2199		
Ast bottom in mm ²	1256		
bending moment in tm	18.23		

		L-beam	
		effective flange width in mm	1557
		fix flange width	1550
		equivalent area in mm ²	726980.9
		cg from top in mm	308.04
		cg from bottom in mm	641.96
		MI in mm ⁴	5.21E+10
		stress at top in Mpa	1.06
		stress at bottom in Mpa	2.20
TYPICAL FLOOR BEAM BELOW FILTER WALL-INTERIOR-LONG			
loading on slab in T/m ²	5.74		
wall thickness in m	0.35		
wall height in m	4.25		
wall material density in T/m ³	2.5		
breadth in m	0.35		
total depth in m	1.15		
span in m	5.15		
span in m left	1.58		
span in m right	3.91		
loading intensity in t/m-bending moment	9.59	(Including walkway loading)	
loading intensity in t/m-for column loads	7.73		
fix breadth of beam in mm	350		
design moment for trial in tm	28.27		
cracked effective depth in mm	853.06		
depth for trial in mm	1150		
static moment	28.27		
seismic moment	9.33		
design moment in tm	45.12		
cracked effective depth in mm	983.78		
effective depth at limit state in mm	610.4		
fix total depth in mm	1150		
Ast for negative moment			
Mdes -ve in tm (LSM)	45.12		
Mdes -ve in tm (WSM)	37.60		
steel at top		steel at bottom	
dia of steel bar 1 in mm	25	dia of steel bar 1 in mm	25
numbers	4	numbers	4
dia of steel bar 2 in mm	25	dia of steel bar 2 in mm	20
numbers	3	numbers	0
area provided in mm ² -at top	3436.13	area provided in mm ² -at bottom	1963.5
M- resistance of section in tm	44.4		
M- resistance of section at limit state	129		
Ast for positive moment			
Mdes +ve in tm	31.81		
steel at bottom		steel at top	
dia of steel bar 1	25	dia of steel bar 1	25
numbers	6	numbers	3

dia of steel bar 2	20	dia of steel bar 2	20
numbers	0	numbers	0
area provided in mm ² -at bottom	2945.25	area provided in mm ² -at top	1472.63
M- resistance of section	38.12		
M- resistance of section at limit state	119.2		
shear force in T	29.64		
shear stress in Mpa	0.75		
area of tension reinforcement	0.89		
allowable shear stress in Mpa	0.48		
number of legs	2		
diameter of shear bars in mm	8		
spacing of shear reinforcement in mm	243		
fix spacing in mm	200	fix spacing at joints for 2d	100
analysis of T/L-beam for stress stipulation			
slab depth in m	0.35	slab depth in mm	350
span in m	5.15	span in mm	5150
depth of web in m	0.8	depth of web in mm	800
width of web in m	0.35	width of web in mm	350
Ast top in mm ²	3436		
Ast bottom in mm ²	1963		
bending moment in tm	39		
T-beam			
effective flange width in mm	3308		
fix flange width	3300		
equivalent area in mm ²	1488882.02		
cg from top in mm	292.03		
cg from bottom in mm	857.97		
MI in mm ⁴	1.1657E+11		
stress at top in Mpa	0.96		
stress at bottom in Mpa	2.82		
TYPICAL FLOOR BEAM BELOW WALL-EXTERIOR-LONG			
loading on slab in T/m ²	5.74		
wall thickness in m	0.35		
wall height in m	4.25		
wall material density in T/m ³	2.5		
breadth in m	0.35		
total depth in m	1.15		
span in m	5.15		
span in m left	3.91		
span in m right	0		
loading intensity in t/m-bending moment	5.63	(Including walkway loading)	
loading intensity in t/m-for column loads	3.89		
fix breadth of beam in mm	350		
design moment for trial in tm	13.58		
cracked effective depth in mm	591.33		
depth for trial in mm	1150		
static moment	13.58		
seismic moment	1.36		

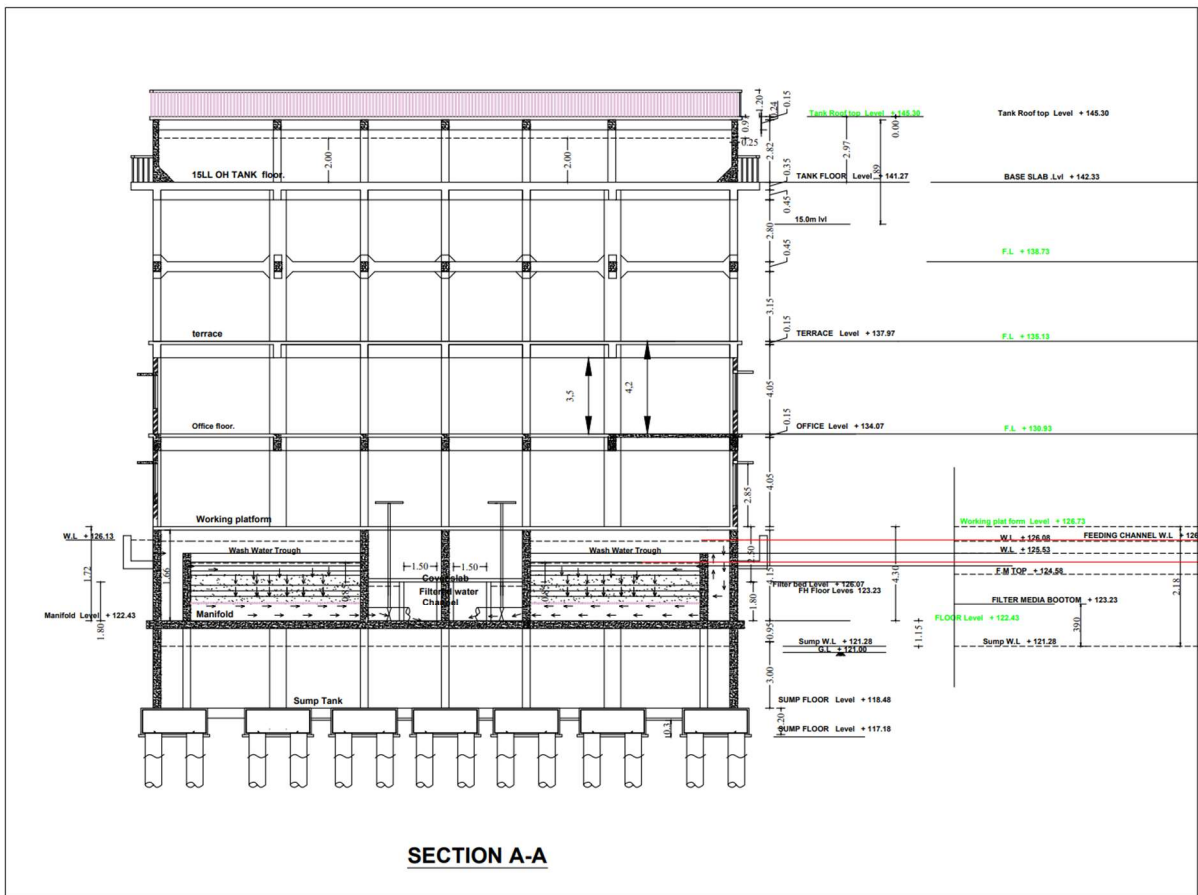
torsional moment/m from slab in Tm	2.27		
moment in beam from torsion in Tm	29.47		
design moment in tm	53.3		
cracked effective depth in mm	1069.25		
effective depth at limit state in mm	663.42		
fix total depth in mm	1150		
Ast for negative moment			
Mdes -ve in tm (LSM)	53.3		
Mdes -ve in tm (WSM)	44.42		
steel at top		steel at bottom	
dia of steel bar 1 in mm	25	dia of steel bar 1 in mm	25
numbers	4	numbers	4
dia of steel bar 2 in mm	25	dia of steel bar 2 in mm	20
numbers	4	numbers	0
area provided in mm2-at top	3927	area provided in mm2-at bottom	1963.5
M- resistance of section in tm	50.4		
M- resistance of section at limit state	154		
Ast for positive moment			
Mdes +ve in tm	46.08		
steel at bottom		steel at top	
dia of steel bar 1	25	dia of steel bar 1	25
numbers	4	numbers	4
dia of steel bar 2	25	dia of steel bar 2	20
numbers	4	numbers	0
area provided in mm2-at bottom	3927	area provided in mm2-at top	1963.5
M- resistance of section	50.4		
M- resistance of section at limit state	154		
shear from torsion in T	53.44		
shear force in T	70.85		
shear stress in Mpa	1.80		
area of tension reinforcement	1.02		
allowable shear stress in Mpa	0.48		
number of legs	4		
diameter of shear bars in mm	10		
spacing of shear reinforcement in mm	157		
fix spacing in mm	150	fix spacing at joints for 2d	100
analysis of T/L-beam for stress stipulation			
slab depth in m	0.35	slab depth in mm	350
span in m	5.1	span in mm	5100
depth of web in m	0.8	depth of web in mm	800
width of web in m	0.35	width of web in mm	350
Ast top in mm ²	3927		
Ast bottom in mm ²	1963		
bending moment in tm	46.43		
		L-beam	
		effective flange width in mm	1825
		fix flange width	1800

		equivalent area in mm ²	968782.2
		cg from top in mm	354.13
		cg from bottom in mm	795.87
		MI in mm ⁴	1.01E+11
		stress at top in Mpa	1.60
		stress at bottom in Mpa	3.60
TYPICAL FLOOR BEAM BELOW FILTER WALL-INTERIOR-LONG - (2)			
loading on slab in T/m ²	5.74		
wall thickness in m	0.35		
wall height in m	4.25		
wall material density in T/m ³	2.5		
breadth in m	0.35		
total depth in m	1.15		
span in m	3.91		
span in m left	2		
span in m right	2		
loading intensity in t/m-bending moment	16.77	(including walkway loading)	
loading intensity in t/m-for column loads	14.63		
fix breadth of beam in mm	350		
design moment for trial in tm	28.48		
cracked effective depth in mm	856.27		
depth for trial in mm	1150		
static moment	28.48		
seismic moment	9.40		
design moment in tm	45.46		
cracked effective depth in mm	987.48		
effective depth at limit state in mm	612.69		
fix total depth in mm	1150		
Ast for negative moment			
Mdes -ve in tm (LSM)	45.46		
Mdes -ve in tm (WSM)	37.88		
steel at top		steel at bottom	
dia of steel bar 1 in mm	25	dia of steel bar 1 in mm	25
numbers	4	numbers	4
dia of steel bar 2 in mm	25	dia of steel bar 2 in mm	20
numbers	3	numbers	0
area provided in mm2-at top	3436.13	area provided in mm2-at bottom	1963.5
M- resistance of section in tm	44.4		
M- resistance of section at limit state	129		
Ast for positive moment			
Mdes +ve in tm	32.05		
steel at bottom		steel at top	
dia of steel bar 1	25	dia of steel bar 1	25
numbers	6	numbers	3
dia of steel bar 2	20	dia of steel bar 2	20
numbers	0	numbers	0
area provided in mm2-at bottom	2945.25	area provided in mm2-at top	1472.63
M- resistance of section	38.12		

M- resistance of section at limit state	119.2		
shear force in T	39.34		
shear stress in Mpa	1.00		
area of tension reinforcement	0.89		
allowable shear stress in Mpa	0.48		
number of legs	2		
diameter of shear bars in mm	10		
spacing of shear reinforcement in mm	199		
fix spacing in mm	150	fix spacing at joints for 2d	100
analysis of T/L-beam for stress stipulation			
slab depth in m	0.35	slab depth in mm	350
span in m	3.91	span in mm	3910
depth of web in m	0.8	depth of web in mm	800
width of web in m	0.35	width of web in mm	350
Ast top in mm ²	3436		
Ast bottom in mm ²	1963		
bending moment in tm	40		
T-beam			
effective flange width in mm	3102		
fix flange width	3100		
equivalent area in mm ²	1418882.02		
cg from top in mm	297.81		
cg from bottom in mm	852.19		
MI in mm ⁴	1.1485E+11		
stress at top in Mpa	1.02		
stress at bottom in Mpa	2.91		
TYPICAL FLOOR BEAM BELOW WALL-EXTERIOR-LONG - (2)			
loading on slab in T/m ²	5.74		
wall thickness in m	0.35		
wall height in m	4.25		
wall material density in T/m ³	2.5		
breadth in m	0.35		
total depth in m	1.15		
span in m	3.91		
span in m left	2		
span in m right	0		
loading intensity in t/m-bending moment	14.35	(Including walkway loading)	
loading intensity in t/m-for column loads	17.88		
fix breadth of beam in mm	350		
design moment for trial in tm	19.95		
cracked effective depth in mm	716.57		
depth for trial in mm	1150		
static moment	19.95		
seismic moment	1.99		
torsional moment/m from slab in Tm	2.27		
moment in beam from torsion in Tm	22.38		
design moment in tm	53.18		
cracked effective depth in mm	1068.04		
effective depth at limit state in mm	662.68		

fix total depth in mm	1150		
Ast for negative moment			
Mdes -ve in tm (LSM)	53.18		
Mdes -ve in tm (WSM)	44.32		
steel at top		steel at bottom	
dia of steel bar 1 in mm	25	dia of steel bar 1 in mm	25
numbers	4	numbers	4
dia of steel bar 2 in mm	25	dia of steel bar 2 in mm	20
numbers	4	numbers	0
area provided in mm ² -at top	3927	area provided in mm ² -at bottom	1963.5
M- resistance of section in tm	50.4		
M- resistance of section at limit state	154		
Ast for positive moment			
Mdes +ve in tm	46.76		
steel at bottom		steel at top	
dia of steel bar 1	25	dia of steel bar 1	25
numbers	4	numbers	4
dia of steel bar 2	25	dia of steel bar 2	20
numbers	4	numbers	0
area provided in mm ² -at bottom	3927	area provided in mm ² -at top	1963.5
M- resistance of section	50.4		
M- resistance of section at limit state	154		
shear from torsion in T	40.57		
shear force in T	74.25		
shear stress in Mpa	1.88		
area of tension reinforcement	1.02		
allowable shear stress in Mpa	0.48		
number of legs	4		
diameter of shear bars in mm	10		
spacing of shear reinforcement in mm	147		
fix spacing in mm	150	fix spacing at joints for 2d	100
analysis of T/L-beam for stress stipulation			
slab depth in m	0.35	slab depth in mm	350
span in m	5.1	span in mm	5100
depth of web in m	0.8	depth of web in mm	800
width of web in m	0.35	width of web in mm	350
Ast top in mm ²	3927		
Ast bottom in mm ²	1963		
bending moment in tm	46.43		
		L-beam	
		effective flange width in mm	1825
		fix flange width	1800
		equivalent area in mm ²	968782.2
		cg from top in mm	354.13
		cg from bottom in mm	795.87
		MI in mm ⁴	1.01E+11
		stress at top in Mpa	1.60

		stress at bottom in Mpa	3.60
SMALLER COLUMNS INSIDE CWR AT MIDDLE OF FILTER			
span along X axis in m	3.91		
span along Y axis in m	2		
service axial load in T	50.97		
side in mm	450		
dia of steel bars	25		
numbers	8		
Ast	3927		
Ac	198573		
direct compressive stress-cal in Mpa	1.94		
bending moment in tm	1.27		
bending compressive stress-cal	0.84		
permissible axial stress in Mpa	8		
permissible bending stress in Mpa	10		
check	0.33	OK	



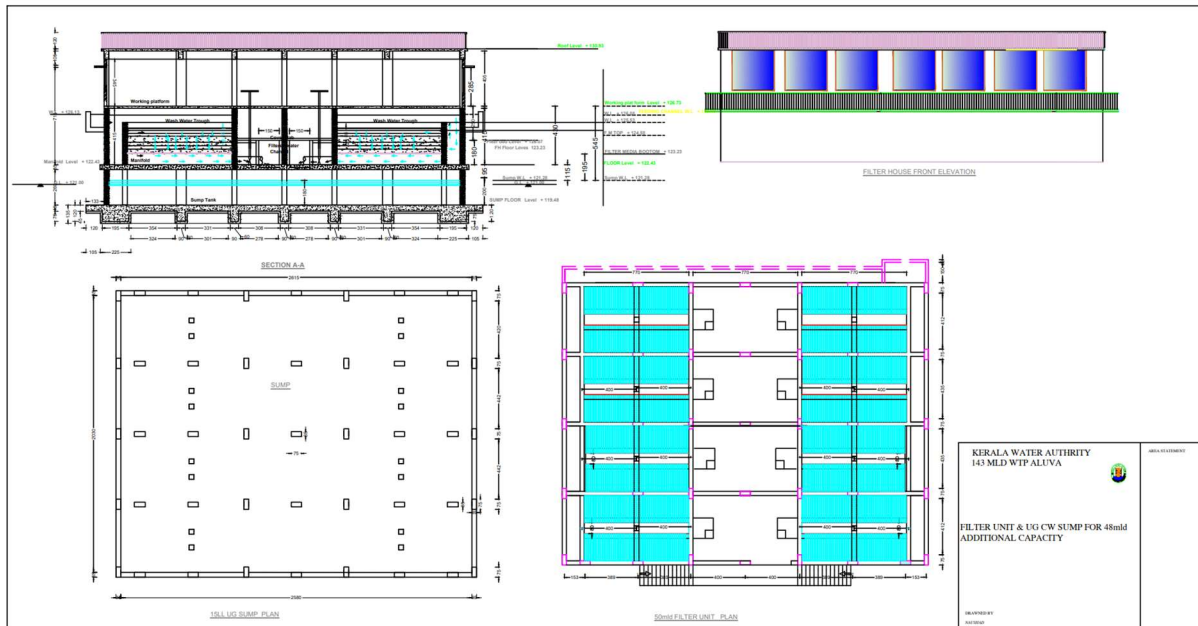


Figure 47. Dual media filter units

4.8 DESIGN OF WASH WATER TANK

The volume of wash water tank is determined for back washing of two beds at a time. The tank is provided at a higher elevation from the filter units to provide adequate pressure. The pressure is controlled using sensor-controlled valves. The structural design is performed in accordance with the stipulations for a water retaining structure. Hydrodynamic analysis has also be done for seismic excitation events.

4.8.1 UNIT OPERATIONS

WASH WATER TANK					
rate of application of wash water	600	lpm/m ²			
quantity required per bed	22.18	m ³ /minute			
time required for washing of one unit	7	minutes			
quantity of water required for two beds with two times washing	310.464	m ³	single	155.23	
quantity of water filtered in one shell	4257.792				
wash water consumption per filter	85.16	m ³			
tank capacity	187.352	m ³	fix	190	m3
water height in m	1				
required length	25.6	m			
breadth	7.42	m	fix	9.9	
WASH WATER MAIN TO OH TANK AND PUMP SETS					
required time	4	hours			
required discharge	0.013	cumecs			
maximum velocity	1.2	m/sec			
required diameter	0.117	m	fix	150	mm
approximate head	13	m			
required power	3.76	HP	fix	5	HP

AIR BLOWER					
rate of air flow	750	lpm/m ²			
flow per bed	27.72	m ³ /minute			

4.8.2 STRUCTURAL DESIGN

WASH WATER TANK				
required quantity in lakh litres	1.9			
required quantity in m ³	190			
required water height	1			
plan area in m ²	190			
square side in m	13.78			
required length in plan in m	23.1	fix		23.1
breadth in m	8.23	fix		9.85
column spacing along length in m (avg.)	3.2			
number of columns along length	8.22	fix		9
column spacing along breadth in m	4.97			
number of columns along breadth	2.98	fix		3
total number of columns	27			
interior columns	7	column along L	spacing	2.89
exterior columns	20	column along B	spacing	4.93
volume in m ³	205.55			
TYPICAL ROOF SLAB				
assumed thickness in m	0.15			
long span in m	5.15			
short span in m	3.91			
live load in t/m ²	0.15			
finishes in t/m ²	0.05			
total load in t/m ²	0.575			
Ly/Lx	1.32			
condition as per IS: 456 (2000)	two adjacent edges discontinuous			
M _x -	0.065	moment in tm		0.57
M _x +	0.049	moment in tm		0.43
M _y -	0.047	moment in tm		0.41
M _y +	0.035	moment in tm		0.31
design moment	0.57	non-crack depth in mm		133.5
		cracked section		71.7
fix depth of roof slab in mm	150	effective depth in mm		120
A _{st} for negative moment in mm ²	278			
A _{st} for positive moment in mm ²	310			
minimum steel area in mm ²	225			
fix dia for top steel	10	spacing		140
fix dia for bottom steel	10	spacing		140
area of steel given in mm ²	top	561.00		0.37
	bottom	561.00		0.37

L/d ratio	42.92		
fs	133.01		
modification factor	1.8	OK	
moment of resistance of section in ws	0.77	tm	
moment of resistance of section in LS	2.42	tm	
TYPICAL WALL-OH TANK			
width	9.9	vertical haunch height in m	0.60
height	1.3	ratio haunch/wall	0.46
height of wall in m	1.8		
b/a	7.62	horizontal haunch height in m	0.60
assumed thickness in mm	200	ratio haunch/wall	0.06
coefficients as per IS: 3370 for the case of spanning between columns-maximum condition			
Mx-	0.126	moment in tm	0.28
Mx- at haunch	0.033	moment in tm	0.07
Mx+	0.01	moment in tm	0.02
My-	0.082	moment in tm	0.18
My- at haunch	0.08	moment in tm	0.18
My+	0.01	moment in tm	0.02
design moment in tm-vertical	0.28	non-crack depth in mm	93.5
design moment in tm-vertical above haunch	0.07	non-crack depth in mm	46.8
design moment in tm-horizontal at ends	0.18	non-crack depth in mm	75
design moment in tm-horizontal at middle	0.02	non-crack depth in mm	25
design moment in tm-horizontal at haunch	0.18	non-crack depth in mm	75
fix wall thickness in mm	200	effective depth in mm	170
fix continous haunch width	300	height	600
haunch bars vertical	10	spacing in mm	180
fix dia for inner steel vertical	10	spacing in mm	180
fix dia for outer steel vertical	10	spacing in mm	180
fix dia for inner steel horizontal	10	spacing in mm	180
fix dia for outer steel horizontal	10	spacing in mm	180
		Ast	436.33
		Ast	436.33
		Ast	436.33
		Ast	436.33
haunch bars vertical in mm	10	spacing in mm	180
moment of resistance of section in ws	0.86	tm	
moment of resistance of section in LS	2.82	tm	
wall as propped cantilever			
height of liquid in m (considering overflow)	1.3		
total wall height in m	1.8		
density of liquid in t/m3	1		
height from top where moment is required in m	1.6		

total load per metre width of wall in t	0.85		
axial pull on t-beam at top in t	0.09		
axial pull on t-beam at bottom in t	0.75		
bending moment in tm	-0.07		
non-crack thickness in mm	47.1		
width of haunch at bottom in mm	300		
height of haunch at bottom in mm	600		
size of vertical haunch in mm	600		
fix wall thickness above haunch in mm	200		
TYPICAL ROOF BEAM-INTERIOR-LONG			
loading on slab in T/m ²	0.575		
breadth in m	0.3		
total depth in m	0.6		
span in m	5.15		
span in m left	3.91		
span in m right	3.91		
loading intensity in t/m-bending moment	2.193		
loading intensity in t/m-for column loads	1.845		
fix breadth of beam in mm	300		
design moment for trial in tm	6.46		
cracked effective depth in mm	440.59		
depth for trial in mm	600		
static moment	6.46		
seismic moment	2.13		
design moment in tm	10.32		
cracked effective depth in mm	508.19		
effective depth at limit state in mm	315.31		
fix total depth in mm	600		
Ast for negative moment			
Mdes -ve in tm (LSM)	10.32		
Mdes -ve in tm (WSM)	8.60		
Ast-bal required in mm ²	882.32		
Ast-bal at limit state in mm ²	626.48		
dia of steel bar 1 in mm	25		
numbers	3		
dia of steel bar 2 in mm	20		
numbers	0		
area provided in mm ² -at top	1472.63		
M- resistance of section in tm	9.44		
M- resistance of section at limit state	27		
area provided in mm ² -at bottom	1472.63		
Ast for positive moment			
Mdes +ve in tm	7.27		
Ast-bal required in mm ²	1090.43		
Ast-bal at limit state	794.62		
dia of steel bar 1	25		
numbers	3		
dia of steel bar 2	20		
numbers	0		
area provided in mm ² -at bottom	1472.63		

M- resistance of section	9.44		
M- resistance of section at limit state	27		
shear force in T	6.78		
shear stress in Mpa	0.40		
area of tension reinforcement	0.88		
allowable shear stress in Mpa	0.37		
number of legs	2		
diameter of shear bars in mm	8		
spacing of shear reinforcement in mm	2627		
fix spacing in mm	200	fix spacing at joints for 2d	100
TYPICAL ROOF BEAM-EXTERIOR-LONG (ENCASED IN WALL)			
loading on slab in T/m ²	0.575		
breadth in m	0.3		
total depth in m	0.6		
span in m	5.15		
span in m left	3.1		
span in m right	0		
loading intensity in t/m-bending moment	1.229		
loading intensity in t/m-for column loads	1.073		
fix breadth of beam in mm	300		
design moment for trial in tm	3.26		
cracked effective depth in mm	312.84		
depth for trial in mm	600		
static moment	3.26		
seismic moment	1.08		
torsional moment/m from slab in Tm	0.57		
moment in beam from torsion in Tm	5.18		
design moment in tm	11.42		
cracked effective depth in mm	534.59		
effective depth at limit state in mm	331.69		
fix total depth in mm	600		
Ast for negative moment			
Mdes -ve in tm (LSM)	11.42		
Mdes -ve in tm (WSM)	9.52		
Ast-bal required in mm ²	976.37		
Ast-bal at limit state in mm ²	693.26		
dia of steel bar 1 in mm	25		
numbers	3		
dia of steel bar 2 in mm	20		
numbers	0		
area provided in mm ² -at top	1472.63		
M- resistance of section in tm	9.44		
M- resistance of section at limit state	27		
area provided in mm ² -at bottom	1472.63		
Ast for positive moment			
Mdes +ve in tm	4.07		
Ast-bal required in mm ²	610.85		
Ast-bal at limit state	445.14		
dia of steel bar 1	25		
numbers	3		

dia of steel bar 2	20		
numbers	0		
area provided in mm ² -at bottom	1472.63		
M- resistance of section	9.44		
M- resistance of section at limit state	27		
shear force in T	3.80		
equivalent shear force with torsion in T	31.43		
shear stress in Mpa	1.85		
area of tension reinforcement	0.88		
allowable shear stress in Mpa	0.36		
number of legs	2		
diameter of shear bars in mm	10		
spacing of shear reinforcement in mm	81	(Presence of wall reduces torsion)	
fix spacing in mm	100	fix spacing at joints for 2d	100
TYPICAL ROOF BEAM-INTERIOR-SHORT			
loading on slab in T/m ²	0.575		
breadth in m	0.3		
total depth in m	0.6		
span in m	3.91		
loading intensity in t/m-bending moment	1.855		
loading intensity in t/m-for column loads	1.574		
fix breadth of beam in mm	300		
design moment for trial in tm	3.15		
cracked effective depth in mm	307.63		
depth for trial in mm	600		
static moment	3.15		
seismic moment	1.04		
design moment in tm	5.03		
cracked effective depth in mm	354.79		
effective depth at limit state in mm	220.13		
fix total depth in mm	600		
Ast for negative moment			
Mdes -ve in tm (LSM)	5.03		
Mdes -ve in tm (WSM)	4.19		
Ast-bal required in mm ²	430.05		
Ast-bal at limit state in mm ²	305.35		
dia of steel bar 1 in mm	20		
numbers	3		
dia of steel bar 2 in mm	16		
numbers	0		
area provided in mm ² -at top	942.48		
M- resistance of section in tm	6.1		
M- resistance of section at limit state	17.41		
area provided in mm ² -at bottom	1143.54		
Ast for positive moment			
Mdes +ve in tm	3.55		
Ast-bal required in mm ²	531.6		
Ast-bal at limit state	387.39		
dia of steel bar 1	20		
numbers	3		

dia of steel bar 2	16		
numbers	1		
area provided in mm ² -at bottom	1143.54		
M- resistance of section	6.1		
M- resistance of section at limit state	17.41		
shear force in T	4.35		
shear stress in Mpa	0.26		
area of tension reinforcement	0.57		
allowable shear stress in Mpa	0.27		
number of legs	2		
diameter of shear bars in mm	8		
spacing of shear reinforcement in mm	-3210		
fix spacing in mm	200	fix spacing at joints for 2d	100
TYPICAL ROOF BEAM-EXTERIOR-SHORT			
loading on slab in T/m ²	0.575		
breadth in m	0.3		
total depth in m	0.6		
span in m	3.91		
loading intensity in t/m-bending moment	1.153		
loading intensity in t/m-for column loads	1.012		
fix breadth of beam in mm	300		
design moment for trial in tm	1.76		
cracked effective depth in mm	230.03		
depth for trial in mm	600		
static moment	1.76		
seismic moment	0.58		
torsional moment/m from slab in Tm	0.43		
moment in beam from torsion in Tm	2.97		
design moment in tm	6.37		
cracked effective depth in mm	399.26		
effective depth at limit state in mm	247.73		
fix total depth in mm	600		
Ast for negative moment			
Mdes -ve in tm (LSM)	6.37		
Mdes -ve in tm (WSM)	5.31		
Ast-bal required in mm ²	544.61		
Ast-bal at limit state in mm ²	386.69		
dia of steel bar 1 in mm	20		
numbers	3		
dia of steel bar 2 in mm	16		
numbers	0		
area provided in mm ² -at top	942.48		
M- resistance of section in tm	6.1		
M- resistance of section at limit state	17.41		
area provided in mm ² -at bottom	942.48		
Ast for positive moment			
Mdes +ve in tm	5.17		
Ast-bal required in mm ²	775.17		
Ast-bal at limit state	564.88		
dia of steel bar 1	20		

numbers	3		
dia of steel bar 2	16		
numbers	0		
area provided in mm ² -at bottom	942.48		
M- resistance of section	6.1		
M- resistance of section at limit state	17.41		
shear force in T	2.70		
equivalent shear force with torsion in T	18.53		
shear stress in Mpa	1.09		
area of tension reinforcement	0.57		
allowable shear stress in Mpa	0.27		
number of legs	2		
diameter of shear bars in mm	10		
spacing of shear reinforcement in mm	147		
fix spacing in mm	150	fix spacing at joints for 2d	100
TYPICAL FLOOR SLAB			
assumed thickness in m	0.275		
long span in m	5.15		
short span in m	3.91		
live load in t/m ²	1.35		
finishes in t/m ²	0.1		
total load in t/m ²	2.1375		
Ly/Lx	1.32		
condition as per IS: 456 (2000)	two adjacent edges discontinuous		
Mx-	0.066	moment in tm	2.16
Mx+	0.05	moment in tm	1.63
My-	0.047	moment in tm	1.54
My+	0.035	moment in tm	1.14
design moment	2.16	non-crack depth in mm	261.9
		cracked section	139.5
fix depth of floor slab in mm	275	effective depth in mm	245
Ast for negative moment in mm ²	516		
Ast for positive moment in mm ²	575		
minimum steel area in mm ²	412.5		
fix dia for top steel	12	spacing	125
fix dia for bottom steel	12	spacing	125
area of steel given in mm ²	top	904.78	0.33
	bottom	904.78	0.33
L/d ratio	15.96		
fs	152.97		
modification factor	2	OK	
moment of resistance of section in ws	2.46	tm	
moment of resistance of section in LS	7.19	tm	
TYPICAL FLOOR BEAM-INTERIOR-LONG			
loading on slab in T/m ²	2.1375		
wall thickness in m	0		
wall height in m	1.8		

wall material density in T/m ³	2.5		
breadth in m	0.35		
total depth in m	0.80		
span in m	5.15		
span in m left	3.91		
span in m right	3.91		
loading intensity in t/m-bending moment	6.94		
loading intensity in t/m-for column loads	5.64		
fix breadth of beam in mm	350		
design moment for trial in tm	20.45		
cracked effective depth in mm	725.59		
depth for trial in mm	800		
static moment	20.45		
seismic moment	6.75		
design moment in tm	32.64		
cracked effective depth in mm	836.74		
effective depth at limit state in mm	519.16		
fix total depth in mm	800		
Ast for negative moment			
Mdes -ve in tm (LSM)	32.64		
Mdes -ve in tm (WSM)	27.20		
steel at top		steel at bottom	
dia of steel bar 1 in mm	25	dia of steel bar 1 in mm	25
numbers	4	numbers	3
dia of steel bar 2 in mm	25	dia of steel bar 2 in mm	20
numbers	3	numbers	0
area provided in mm ² -at top	3436.13	area provided in mm ² -at bottom	1472.63
M- resistance of section in tm	29.5		
M- resistance of section at limit state	84.14		
Ast for positive moment			
Mdes +ve in tm	20.45		
steel at bottom		steel at top	
dia of steel bar 1	25	dia of steel bar 1	25
numbers	6	numbers	3
dia of steel bar 2	20	dia of steel bar 2	20
numbers	0	numbers	0
area provided in mm ² -at bottom	2945.25	area provided in mm ² -at top	1472.63
M- resistance of section	25.5		
M- resistance of section at limit state	73.42		
shear force in T	21.45		
shear stress in Mpa	0.80		
area of tension reinforcement	1.30		
allowable shear stress in Mpa	0.48		
number of legs	2		
diameter of shear bars in mm	8		
spacing of shear reinforcement in mm	209		
fix spacing in mm	200	fix spacing at joints	100

		for 2d	
analysis of T/L-beam for stress stipulation			
slab depth in m	0.27	slab depth in mm	270
span in m	5.15	span in mm	5150
depth of web in m	0.525	depth of web in mm	525
width of web in m	0.35	width of web in mm	350
Ast top in mm ²	3436		
Ast bottom in mm ²	2945		
bending moment in tm	27.08		
T-beam			
effective flange width in mm	2828		
fix flange width	2800		
equivalent area in mm ²	1003432.38		
cg from top in mm	222.22		
cg from bottom in mm	572.78		
MI in mm ⁴	4.1709E+10		
stress at top in Mpa	1.42		
stress at bottom in Mpa	3.65		
TYPICAL FLOOR BEAM-EXTERIOR-LONG			
loading on slab in T/m ²	2.1375		
wall thickness in m	0.2		
wall height in m	1.8		
wall material density in T/m ³	2.5		
breadth in m	0.35		
total depth in m	0.8		
span in m	5.15		
span in m left	3.91		
span in m right	0		
loading intensity in t/m-bending moment	4.60		
loading intensity in t/m-for column loads	3.95		
fix breadth of beam in mm	350		
design moment for trial in tm	11.09		
cracked effective depth in mm	534.31		
depth for trial in mm	800		
static moment	11.09		
seismic moment	1.11		
torsional moment/m from slab in Tm	2.14		
moment in beam from torsion in Tm	21.30		
design moment in tm	40.2		
cracked effective depth in mm	928.6		
effective depth at limit state in mm	576.16		
fix total depth in mm	800		
Ast for negative moment			
Mdes -ve in tm (LSM)	40.2		
Mdes -ve in tm (WSM)	33.50		
steel at top		steel at bottom	
dia of steel bar 1 in mm	25	dia of steel bar 1 in mm	25
numbers	4	numbers	4
dia of steel bar 2 in mm	25	dia of steel bar 2 in mm	20

		mm	
numbers	4	numbers	0
area provided in mm ² -at top	3927	area provided in mm ² -at bottom	1963.5
M- resistance of section in tm	33.72		
M- resistance of section at limit state	96.4		
Ast for positive moment			
Mdes +ve in tm	32.39		
steel at bottom		steel at top	
dia of steel bar 1	25	dia of steel bar 1	25
numbers	4	numbers	4
dia of steel bar 2	25	dia of steel bar 2	20
numbers	4	numbers	0
area provided in mm ² -at bottom	3927	area provided in mm ² -at top	1963.5
M- resistance of section	33.72		
M- resistance of section at limit state	96.4		
shear from torsion in T	50.38		
shear force in T	64.60		
shear stress in Mpa	2.40		
area of tension reinforcement	1.49		
allowable shear stress in Mpa	0.48		
number of legs	4		
diameter of shear bars in mm	10		
spacing of shear reinforcement in mm	108		
fix spacing in mm	100	fix spacing at joints for 2d	100
analysis of T/L-beam for stress stipulation			
slab depth in m	0.27	slab depth in mm	270
span in m	5.1	span in mm	5100
depth of web in m	0.525	depth of web in mm	525
width of web in m	0.35	width of web in mm	350
Ast top in mm ²	3927		
Ast bottom in mm ²	1963		
bending moment in tm	33.72		
		L-beam	
		effective flange width in mm	1585
		fix flange width	1500
		equivalent area in mm ²	647532.2
		cg from top in mm	260.05
		cg from bottom in mm	534.95
		MI in mm ⁴	3.34E+10
		stress at top in Mpa	2.57
		stress at bottom in Mpa	5.29
TYPICAL FLOOR BEAM-INTERIOR-SHORT			
loading on slab in T/m ²	2.1375		
wall thickness in m	0		

wall height in m	1.6		
wall material density in T/m ³	2.5		
breadth in m	0.35		
total depth in m	0.8		
span in m	3.91		
span in m left	5.15		
span in m right	5.15		
loading intensity in t/m-bending moment	5.69		
loading intensity in t/m-for column loads	4.64		
fix breadth of beam in mm	350		
design moment for trial in tm	9.66		
cracked effective depth in mm	498.67		
depth for trial in mm	800		
static moment	9.66		
seismic moment	3.19		
design moment in tm	15.42		
cracked effective depth in mm	575.12		
effective depth at limit state in mm	356.84		
fix total depth in mm	800		
Ast for negative moment			
Mdes -ve in tm (LSM)	15.42		
Mdes -ve in tm (WSM)	12.85		
steel at top		steel at bottom	
dia of steel bar 1 in mm	20	dia of steel bar 1 in mm	20
numbers	6	numbers	3
dia of steel bar 2 in mm	20	dia of steel bar 2 in mm	20
numbers	0	numbers	0
area provided in mm ² -at top	1884.96	area provided in mm ² -at bottom	942.48
M- resistance of section in tm	16.58		
M- resistance of section at limit state	47.71		
Ast for positive moment			
Mdes +ve in tm	10.87		
steel at bottom		steel at top	
dia of steel bar 1	20	dia of steel bar 1	20
numbers	6	numbers	3
dia of steel bar 2	20	dia of steel bar 2	20
numbers	0	numbers	0
area provided in mm ² -at bottom	1884.96	area provided in mm ² -at top	942.48
M- resistance of section	16.58		
M- resistance of section at limit state	47.71		
shear force in T	13.34		
shear stress in Mpa	0.50		
area of tension reinforcement	0.71		
allowable shear stress in Mpa	0.33		
number of legs	2		
diameter of shear bars in mm	8		
spacing of shear reinforcement in mm	400		

fix spacing in mm	200	fix spacing at joints for 2d	100
analysis of T/L-beam for stress stipulation			
slab depth in m	0.27	slab depth in mm	270
span in m	3.91	span in mm	3910
depth of web in m	0.525	depth of web in mm	525
width of web in m	0.35	width of web in mm	350
Ast top in mm ²	1884		
Ast bottom in mm ²	942		
bending moment in tm	12.78		
T-beam			
effective flange width in mm	2622		
fix flange width	2600		
equivalent area in mm ²	913953		
cg from top in mm	219.08		
cg from bottom in mm	575.92		
MI in mm ⁴	3.482E+10		
stress at top in Mpa	0.79		
stress at bottom in Mpa	2.07		
TYPICAL FLOOR BEAM-EXTERIOR-SHORT			
loading on slab in T/m ²	2.1375		
wall thickness in m	0.2		
wall height in m	1.8		
wall material density in T/m ³	2.5		
breadth in m	0.35		
total depth in m	0.8		
span in m	3.91		
span in m left	5.15		
span in m right	0		
loading intensity in t/m-bending moment	3.97		
loading intensity in t/m-for column loads	3.45		
fix breadth of beam in mm	350		
design moment for trial in tm	6.07		
cracked effective depth in mm	395.31		
depth for trial in mm	800		
static moment	6.07		
seismic moment	2.00		
torsional moment/m from slab in Tm	1.53		
moment in beam from torsion in Tm	11.56		
design moment in tm	23.56		
cracked effective depth in mm	710.89		
effective depth at limit state in mm	441.08		
fix total depth in mm	800		
Ast for negative moment			
Mdes -ve in tm (LSM)	23.56		
Mdes -ve in tm (WSM)	19.63		
steel at top		steel at bottom	
dia of steel bar 1 in mm	20	dia of steel bar 1 in mm	20
numbers	7	numbers	4

dia of steel bar 2 in mm	20	dia of steel bar 2 in mm	20
numbers	0	numbers	0
area provided in mm ² -at top	2199.12	area provided in mm ² -at bottom	1256.64
M- resistance of section in tm	19.5		
M- resistance of section at limit state	55.53		
Ast for positive moment			
Mdes +ve in tm	17.63		
steel at bottom		steel at top	
dia of steel bar 1	20	dia of steel bar 1	20
numbers	7	numbers	4
dia of steel bar 2	20	dia of steel bar 2	20
numbers	0	numbers	0
area provided in mm ² -at bottom	2199.12	area provided in mm ² -at top	1256.64
M- resistance of section	19.5		
M- resistance of section at limit state	55.53		
shear from torsion in T	27.3		
shear force in T	36.66		
shear stress in Mpa	1.36		
area of tension reinforcement	0.83		
allowable shear stress in Mpa	0.39		
number of legs	2		
diameter of shear bars in mm	10		
spacing of shear reinforcement in mm	106		
fix spacing in mm	100	fix spacing at joints for 2d	100
analysis of T/L-beam for stress stipulation			
slab depth in m	0.27	slab depth in mm	270
span in m	3.91	span in mm	3910
depth of web in m	0.525	depth of web in mm	525
width of web in m	0.35	width of web in mm	350
Ast top in mm ²	2199		
Ast bottom in mm ²	1256		
bending moment in tm	18.23		
		L-beam	
		effective flange width in mm	1486
		fix flange width	1480
		equivalent area in mm ²	617830.9
		cg from top in mm	261.97
		cg from bottom in mm	533.03
		MI in mm ⁴	3.07E+10
		stress at top in Mpa	1.53
		stress at bottom in Mpa	3.10
COLUMNS INSIDE TANK			
span along X axis in m	5.15		
span along Y axis in m	3.91		

column loading in T/m-long	1.9		
column loading in T/m-short	1.6		
service axial load in T	16.04		
side in mm	350		
dia of steel bars	20		
numbers	8		
Ast	2513.28		
Ac	119986.72		
direct compressive stress- cal in Mpa	0.99		
bending moment in tm	0.32		
bending compressive stress-cal	0.45		
permissible axial stress in Mpa	8		
permissible bending stress in Mpa	10		
check	0.17	OK	
SEISMIC ANALYSIS			
along length		along breadth	
total length in m	23.1		
total beadh in m	9.85		
water height in m	1		
height of wall in m	2.6		
thickness of wall in m	0.25		
thickness of roof slab in m	0.15		
thickness of floor slab in m	0.3		
water volume in m ³	205.55		
impulsive mass mi in t	10.28	impulsive mass mi in t	24.1
hi	0.38	hi	0.38
hi*	9.88	hi*	4.14
convective mass in t	170.42	convective mass in t	165.83
hc	0.5	hc	0.5
hc*	54.31	hc*	10.15
Kc in N/mm	31.04	Kc in N/mm	161.67
lateral stiffness of staging		lateral stiffness of staging	
number of tiers	3	number of tiers	3
staging height	4.2	staging height	4.2
number of interior columns	35	number of interior columns	35
size in mm-breadth	350	size in mm-breadth	350
size in mm-depth	450	size in mm-depth	450
number of exterior columns	28	number of exterior columns	28
size in mm-breadth	350	size in mm-breadth	350
size in mm-depth	450	size in mm-depth	450
Ks in kN/m	116545.14	Ks in kN/m	116545.1
ms in t	345.97	ms in t	345.97
time in impulsive mode Ti	0.35	time in impulsive mode Ti	0.35
give the value of Cc for h/L equals	0.043	give the value of Cc for h/L equals	0.102
Cc	9.58	Cc	6.34
time in convective mode Tc	14.7	time in convective	6.35

		mode Tc	
Design horizontal seismic coefficient		Design horizontal seismic coefficient	
soil type	medium	soil type	medium
Sa/g(i) value	2.86	Sa/g(i) value	2.86
Sa/g(c) value	0.12	Sa/g(c) value	0.28
Ahi in impulsive mode	0.137	Ahi in impulsive mode	0.137
Ahc in convective mode	0.01	Ahc in convective mode	0.01
base shear Vi in t	48.86	base shear Vi in t	50.75
base shear Vc	1.7	base shear Vc	1.66
total base shear at bottom of staging in t	48.89	total base shear at bottom of staging in t	50.78
number frames resisting shear	9	number frames resisting shear	7
shear per frame in t	5.43	shear per frame in t	7.25
total number of coulmns in frame	7	total number of columns in frame	9
shear in interior column in t	0.91	shear in interior column in t	0.91
shear in exterior column in t	0.45	shear in exterior column in t	0.45
moment in interior column in tm	1.90	moment in interior column in tm	1.90
moment in exterior column in tm	0.95	moment in exterior column in tm	0.95
overturning base moment Mi* in tm	326.59	overturning base moment Mi* in tm	345.78
overturning base moment Mc* in tm	116.58	overturning base moment Mc* in tm	40.21
COLUMN LOAD INTENSITY FOR FOUNDATION DESIGN			
corner column			
top slab length in m	5.15	top slab breadth in m	3.91
top beam breadth in m	0.3	top beam drop in m	0.45
slab loading intensity T ² (live load and finishes)	0.2		
top slab thickness in m	0.15		
column breadth in m	0	column width in m	0.35
columns height in m	1.8		
wall thickness in m	0.2	wall height in m	1.35
wall density in T/m ³	2.5		
water column height in m	1		
floor slab length in m	5.15	floor slab breadth in m	3.91
floor slab thickness in m	0.275		
slab loading intensity T ² (live load and finishes)	0.1		
floor beam breadth in m	0.35	floor beam drop in m	0.525
load on column in T	18.56		
exterior column type-1			
top slab length-1 in m	3.91	top slab cross length in m	5.15

top slab length-2 in m	3.91		
top beam breadth in m	0.3	top beam drop in m	0.45
slab loading intensity $T/2$ (live load and finishes)	0.2		
top slab thickness in m	0.15		
column breadth in m	0	column width in m	0.35
columns height in m	1.8		
wall thickness in m	0.2	wall height in m	1.8
wall density in T/m^3	2.5		
water column height in m	1		
floor slab length-1 in m	3.91	floor slab cross length in m	5.15
floor slab length-2 in m	3.91		
floor slab thickness in m	0.275		
slab loading intensity $T/2$ (live load and finishes)	0.1		
floor beam breadth in m	0.35	floor beam drop in m	0.525
load on column in T	32.47		
exterior column type-2			
top slab length-1 in m	3.91	top slab cross length in m	5.15
top slab length-2 in m	3.68		
top beam breadth in m	0.3	top beam drop in m	0.45
slab loading intensity $T/2$ (live load and finishes)	0.2		
top slab thickness in m	0.15		
column breadth in m	0	column width in m	0.35
columns height in m	1.8		
wall thickness in m	0.2	wall height in m	1.8
wall density in T/m^3	2.5		
water column height in m	1		
floor slab length-1 in m	3.91	floor slab cross length in m	5.15
floor slab length-2 in m	3.68		
floor slab thickness in m	0.275		
slab loading intensity $T/2$ (live load and finishes)	0.1		
floor beam breadth in m	0.35	floor beam drop in m	0.525
load on column in T	31.58		
exterior column type-3			
top slab length-1 in m	3.68	top slab cross length in m	5.15
top slab length-2 in m	3.68		
top beam breadth in m	0.3	top beam drop in m	0.45
slab loading intensity $T/2$ (live load and finishes)	0.2		
top slab thickness in m	0.15		
column breadth in m	0	column width in m	0.35
columns height in m	1.8		
wall thickness in m	0.2	wall height in m	1.8
wall density in T/m^3	2.5		
water column height in m	1		

floor slab length-1 in m	3.68	floor slab cross length in m	5.15
floor slab length-2 in m	3.68		
floor slab thickness in m	0.275		
slab loading intensity $T/2$ (live load and finishes)	0.1		
floor beam breadth in m	0.35	floor beam drop in m	0.525
load on column in T	30.68		
exterior column type-4			
top slab length-1 in m	5.15	top slab cross length in m	3.91
top slab length-2 in m	5.15		
top beam breadth in m	0.3	top beam drop in m	0.45
slab loading intensity $T/2$ (live load and finishes)	0.2		
top slab thickness in m	0.15		
column breadth in m	0	column width in m	0.35
columns height in m	1.8		
wall thickness in m	0.2	wall height in m	1.8
wall density in T/m^3	2.5		
water column height in m	1		
floor slab length-1 in m	5.15	floor slab cross length in m	3.91
floor slab length-2 in m	5.15		
floor slab thickness in m	0.275		
slab loading intensity $T/2$ (live load and finishes)	0.1		
floor beam breadth in m	0.35	floor beam drop in m	0.525
load on column in T	34.08		
interior column type-1			
top slab length-1 in m	3.91	top slab cross length-1 in m	5.15
top slab length-2 in m	3.91	top slab cross length-2 in m	5.15
top beam breadth in m	0.3	top beam drop in m	0.45
slab loading intensity $T/2$ (live load and finishes)	0.2		
top slab thickness in m	0.15		
column breadth in m	0	column width in m	0.35
columns height in m	1.8		
wall thickness in m	0	wall height in m	1.8
wall density in T/m^3	2.5		
water column height in m	1		
floor slab length-1 in m	3.91	floor slab cross length-1 in m	5.15
floor slab length-2 in m	3.91	floor slab cross length-2 in m	5.15
floor slab thickness in m	0.275		
slab loading intensity $T/2$ (live load and finishes)	0.1		
floor beam breadth in m	0.35	floor beam drop in m	0.525
load on column in T	54.79		
interior column type-2			

top slab length-1 in m	3.91	top slab cross length-1 in m	5.15
top slab length-2 in m	3.68	top slab cross length-2 in m	5.15
top beam breadth in m	0.3	top beam drop in m	0.45
slab loading intensity $T/2$ (live load and finishes)	0.2		
top slab thickness in m	0.15		
column breadth in m	0	column width in m	0.35
columns height in m	1.8		
wall thickness in m	0.2	wall height in m	1.8
wall density in T/m^3	2.5		
water column height in m	1		
floor slab length-1 in m	3.91	floor slab cross length-1 in m	5.15
floor slab length-2 in m	3.68	floor slab cross length-2 in m	5.15
floor slab thickness in m	0.275		
slab loading intensity $T/2$ (live load and finishes)	0.1		
floor beam breadth in m	0.35	floor beam drop in m	0.525
load on column in T	61.35		
interior column type-3			
top slab length-1 in m	3.68	top slab cross length-1 in m	5.15
top slab length-2 in m	3.68	top slab cross length-2 in m	5.15
top beam breadth in m	0.3	top beam drop in m	0.45
slab loading intensity $T/2$ (live load and finishes)	0.2		
top slab thickness in m	0.15		
column breadth in m	0	column width in m	0.35
columns height in m	1.8		
wall thickness in m	0.2	wall height in m	1.8
wall density in T/m^3	2.5		
water column height in m	1		
floor slab length-1 in m	3.68	floor slab cross length-1 in m	5.15
floor slab length-2 in m	3.68	floor slab cross length-2 in m	5.15
floor slab thickness in m	0.275		
slab loading intensity $T/2$ (live load and finishes)	0.1		
floor beam breadth in m	0.35	floor beam drop in m	0.525
load on column in T	59.76		
column type	load in T	number	total
corner column	18.56	4	74.2
average load in T-corner	18.56		
exterior column-type-1	32.47	4	129.9
exterior column-type-2	31.58	4	126.3
exterior column-type-3	30.68	2	61.4
exterior column-type-4	34.08	2	68.2

average load in T-exterior	32.14		
interior column-type-1	54.79	2	109.6
interior column-type-2	61.35	2	122.7
interior column-type-3	59.76	1	59.8
average load in T-interior	58.4		
INTERIOR COLUMNS		EXTERIOR COLUMNS	
axial load in t	58.4	axial load in t	32.1
		axial load in t for corner column	18.6
factored axial load in t	88	factored axial load in t	48
static moment in tm	1	static moment in tm	1
seismic moment in tm	2.00	seismic moment in tm	1.00
breadth of the column adopted in mm	350	breadth of the column adopted in mm	350
depth of the column adopted in mm	450	depth of the column adopted in mm	450
dia of steel bars 1	25	dia of steel bars 1	25
numbers	8		8
dia of steel bars 2	12	dia of steel bars 2	12
numbers	0		0
total area of steel in mm ²	3927	total area of steel in mm ²	3927
% steel	2.49	% steel	2.49
axial load capacity in t	262.76	axial load capacity in t	262.76
ratio	0.33	ratio	0.18
unsupported length in m	4	unsupported length in m	4
L/d ratio	11.43	L/d ratio	11.43
Pu/fck b d	0.22	Pu/fck b d	0.12
p/fck	0.1	p/fck	0.1
d'/B	0.12	d'/B	0.12
d'/D	0.09	d'/D	0.09
Mu/fck D b ² from chart	0.135		0.135
Mu/fck b D ² from chart	0.15	Mu/fck b D ² from chart	0.15
<i>seismic force in X direction</i>		<i>seismic force in X direction</i>	
Mux1	265781250	Mux1	2.66E+08
Mux	35316000	Mux	23544000
Muy1	186046875	Muy1	1.86E+08
Muy	35316000	Muy	23544000
Puz in t	299.42	Puz in t	299.42
Pu/Puz	0.29	Pu/Puz	0.16
alfa n	1.15	alfa n	1.00
check	0.25	check	0.22
<i>seismic force in Y direction</i>		<i>seismic force in Y direction</i>	
Mux1	265781250	Mux1	2.66E+08
Mux	35316000	Mux	23544000

Muy1	186046875	Muy1	1.86E+08
Muy	35316000	Muy	23544000
Puz in t	260.04	Puz in t	260.04
Pu/Puz	0.29	Pu/Puz	0.16
alfa n	1.15	alfa n	1
check	0.25	check	0.22

4.9 DESIGN OF OVERHEAD RESERVOIR

The overhead reservoir planned to distribute purified water to Aluva municipality and certain other areas is to be constructed at the top floor of filter house building. The top level of the tank is given at a higher elevation than that of the existing overhead tank at the site. The capacity of the overhead reservoir is given as 15 Lakh Litres.

4.9.1 UNIT OPERATIONS

OH TANK						
capacity	1500	m3				
depth of water	2.1	m				
diameter required	30.16	m				
required length	24.2	m				
breadth	29.52	m	fix	30.3		

4.9.2 STRUCTURAL DESIGN

OH TANK			
required quantity in lakh litres	15		
required quantity in m ³	1500		
required water height	2		
plan area in m ²	750		
square side in m	27.39		
required length in plan in m	30.3	fix	30.3
breadth in m	24.75	fix	25.6
column spacing along length in m (avg.)	5.05		
number of columns along length	7	fix	7
column spacing along breadth in m	3.2		
number of columns along breadth	9	fix	9
total number of columns	63		
interior columns	35	column spacing along L	5.05
exterior columns	28	column spacing along B	3.2
volume in m ³	1513.14		
TYPICAL WALL-OH TANK			
width	15	vertical haunch height in m	0.60
height	2.3	ratio haunch/wall	0.26
b/a	6.52	horizontal haunch height in m	0.60
assumed thickness in mm	250	ratio haunch/wall	0.04

coefficients as per IS: 3370 for the case of spanning between columns-maximum condition			
Mx-	0.126	moment in tm	1.53
Mx- at haunch	0.033	moment in tm	0.4
Mx+	0.01	moment in tm	0.12
My-	0.082	moment in tm	1
My- at haunch	0.08	moment in tm	0.97
My+	0.01	moment in tm	0.12
design moment in tm-vertical	1.53	non-crack depth in mm	218.7
design moment in tm-vertical above haunch	0.4	non-crack depth in mm	111.8
design moment in tm-horizontal at ends	1	non-crack depth in mm	176.8
design moment in tm-horizontal at middle	0.12	non-crack depth in mm	61.2
design moment in tm-horizontal at haunch	0.97	non-crack depth in mm	174.1
fix wall thickness in mm	250	effective depth in mm	220
fix continous haunch width	300	height	600
haunch bars vertical	12	spacing in mm	150
fix dia for inner steel vertical	12	spacing in mm	150
fix dia for outer steel vertical	12	spacing in mm	200
fix dia for inner steel horizontal	12	spacing in mm	150
fix dia for outer steel horizontal	12	spacing in mm	200
		Ast	753.98
		Ast	565.49
		Ast	753.98
		Ast	565.49
wall as propped cantilever			
height of liquid in m (considering overflow)	2.3		
total wall height in m	2.6		
density of liquid in t/m ³	1		
height from top where moment is required in m	2.6		
total load per metre width of wall in t	2.65		
axial pull on t-beam at top in t	0.43		
axial pull on t-beam at bottom in t	2.22		
bending moment in tm	-0.92		
non-crack thickness in mm	169.6		
width of haunch at bottom in mm	300		
height of haunch at bottom in mm	600		
size of vertical haunch in mm	600		
fix wall thickness above haunch in mm	250		
TYPICAL ROOF SLAB			
assumed thickness in m	0.15		
long span in m	5.15		
short span in m	3.91		
live load in t/m ²	0.15		
finishes in t/m ²	0.05		
total load in t/m ²	0.575		
Ly/Lx	1.32		
condition as per IS: 456 (2000)	two adjacent edges discontinuous		
Mx-	0.065	moment in tm	0.57

Mx+	0.049	moment in tm	0.43
My-	0.047	moment in tm	0.41
My+	0.035	moment in tm	0.31
design moment	0.57	non-crack depth in mm	133.5
		cracked section	71.7
fix depth of roof slab in mm	150	effective depth in mm	120
Ast for negative moment in mm ²	278		
Ast for positive moment in mm ²	310		
minimum steel area in mm ²	225		
fix dia for top steel	10	spacing	140
fix dia for bottom steel	10	spacing	140
area of steel given in mm ²	top	561.00	0.37
	bottom	561.00	0.37
L/d ratio	42.92		
fs	133.01		
modification factor	1.8	OK	
moment of resistance of section in ws	0.77	tm	
moment of resistance of section in LS	2.42	tm	
TYPICAL ROOF BEAM-INTERIOR-LONG			
loading on slab in T/m ²	0.575		
breadth in m	0.3		
total depth in m	0.6		
span in m	5.15		
span in m left	3.91		
span in m right	3.91		
loading intensity in t/m-bending moment	2.193		
loading intensity in t/m-for column loads	1.845		
fix breadth of beam in mm	300		
design moment for trial in tm	6.46		
cracked effective depth in mm	440.59		
depth for trial in mm	600		
static moment	6.46		
seismic moment	2.13		
design moment in tm	10.32		
cracked effective depth in mm	508.19		
effective depth at limit state in mm	315.31		
fix total depth in mm	600		
Ast for negative moment			
Mdes -ve in tm (LSM)	10.32		
Mdes -ve in tm (WSM)	8.60		
Ast-bal required in mm ²	882.32		
Ast-bal at limit state in mm ²	626.48		
dia of steel bar 1 in mm	25		
numbers	3		
dia of steel bar 2 in mm	20		
numbers	0		
area provided in mm ² -at top	1472.63		
M- resistance of section in tm	9.44		
M- resistance of section at limit state	27		
area provided in mm ² -at bottom	1472.63		

Ast for positive moment			
Mdes +ve in tm	7.27		
Ast-bal required in mm ²	1090.43		
Ast-bal at limit state	794.62		
dia of steel bar 1	25		
numbers	3		
dia of steel bar 2	20		
numbers	0		
area provided in mm ² -at bottom	1472.63		
M- resistance of section	9.44		
M- resistance of section at limit state	27		
shear force in T	6.78		
shear stress in Mpa	0.40		
area of tension reinforcement	0.88		
allowable shear stress in Mpa	0.37		
number of legs	2		
diameter of shear bars in mm	8		
spacing of shear reinforcement in mm	2627		
fix spacing in mm	200	fix spacing at joints for 2d	100
TYPICAL ROOF BEAM-EXTERIOR-LONG (ENCASED IN WALL)			
loading on slab in T/m ²	0.575		
breadth in m	0.3		
total depth in m	0.6		
span in m	5.15		
span in m left	3.1		
span in m right	0		
loading intensity in t/m-bending moment	1.229		
loading intensity in t/m-for column loads	1.073		
fix breadth of beam in mm	300		
design moment for trial in tm	3.26		
cracked effective depth in mm	312.84		
depth for trial in mm	600		
static moment	3.26		
seismic moment	1.08		
torsional moment/m from slab in Tm	0.57		
moment in beam from torsion in Tm	5.18		
design moment in tm	11.42		
cracked effective depth in mm	534.59		
effective depth at limit state in mm	331.69		
fix total depth in mm	600		
Ast for negative moment			
Mdes -ve in tm (LSM)	11.42		
Mdes -ve in tm (WSM)	9.52		
Ast-bal required in mm ²	976.37		
Ast-bal at limit state in mm ²	693.26		
dia of steel bar 1 in mm	25		
numbers	3		
dia of steel bar 2 in mm	20		
numbers	0		
area provided in mm ² -at top	1472.63		

M- resistance of section in tm	9.44		
M- resistance of section at limit state	27		
area provided in mm ² -at bottom	1472.63		
Ast for positive moment			
Mdes +ve in tm	4.07		
Ast-bal required in mm ²	610.85		
Ast-bal at limit state	445.14		
dia of steel bar 1	25		
numbers	3		
dia of steel bar 2	20		
numbers	0		
area provided in mm ² -at bottom	1472.63		
M- resistance of section	9.44		
M- resistance of section at limit state	27		
shear force in T	3.80		
equivalent shear force with torsion in T	31.43		
shear stress in Mpa	1.85		
area of tension reinforcement	0.88		
allowable shear stress in Mpa	0.36		
number of legs	2		
diameter of shear bars in mm	10		
spacing of shear reinforcement in mm	81	(Presence of wall reduces torsion)	
fix spacing in mm	100	fix spacing at joints for	100
		2d	
TYPICAL ROOF BEAM-INTERIOR-SHORT			
loading on slab in T/m ²	0.575		
breadth in m	0.3		
total depth in m	0.6		
span in m	3.91		
loading intensity in t/m-bending moment	1.855		
loading intensity in t/m-for column loads	1.574		
fix breadth of beam in mm	300		
design moment for trial in tm	3.15		
cracked effective depth in mm	307.63		
depth for trial in mm	600		
static moment	3.15		
seismic moment	1.04		
design moment in tm	5.03		
cracked effective depth in mm	354.79		
effective depth at limit state in mm	220.13		
fix total depth in mm	600		
Ast for negative moment			
Mdes -ve in tm (LSM)	5.03		
Mdes -ve in tm (WSM)	4.19		
Ast-bal required in mm ²	430.05		
Ast-bal at limit state in mm ²	305.35		
dia of steel bar 1 in mm	20		
numbers	3		
dia of steel bar 2 in mm	16		
numbers	0		
area provided in mm ² -at top	942.48		

M- resistance of section in tm	6.1		
M- resistance of section at limit state	17.41		
area provided in mm2-at bottom	942.48		
Ast for positive moment			
Mdes +ve in tm	3.55		
Ast-bal required in mm2	531.6		
Ast-bal at limit state	387.39		
dia of steel bar 1	20		
numbers	3		
dia of steel bar 2	16		
numbers	0		
area provided in mm2-at bottom	942.48		
M- resistance of section	6.1		
M- resistance of section at limit state	17.41		
shear force in T	4.35		
shear stress in Mpa	0.26		
area of tension reinforcement	0.57		
allowable shear stress in Mpa	0.27		
number of legs	2		
diameter of shear bars in mm	8		
spacing of shear reinforcement in mm	-3210		
fix spacing in mm	200	fix spacing at joints for 2d	100
TYPICAL ROOF BEAM-EXTERIOR-SHORT			
loading on slab in T/m ²	0.575		
breadth in m	0.3		
total depth in m	0.6		
span in m	3.91		
loading intensity in t/m-bending moment	1.153		
loading intensity in t/m-for column loads	1.012		
fix breadth of beam in mm	300		
design moment for trial in tm	1.76		
cracked effective depth in mm	230.03		
depth for trial in mm	600		
static moment	1.76		
seismic moment	0.58		
torsional moment/m from slab in Tm	0.43		
moment in beam from torsion in Tm	2.97		
design moment in tm	6.37		
cracked effective depth in mm	399.26		
effective depth at limit state in mm	247.73		
fix total depth in mm	600		
Ast for negative moment			
Mdes -ve in tm (LSM)	6.37		
Mdes -ve in tm (WSM)	5.31		
Ast-bal required in mm2	544.61		
Ast-bal at limit state in mm2	386.69		
dia of steel bar 1 in mm	20		
numbers	3		
dia of steel bar 2 in mm	16		
numbers	0		

area provided in mm ² -at top	942.48		
M- resistance of section in tm	6.1		
M- resistance of section at limit state	17.41		
area provided in mm ² -at bottom	942.48		
Ast for positive moment			
Mdes +ve in tm	5.17		
Ast-bal required in mm ²	775.17		
Ast-bal at limit state	564.88		
dia of steel bar 1	20		
numbers	3		
dia of steel bar 2	16		
numbers	0		
area provided in mm ² -at bottom	942.48		
M- resistance of section	6.1		
M- resistance of section at limit state	17.41		
shear force in T	2.70		
equivalent shear force with torsion in T	18.53		
shear stress in Mpa	1.09		
area of tension reinforcement	0.57		
allowable shear stress in Mpa	0.27		
number of legs	2		
diameter of shear bars in mm	10		
spacing of shear reinforcement in mm	147		
fix spacing in mm	150	fix spacing at joints for 2d	100
TYPICAL FLOOR SLAB			
assumed thickness in m	0.35		
long span in m	5.15		
short span in m	3.91		
live load in t/m ²	2.1		
finishes in t/m ²	0.1		
total load in t/m ²	3.075		
Ly/Lx	1.32		
condition as per IS: 456 (2000)	two adjacent edges discontinuous		
Mx-	0.066	moment in tm	3.1
Mx+	0.05	moment in tm	2.35
My-	0.047	moment in tm	2.21
My+	0.035	moment in tm	1.65
design moment	3.1	non-crack depth in mm	313.7
		cracked section	167.1
fix depth of floor slab in mm	350	effective depth in mm	320
Ast for negative moment in mm ²	567		
Ast for positive moment in mm ²	635		
minimum steel area in mm ²	525		
fix dia for top steel	12	spacing	120
fix dia for bottom steel	12	spacing	120
area of steel given in mm ²	top	942.48	0.27
	bottom	942.48	0.27
L/d ratio	12.22		
fs	162.17		

modification factor	2	OK	
moment of resistance of section in ws	3.5	tm	
moment of resistance of section in LS	10.17	tm	
TYPICAL FLOOR BEAM-INTERIOR-LONG			
loading on slab in T/m ²	3.075		
wall thickness in m	0		
wall height in m	2.75		
wall material density in T/m ³	2.5		
breadth in m	0.35		
total depth in m	0.98		
span in m	5.15		
span in m left	3.91		
span in m right	3.91		
loading intensity in t/m-bending moment	9.87		
loading intensity in t/m-for column loads	8.01		
fix breadth of beam in mm	350		
design moment for trial in tm	29.09		
cracked effective depth in mm	865.3		
depth for trial in mm	975		
static moment	29.09		
seismic moment	9.60		
design moment in tm	46.43		
cracked effective depth in mm	997.96		
effective depth at limit state in mm	619.19		
fix total depth in mm	975		
Ast for negative moment			
Mdes -ve in tm (LSM)	46.43		
Mdes -ve in tm (WSM)	38.69		
steel at top		steel at bottom	
dia of steel bar 1 in mm	25	dia of steel bar 1 in mm	25
numbers	4	numbers	4
dia of steel bar 2 in mm	25	dia of steel bar 2 in mm	20
numbers	4	numbers	0
area provided in mm2-at top	3927	area provided in mm2-at bottom	1963.5
M- resistance of section in tm	43.77		
M- resistance of section at limit state	132		
Ast for positive moment			
Mdes +ve in tm	29.09		
steel at bottom		steel at top	
dia of steel bar 1	25	dia of steel bar 1	25
numbers	6	numbers	3
dia of steel bar 2	20	dia of steel bar 2	20
numbers	0	numbers	0
area provided in mm2-at bottom	2945.25	area provided in mm2-at top	1472.63
M- resistance of section	32		
M- resistance of section at limit state	98		
shear force in T	30.50		
shear stress in Mpa	0.92		
area of tension reinforcement	1.21		

allowable shear stress in Mpa	0.48		
number of legs	4		
diameter of shear bars in mm	8		
spacing of shear reinforcement in mm	301		
fix spacing in mm	200	fix spacing at joints for 2d	100
analysis of T/L-beam for stress stipulation			
slab depth in m	0.35	slab depth in mm	350
span in m	5.15	span in mm	5150
depth of web in m	0.625	depth of web in mm	625
width of web in m	0.35	width of web in mm	350
Ast top in mm ²	3927		
Ast bottom in mm ²	1963		
bending moment in tm	38.8		
T-beam			
effective flange width in mm	3308		
fix flange width	3300		
equivalent area in mm ²	1432532.2		
cg from top in mm	255.80		
cg from bottom in mm	719.20		
MI in mm ⁴	7.3537E+10		
stess at top in Mpa	1.32		
stress at bottom in Mpa	3.72		
TYPICAL FLOOR BEAM-EXTERIOR-LONG			
loading on slab in T/m ²	3.075		
wall thickness in m	0.25		
wall height in m	2.8		
wall material density in T/m ³	2.5		
breadth in m	0.35		
total depth in m	0.975		
span in m	5.15		
span in m left	3.91		
span in m right	0		
loading intensity in t/m-bending moment	6.96		
loading intensity in t/m-for column loads	6.03		
fix breadth of beam in mm	350		
design moment for trial in tm	16.78		
cracked effective depth in mm	657.18		
depth for trial in mm	975		
static moment	16.78		
seismic moment	1.68		
torsional moment/m from slab in Tm	1.57		
moment in beam from torsion in Tm	18.01		
design moment in tm	43.75		
cracked effective depth in mm	968.73		
effective depth at limit state in mm	601.06		
fix total depth in mm	975		
Ast for negative moment			
Mdes -ve in tm (LSM)	43.75		

Mdes -ve in tm (WSM)	36.46		
steel at top		steel at bottom	
dia of steel bar 1 in mm	25	dia of steel bar 1 in mm	25
numbers	4	numbers	4
dia of steel bar 2 in mm	25	dia of steel bar 2 in mm	20
numbers	4	numbers	0
area provided in mm ² -at top	3927	area provided in mm ² -at bottom	1963.5
M- resistance of section in tm	42		
M- resistance of section at limit state	120		
Ast for positive moment			
Mdes +ve in tm	34.78		
steel at bottom		steel at top	
dia of steel bar 1	25	dia of steel bar 1	25
numbers	4	numbers	4
dia of steel bar 2	25	dia of steel bar 2	20
numbers	3	numbers	0
area provided in mm ² -at bottom	3436.13	area provided in mm ² -at top	1963.5
M- resistance of section	37.4		
M- resistance of section at limit state	115		
shear from torsion in T	36.96		
shear force in T	58.46		
shear stress in Mpa	1.76		
area of tension reinforcement	1.21		
allowable shear stress in Mpa	0.48		
number of legs	4		
diameter of shear bars in mm	10		
spacing of shear reinforcement in mm	161		
fix spacing in mm	150	fix spacing at joints for 2d	100
analysis of T/L-beam for stress stipulation			
slab depth in m	0.35	slab depth in mm	350
span in m	5.1	span in mm	5100
depth of web in m	0.625	depth of web in mm	625
width of web in m	0.35	width of web in mm	350
Ast top in mm ²	3927		
Ast bottom in mm ²	1963		
bending moment in tm	36.46		
		L-beam	
		effective flange width in mm	1825
		fix flange width	1800
		equivalent area in mm ²	907532.2
		cg from top in mm	302.54
		cg from bottom in mm	672.46
		MI in mm ⁴	6.28E+10
		stress at top in Mpa	1.72
		stress at bottom in Mpa	3.83
TYPICAL FLOOR BEAM-INTERIOR-SHORT			

loading on slab in T/m ²	3.075		
wall thickness in m	0		
wall height in m	2.8		
wall material density in T/m ³	2.5		
breadth in m	0.35		
total depth in m	0.975		
span in m	3.91		
span in m left	5.15		
span in m right	5.15		
loading intensity in t/m-bending moment	8.06		
loading intensity in t/m-for column loads	6.56		
fix breadth of beam in mm	350		
design moment for trial in tm	13.69		
cracked effective depth in mm	593.7		
depth for trial in mm	975		
static moment	13.69		
seismic moment	4.52		
design moment in tm	21.86		
cracked effective depth in mm	684.76		
effective depth at limit state in mm	424.87		
fix total depth in mm	975		
Ast for negative moment			
Mdes -ve in tm (LSM)	21.86		
Mdes -ve in tm (WSM)	18.22		
steel at top		steel at bottom	
dia of steel bar 1 in mm	20	dia of steel bar 1 in mm	20
numbers	7	numbers	4
dia of steel bar 2 in mm	20	dia of steel bar 2 in mm	20
numbers	0	numbers	0
area provided in mm2-at top	2199.12	area provided in mm2-at bottom	1256.64
M- resistance of section in tm	24		
M- resistance of section at limit state	76		
Ast for positive moment			
Mdes +ve in tm	15.41		
steel at bottom		steel at top	
dia of steel bar 1	20	dia of steel bar 1	20
numbers	7	numbers	4
dia of steel bar 2	20	dia of steel bar 2	20
numbers	0	numbers	0
area provided in mm2-at bottom	2199.12	area provided in mm2-at top	1256.64
M- resistance of section	24		
M- resistance of section at limit state	76		
shear force in T	18.91		
shear stress in Mpa	0.57		
area of tension reinforcement	0.68		
allowable shear stress in Mpa	0.33		
number of legs	4		
diameter of shear bars in mm	8		
spacing of shear reinforcement in mm	551		

fix spacing in mm	200	fix spacing at joints for 2d	100
analysis of T/L-beam for stress stipulation			
slab depth in m	0.35	slab depth in mm	350
span in m	3.91	span in mm	3910
depth of web in m	0.625	depth of web in mm	625
width of web in m	0.35	width of web in mm	350
Ast top in mm ²	2199		
Ast bottom in mm ²	1256		
bending moment in tm	18.22		
T-beam			
effective flange width in mm	3102		
fix flange width	3100		
equivalent area in mm ²	1338231		
cg from top in mm	259.38		
cg from bottom in mm	715.62		
MI in mm ⁴	6.8262E+10		
stress at top in Mpa	0.68		
stress at bottom in Mpa	1.87		
TYPICAL FLOOR BEAM-EXTERIOR-SHORT			
loading on slab in T/m ²	3.075		
wall thickness in m	0.25		
wall height in m	2.8		
wall material density in T/m ³	2.5		
breadth in m	0.35		
total depth in m	0.975		
span in m	3.91		
span in m left	5.15		
span in m right	0		
loading intensity in t/m-bending moment	6.05		
loading intensity in t/m-for column loads	5.30		
fix breadth of beam in mm	350		
design moment for trial in tm	10.28		
cracked effective depth in mm	514.5		
depth for trial in mm	975		
static moment	10.28		
seismic moment	3.39		
torsional moment/m from slab in Tm	0.68		
moment in beam from torsion in Tm	5.92		
design moment in tm	23.52		
cracked effective depth in mm	710.28		
effective depth at limit state in mm	440.7		
fix total depth in mm	975		
Ast for negative moment			
Mdes -ve in tm (LSM)	23.52		
Mdes -ve in tm (WSM)	19.60		
steel at top		steel at bottom	
dia of steel bar 1 in mm	20	dia of steel bar 1 in mm	20
numbers	7	numbers	4
dia of steel bar 2 in mm	20	dia of steel bar 2 in mm	20

numbers	0	numbers	0
area provided in mm ² -at top	2199.12	area provided in mm ² -at bottom	1256.64
M- resistance of section in tm	24		
M- resistance of section at limit state	76		
Ast for positive moment			
Mdes +ve in tm	15.18		
steel at bottom		steel at top	
dia of steel bar 1	20	dia of steel bar 1	20
numbers	7	numbers	4
dia of steel bar 2	20	dia of steel bar 2	20
numbers	0	numbers	0
area provided in mm ² -at bottom	2199.12	area provided in mm ² -at top	1256.64
M- resistance of section	24		
M- resistance of section at limit state	76		
shear from torsion in T	12.2		
shear force in T	26.36		
shear stress in Mpa	0.79		
area of tension reinforcement	0.68		
allowable shear stress in Mpa	0.39		
number of legs	4		
diameter of shear bars in mm	8		
spacing of shear reinforcement in mm	327		
fix spacing in mm	100	fix spacing at joints for 2d	100
analysis of T/L-beam for stress stipulation			
slab depth in m	0.35	slab depth in mm	350
span in m	3.91	span in mm	3910
depth of web in m	0.625	depth of web in mm	625
width of web in m	0.35	width of web in mm	350
Ast top in mm ²	2199		
Ast bottom in mm ²	1256		
bending moment in tm	20		
		L-beam	
		effective flange width in mm	1726
		fix flange width	1700
		equivalent area in mm ²	848230.9
		cg from top in mm	308.13
		cg from bottom in mm	666.87
		MI in mm ⁴	5.78E+10
		stess at top in Mpa	1.05
		stress at bottom in Mpa	2.27
COLUMNS INSIDE TANK			
span along X axis in m	5.15		
span along Y axis in m	3.91		
column loading in T/m-long	1.9		
column loading in T/m-short	1.6		
service axial load in T	16.04		
side in mm	350		

dia of steel bars	20		
numbers	8		
Ast	2513.28		
Ac	119986.72		
direct compressive stress- cal in Mpa	0.99		
bending moment in tm	0.32		
bending compressive stress-cal	0.45		
permissible axial stress in Mpa	8		
permissible bending stress in Mpa	10		
check	0.17	OK	
SEISMIC ANALYSIS			
along length		along breadth	
total length in m	30.3		
total beadth in m	25.6		
water height in m	1		
height of wall in m	2.6		
thickness of wall in m	0.25		
thickness of roof slab in m	0.15		
thickness of floor slab in m	0.3		
water volume in m ³	205.55		
impulsive mass mi in t	7.83	impulsive mass mi in t	9.27
hi	0.38	hi	0.38
hi*	12.99	hi*	10.96
convective mass in t	170.86	convective mass in t	170.61
hc	0.5	hc	0.5
hc*	93.19	hc*	66.62
Kc in N/mm	18.14	Kc in N/mm	25.34
lateral stiffness of staging		lateral stiffness of staging	
number of tiers	3	number of tiers	3
staging height	4.2	staging height	4.2
number of interior columns	35	number of interior columns	35
size in mm-breadth	350	size in mm-breadth	350
size in mm-depth	450	size in mm-depth	450
number of exterior columns	28	number of exterior columns	28
size in mm-breadth	350	size in mm-breadth	350
size in mm-depth	450	size in mm-depth	450
Ks in kN/m	116545.14	Ks in kN/m	116545.1
ms in t	1328.87	ms in t	1328.87
time period in impulsive mode Ti	0.67	time period in impulsive mode Ti	0.67
give the value of Cc for h/L equals	0.033	give the value of Cc for h/L equals	0.039
Cc	10.96	Cc	10.08
time period in convective mode Tc	19.26	time period in convective mode Tc	16.28
Design horizontal seismic coefficient		Design horizontal seismic coefficient	
soil type	medium	soil type	medium
Sa/g(i) value	1.49	Sa/g(i) value	1.49
Sa/g(c) value	0.09	Sa/g(c) value	0.11

Ahi in impulsive mode	0.072	Ahi in impulsive mode	0.072
Ahc in convective mode	0.0	Ahc in convective mode	0.01
base shear V_i in t	95.76	base shear V_i in t	95.87
base shear V_c	0	base shear V_c	1.71
total base shear at bottom of staging in t	95.76	total base shear at bottom of staging in t	95.89
number frames resisting shear	9	number frames resisting shear	7
shear per frame in t	10.64	shear per frame in t	13.70
total number of columns in frame	7	total number of columns in frame	9
shear in interior column in t	1.77	shear in interior column in t	1.71
shear in exterior column in t	0.89	shear in exterior column in t	0.86
moment in interior column in tm	3.72	moment in interior column in tm	3.60
moment in exterior column in tm	1.86	moment in exterior column in tm	1.80
over turning base moment M_i^* in tm	178.27	overturning base moment M_i^* in tm	179.51
over turning base moment M_c^* in tm	0	overturning base moment M_c^* in tm	137.72
COLUMN LOAD INTENSITY FOR FOUNDATION DESIGN			
corner column			
top slab length in m	5.15	top slab breadth in m	1.58
top beam breadth in m	0.3	top beam drop in m	0.45
slab loading intensity $T/2$ (live load and finishes)	0.2		
top slab thickness in m	0.15		
column breadth in m	0	column width in m	0.45
columns height in m	2.8		
wall thickness in m	0.25	wall height in m	2.6
wall density in T/m^3	2.5		
water column height in m	2		
floor slab length in m	5.15	floor slab breadth in m	1.58
floor slab thickness in m	0.35		
slab loading intensity $T/2$ (live load and finishes)	0.1		
floor beam breadth in m	0.35	floor beam drop in m	0.625
load on column in T	15.67		
exterior column type-1			
top slab length-1 in m	3.91	top slab cross length in m	5.15
top slab length-2 in m	3.91		
top beam breadth in m	0.3	top beam drop in m	0.45
slab loading intensity $T/2$ (live load and finishes)	0.2		
top slab thickness in m	0.15		
column breadth in m	0	column width in m	0.35
columns height in m	2.8		
wall thickness in m	0.25	wall height in m	2.6

wall density in T/m ³	2.5		
water column height in m	2		
floor slab length-1 in m	3.91	floor slab cross length in m	5.15
floor slab length-2 in m	3.91		
floor slab thickness in m	0.35		
slab loading intensity T ² (live load and finishes)	0.1		
floor beam breadth in m	0.35	floor beam drop in m	0.625
load on column in T	47.83		
exterior column type-2			
top slab length-1 in m	3.91	top slab cross length in m	5.15
top slab length-2 in m	3.68		
top beam breadth in m	0.3	top beam drop in m	0.45
slab loading intensity T ² (live load and finishes)	0.2		
top slab thickness in m	0.15		
column breadth in m	0	column width in m	0.35
columns height in m	2.6		
wall thickness in m	0.25	wall height in m	2.6
wall density in T/m ³	2.5		
water column height in m	2		
floor slab length-1 in m	3.91	floor slab cross length in m	5.15
floor slab length-2 in m	3.68		
floor slab thickness in m	0.35		
slab loading intensity T ² (live load and finishes)	0.1		
floor beam breadth in m	0.35	floor beam drop in m	0.625
load on column in T	46.49		
exterior column type-3			
top slab length-1 in m	3.68	top slab cross length in m	5.15
top slab length-2 in m	3.68		
top beam breadth in m	0.3	top beam drop in m	0.45
slab loading intensity T ² (live load and finishes)	0.2		
top slab thickness in m	0.15		
column breadth in m	0	column width in m	0.35
columns height in m	2.6		
wall thickness in m	0.25	wall height in m	2.6
wall density in T/m ³	2.5		
water column height in m	2		
floor slab length-1 in m	3.68	floor slab cross length in m	5.15
floor slab length-2 in m	3.68		
floor slab thickness in m	0.35		
slab loading intensity T ² (live load and finishes)	0.1		
floor beam breadth in m	0.35	floor beam drop in m	0.625
load on column in T	45.15		

exterior column type-4			
top slab length-1 in m	5.15	top slab cross length in m	1.58
top slab length-2 in m	5.15		
top beam breadth in m	0.3	top beam drop in m	0.45
slab loading intensity T^2 (live load and finishes)	0.2		
top slab thickness in m	0.15		
column breadth in m	0	column width in m	0.35
columns height in m	2.6		
wall thickness in m	0.25	wall height in m	2.6
wall density in T/m^3	2.5		
water column height in m	2		
floor slab length-1 in m	5.15	floor slab cross length in m	1.58
floor slab length-2 in m	5.15		
floor slab thickness in m	0.35		
slab loading intensity T^2 (live load and finishes)	0.1		
floor beam breadth in m	0.35	floor beam drop in m	0.625
load on column in T	28.07		
exterior column type-5			
top slab length-1 in m	1.58	top slab cross length in m	5.15
top slab length-2 in m	3.91		
top beam breadth in m	0.3	top beam drop in m	0.45
slab loading intensity T^2 (live load and finishes)	0.2		
top slab thickness in m	0.15		
column breadth in m	0	column width in m	0.35
columns height in m	2.6		
wall thickness in m	0.25	wall height in m	2.6
wall density in T/m^3	2.5		
water column height in m	2		
floor slab length-1 in m	1.58	floor slab cross length in m	5.15
floor slab length-2 in m	3.91		
floor slab thickness in m	0.35		
slab loading intensity T^2 (live load and finishes)	0.1		
floor beam breadth in m	0.35	floor beam drop in m	0.625
load on column in T	34.26		
interior column type-1			
top slab length-1 in m	3.91	top slab cross length-1 in m	5.15
top slab length-2 in m	3.91	top slab cross length-2 in m	5.15
top beam breadth in m	0.3	top beam drop in m	0.45
slab loading intensity T^2 (live load and finishes)	0.2		
top slab thickness in m	0.15		
column breadth in m	0.35	column width in m	0.35

columns height in m	2.6		
wall thickness in m	0	wall height in m	1.8
wall density in T/m ³	2.5		
water column height in m	2		
floor slab length-1 in m	3.91	floor slab cross length-1 in m	5.15
floor slab length-2 in m	3.91	floor slab cross length-2 in m	5.15
floor slab thickness in m	0.35		
slab loading intensity T ² (live load and finishes)	0.1		
floor beam breadth in m	0.35	floor beam drop in m	0.625
load on column in T	80.29		
interior column type-2			
top slab length-1 in m	3.91	top slab cross length-1 in m	5.15
top slab length-2 in m	3.68	top slab cross length-2 in m	5.15
top beam breadth in m	0.3	top beam drop in m	0.45
slab loading intensity T ² (live load and finishes)	0.2		
top slab thickness in m	0.15		
column breadth in m	0.35	column width in m	0.35
columns height in m	2.6		
wall thickness in m	0	wall height in m	2.6
wall density in T/m ³	2.5		
water column height in m	2		
floor slab length-1 in m	3.91	floor slab cross length-1 in m	5.15
floor slab length-2 in m	3.68	floor slab cross length-2 in m	5.15
floor slab thickness in m	0.35		
slab loading intensity T ² (live load and finishes)	0.1		
floor beam breadth in m	0.35	floor beam drop in m	0.625
load on column in T	78.09		
interior column type-3			
top slab length-1 in m	3.68	top slab cross length-1 in m	5.15
top slab length-2 in m	3.68	top slab cross length-2 in m	5.15
top beam breadth in m	0.3	top beam drop in m	0.45
slab loading intensity T ² (live load and finishes)	0.2		
top slab thickness in m	0.15		
column breadth in m	0.35	column width in m	0.35
columns height in m	2.6		
wall thickness in m	0	wall height in m	2.6
wall density in T/m ³	2.5		
water column height in m	2		
floor slab length-1 in m	3.68	floor slab cross length-1 in m	5.15

floor slab length-2 in m	3.68	floor slab cross length-2 in m	5.15
floor slab thickness in m	0.35		
slab loading intensity T^2 (live load and finishes)	0.1		
floor beam breadth in m	0.35	floor beam drop in m	0.625
load on column in T	75.88		
interior column type-4			
top slab length-1 in m	1.58	top slab cross length-1 in m	5.15
top slab length-2 in m	3.91	top slab cross length-2 in m	5.15
top beam breadth in m	0.3	top beam drop in m	0.45
slab loading intensity T^2 (live load and finishes)	0.2		
top slab thickness in m	0.15		
column breadth in m	0.35	column width in m	0.35
columns height in m	2.6		
wall thickness in m	0	wall height in m	2.6
wall density in T/m^3	2.5		
water column height in m	2		
floor slab length-1 in m	1.58	floor slab cross length-1 in m	5.15
floor slab length-2 in m	3.91	floor slab cross length-2 in m	5.15
floor slab thickness in m	0.35		
slab loading intensity T^2 (live load and finishes)	0.1		
floor beam breadth in m	0.35	floor beam drop in m	0.625
load on column in T	57.96		
column type	load in T	number	total
corner column	15.67	4	62.7
average load in T-corner	15.67		
maximum load in T-corner	15.67		
exterior column-type-1	47.83	4	191.3
exterior column-type-2	46.49	4	186.0
exterior column-type-3	45.15	2	90.3
exterior column-type-4	28.07	10	280.7
exterior column-type-5	34.26	4	137.0
average load in T-exterior	36.89		
maximum load in T-exterior	47.83		
interior column-type-1	80.29	10	802.9
interior column-type-2	78.09	10	780.9
interior column-type-3	75.88	5	379.4
interior column-type-4	57.96	10	579.6
average load in T-interior	72.7		
maximum load in T-interior	80.29		
INTERIOR COLUMNS		EXTERIOR COLUMNS	
axial load in t	80.3	axial load in t	47.8
		axial load in t for corner column	15.7
factored axial load in t	120	factored axial load in t	72

static moment in tm	1.61	static moment in tm	0.96
seismic moment in tm	3.72	seismic moment in tm	1.86
breadth of the column adopted in mm	350	breadth of the column adopted in mm	350
depth of the column adopted in mm	450	depth of the column adopted in mm	450
dia of steel bars 1	25	dia of steel bars 1	25
numbers	8		8
dia of steel bars 2	12	dia of steel bars 2	12
numbers	0		0
total area of steel in mm ²	3927	total area of steel in mm ²	3927
% steel	2.49	% steel	2.49
axial load capacity in t	262.76	axial load capacity in t	262.76
ratio	0.46	ratio	0.27
unsupported length in m	4	unsupported length in m	4
L/d ratio	11.43	L/d ratio	11.43
Pu/fck b d	0.31	Pu/fck b d	0.18
p/fck	0.1	p/fck	0.1
d'/B	0.12	d'/B	0.12
d'/D	0.09	d'/D	0.09
Mu/fck D b ² from chart	0.11		0.15
Mu/fck b D ² from chart	0.125	Mu/fck b D ² from chart	0.15
<i>seismic force in X direction</i>		<i>seismic force in X direction</i>	
Mux1	221484375	Mux1	2.66E+08
Mux	62696085.7	Mux	33157300
Muy1	151593750	Muy1	2.07E+08
Muy	62696085.7	Muy	33157300
Puz in t	299.42	Puz in t	299.42
Pu/Puz	0.4	Pu/Puz	0.24
alfa n	1.33	alfa n	1.07
check	0.50	check	0.25
<i>seismic force in Y direction</i>		<i>seismic force in Y direction</i>	
Mux1	221484375	Mux1	2.66E+08
Mux	62696085.7	Mux	33157300
Muy1	151593750	Muy1	2.07E+08
Muy	62696085.7	Muy	33157300
Puz in t	260.04	Puz in t	260.04
Pu/Puz	0.4	Pu/Puz	0.24
alfa n	1.33	alfa n	1.07
check	0.50	check	0.25

4.10 DESIGN OF CHEMICAL HOUSE

The chemical house has been designed for storage of chemicals like Alum and Lime used for clarification process. The storage time is fixed as three months. Alum and Lime tanks are designed as liquid storage tanks. There are steel silos for storage of Lime and feeding with constant consistency and strength. The dosage of chemicals is to be controlled using sensors also.

4.10.1 UNIT OPERATIONS

ALUM SOLUTION TANK			
number of units	4		
dosage of alum	50	ppm	
requirement for 8 hours	2578.33	kg	
volume of solution at 10% strength/unit	5.8275	m ³	
length of tank	2	m	
breadth of tank	2	m	
liquid depth	1.46	m	
total depth	2	m	
solution flow rate	0.73	m ³ /hour	
LIME SOLUTION TANK			
number of units	4		
dosage of lime	25	ppm	
requirement for 8 hours	1289.17	kg	
volume of solution at 10% strength/unit	2.9725	m ³	
length of tank	2	m	
breadth of tank	2	m	
liquid depth	0.74	m	
total depth	2	m	
solution flow rate	0.37	m ³ /hour	
CHEMICAL STORE			
alum required for 3 months	696149.1	kg	
density of alum	1065	kg/m ³	
volume required	653.66	m ³	
area required at a stacking height of 2 m	326.83	m ²	
assuming 50% circulation space total area	490.25	m ²	
lime required for 3 months	348075.9	kg	
density of lime	1113	kg/m ³	
volume required	312.74	m ³	
area required at a stacking height of 2 m	156.37	m ²	
assuming 50% circulation space total area	234.56	m ²	

4.10.2 STRUCTURAL DESIGN

TYPICAL PORCH SLAB			
assumed thickness in m	0.15		
long span in m	6.8		
short span in m	4.52		
live load in t/m ²	0.15		
finishes in t/m ²	0.05		
total load in t/m ²	0.575		
Ly/Lx	1.50		
condition as per IS: 456 (2000)	two adjacent edges discontinuous		
M _x -	0.089	moment in tm	1.05
M _x +	0.056	moment in tm	0.66
M _y -	0.047	moment in tm	0.55

My+	0.035	moment in tm	0.41
design moment	1.05	non-crack depth in mm	184
		cracked section	97.3
fix depth of roof slab in mm	150	effective depth in mm	120
Ast for negative moment in mm ²	423		
Ast for positive moment in mm ²	269		
minimum steel area in mm ²	225		
fix dia for top steel	10	spacing	125
fix dia for bottom steel	10	spacing	125
area of steel given in mm ²	top	628.32	0.42
	bottom	628.32	0.42
L/d ratio	37.67		
fs	103.05		
modification factor	2	OK	
moment of resistance of section in ws	1.24	tm	
moment of resistance of section in LS	2.65	tm	
TYPICAL ROOF BEAM-INTERIOR			
loading on slab in T/m ²	0.575		
breadth in m	0.35		
total depth in m	0.75		
span in m	6.8		
span in m left	4.52		
span in m right	4.52		
loading intensity in t/m-bending moment	2.825		
loading intensity in t/m-for column loads	2.391		
fix breadth of beam in mm	350		
design moment for trial in tm	14.52		
cracked effective depth in mm	611.25		
depth for trial in mm	750		
static moment	14.52		
seismic moment	4.79		
design moment in tm	23.17		
cracked effective depth in mm	704.98		
effective depth at limit state in mm	437.41		
fix total depth in mm	750		
Ast for negative moment			
Mdes -ve in tm (LSM)	23.17		
Mdes -ve in tm (WSM)	19.31		
steel at top		steel at bottom	
dia of steel bar 1 in mm	20	dia of steel bar 1 in mm	20
numbers	3	numbers	3
dia of steel bar 2 in mm	20	dia of steel bar 2 in mm	20

numbers	0	numbers	0
area provided in mm ² -at top	942.48	area provided in mm ² -at bottom	942.48
M- resistance of section in tm	7.84		
M- resistance of section at limit state	17.2		
Ast for positive moment			
Mdes +ve in tm	16.33		
steel at bottom		steel at top	
dia of steel bar 1	16	dia of steel bar 1	16
numbers	4	numbers	2
dia of steel bar 2	20	dia of steel bar 2	20
numbers	0	numbers	0
area provided in mm ² -at bottom	804.25	area provided in mm ² -at top	402.12
M- resistance of section	7.84		
M- resistance of section at limit state	17.2		
shear force in T	11.53		
shear stress in Mpa	0.46		
area of tension reinforcement	0.38		
allowable shear stress in Mpa	0.28		
number of legs	2		
diameter of shear bars in mm	8		
spacing of shear reinforcement in mm	371		
fix spacing in mm	200	fix spacing at joints for 2d	100
TYPICAL ROOF BEAM-EXTERIOR			
loading on slab in T/m ²	0.575		
breadth in m	0.35		
total depth in m	0.75		
span in m	4.52		
span in m left	6.8		
span in m right	0		
loading intensity in t/m-bending moment	1.262		
loading intensity in t/m-for column loads	1.141		
fix breadth of beam in mm	350		
design moment for trial in tm	2.58		
cracked effective depth in mm	257.59		
depth for trial in mm	750		
static moment	2.58		
seismic moment	0.85		
torsional moment/m from slab in Tm	1.05		
moment in beam from torsion in Tm	8.77		

design moment in tm	14.64		
cracked effective depth in mm	560.38		
effective depth at limit state in mm	347.7		
fix total depth in mm	750		
Ast for negative moment			
Mdes -ve in tm (LSM)	14.64		
Mdes -ve in tm (WSM)	12.20		
steel at top		steel at bottom	
dia of steel bar 1 in mm	20	dia of steel bar 1 in mm	20
numbers	3	numbers	3
dia of steel bar 2 in mm	20	dia of steel bar 2 in mm	20
numbers	0	numbers	0
area provided in mm2-at top	942.48	area provided in mm2-at bottom	942.48
M- resistance of section in tm	14.1		
M- resistance of section at limit state	27.2		
Ast for positive moment			
Mdes +ve in tm	12.00		
steel at bottom		steel at top	
dia of steel bar 1	16	dia of steel bar 1	16
numbers	4	numbers	2
dia of steel bar 2	20	dia of steel bar 2	20
numbers	0	numbers	0
area provided in mm2-at bottom	804.25	area provided in mm2-at top	402.12
M- resistance of section	14.1		
M- resistance of section at limit state	27.2		
shear from torsion in T	21.70		
shear force in T	25.12		
shear stress in Mpa	1.00		
area of tension reinforcement	0.38		
allowable shear stress in Mpa	0.28		
number of legs	2		
diameter of shear bars in mm	10		
spacing of shear reinforcement in mm	144		
fix spacing in mm	140	fix spacing at joints for 2d	100
TYPICAL ROOF SLAB			
assumed thickness in m	0.15		
long span in m	4.75		
short span in m	3.8		
live load in t/m ²	0.15		
finishes in t/m ²	0.05		
total load in t/m ²	0.575		

Ly/Lx	1.25		
condition as per IS: 456 (2000)	two adjacent edges discontinuous		
Mx-	0.06	moment in tm	0.5
Mx+	0.045	moment in tm	0.37
My-	0.047	moment in tm	0.39
My+	0.035	moment in tm	0.29
design moment	0.5	non-crack depth in mm	127
		cracked section	67.1
fix depth of roof slab in mm	150	effective depth in mm	120
Ast for negative moment in mm ²	201		
Ast for positive moment in mm ²	151		
minimum steel area in mm ²	225		
fix dia for top steel	8	spacing	200
fix dia for bottom steel	8	spacing	200
area of steel given in mm ²	top	251.33	0.17
	bottom	251.33	0.17
L/d ratio	31.67		
fs	144.61		
modification factor	2	OK	
moment of resistance of section in ws	0.52	tm	
moment of resistance of section in LS	1.05	tm	
TYPICAL ROOF BEAM-INTERIOR			
loading on slab in T/m ²	0.575		
breadth in m	0.35		
total depth in m	0.60		
span in m	4.75		
span in m left	3.8		
span in m right	3.8		
loading intensity in t/m-bending moment	2.164		
loading intensity in t/m-for column loads	1.836		
fix breadth of beam in mm	350		
design moment for trial in tm	5.42		
cracked effective depth in mm	373.66		
depth for trial in mm	600		
static moment	5.42		
seismic moment	1.79		
design moment in tm	8.66		
cracked effective depth in mm	431		
effective depth at limit state in mm	267.42		
fix total depth in mm	600		
Ast for negative moment			
Mdes -ve in tm (LSM)	8.66		
Mdes -ve in tm (WSM)	7.22		
steel at top		steel at bottom	
dia of steel bar 1 in mm	16	dia of steel bar 1 in mm	16
numbers	4	numbers	2

dia of steel bar 2 in mm	20	dia of steel bar 2 in mm	20
numbers	0	numbers	0
area provided in mm ² -at top	804.25	area provided in mm ² -at bottom	402.12
M- resistance of section in tm	7.84		
M- resistance of section at limit state	17.2		
Ast for positive moment			
Mdes +ve in tm	6.10		
steel at bottom		steel at top	
dia of steel bar 1	16	dia of steel bar 1	16
numbers	4	numbers	2
dia of steel bar 2	20	dia of steel bar 2	20
numbers	0	numbers	0
area provided in mm ² -at bottom	804.25	area provided in mm ² -at top	402.12
M- resistance of section	7.84		
M- resistance of section at limit state	17.2		
shear force in T	6.17		
shear stress in Mpa	0.31		
area of tension reinforcement	0.41		
allowable shear stress in Mpa	0.28		
number of legs	2		
diameter of shear bars in mm	8		
spacing of shear reinforcement in mm	2102		
fix spacing in mm	200	fix spacing at joints for 2d	100
TYPICAL ROOF BEAM-EXTERIOR			
loading on slab in T/m ²	0.575		
breadth in m	0.35		
total depth in m	0.6		
span in m	4.75		
span in m left	3.8		
span in m right	0		
loading intensity in t/m-bending moment	1.344		
loading intensity in t/m-for column loads	1.181		
fix breadth of beam in mm	350		
design moment for trial in tm	3.03		
cracked effective depth in mm	279.42		
depth for trial in mm	600		
static moment	3.03		
seismic moment	1.00		
torsional moment/m from slab in Tm	0.52		
moment in beam from torsion in Tm	3.94		
design moment in tm	9.57		
cracked effective depth in mm	453.07		

effective depth at limit state in mm	281.11		
fix total depth in mm	600		
Ast for negative moment			
Mdes -ve in tm (LSM)	9.57		
Mdes -ve in tm (WSM)	7.98		
steel at top		steel at bottom	
dia of steel bar 1 in mm	16	dia of steel bar 1 in mm	16
numbers	4	numbers	2
dia of steel bar 2 in mm	20	dia of steel bar 2 in mm	20
numbers	0	numbers	0
area provided in mm2-at top	804.25	area provided in mm2-at bottom	402.12
M- resistance of section in tm	7.84		
M- resistance of section at limit state	17.2		
Ast for positive moment			
Mdes +ve in tm	7.74		
steel at bottom		steel at top	
dia of steel bar 1	16	dia of steel bar 1	16
numbers	4	numbers	2
dia of steel bar 2	20	dia of steel bar 2	20
numbers	0	numbers	0
area provided in mm2-at bottom	804.25	area provided in mm2-at top	402.12
M- resistance of section	7.84		
M- resistance of section at limit state	17.2		
shear from torsion in T	11.29		
shear force in T	15.12		
shear stress in Mpa	0.76		
area of tension reinforcement	0.41		
allowable shear stress in Mpa	0.28		
number of legs	2		
diameter of shear bars in mm	8		
spacing of shear reinforcement in mm	137		
fix spacing in mm	100	fix spacing at joints for 2d	100

TYPICAL FLOOR SLAB-LIGHT STORAGE-FF

assumed thickness in m	0.18		
long span in m	4.75		
short span in m	3.8		
live load in t/m ²	1		
finishes in t/m ²	0.1		
total load in t/m ²	1.55		
Ly/Lx	1.25		
condition as per IS: 456 (2000)	two adjacent edges discontinuous		
Mx-	0.062	moment in tm	1.39

Mx+	0.047	moment in tm	1.05
My-	0.047	moment in tm	1.05
My+	0.035	moment in tm	0.78
design moment	1.39	non-crack depth in mm	211.8
		cracked section	111.9
fix depth of floor slab in mm	180	effective depth in mm	150
Ast for negative moment in mm ²	542		
Ast for positive moment in mm ²	342		
minimum steel area in mm ²	270		
fix dia for top steel	10	spacing	150
fix dia for bottom steel	10	spacing	150
area of steel given in mm ²	top	523.60	0.29
	bottom	523.60	0.29
L/d ratio	25.33		
fs	157.22		
modification factor	2	OK	
moment of resistance of section in ws	1.59	tm	
moment of resistance of section in LS	2.8	tm	
TYPICAL INTERIOR FLOOR BEAM-LIGHT STORAGE-FF			
loading on slab in T/m ²	1.55		
wall thickness in m	0.2		
wall height in m	3.6		
wall material density in T/m ³	2		
breadth in m	0.35		
total depth in m	0.78		
span in m	4.75		
span in m left	3.8		
span in m right	3.8		
loading intensity in t/m-bending moment	6.38		
loading intensity in t/m-for column loads	5.50		
fix breadth of beam in mm	350		
design moment for trial in tm	16.00		
cracked effective depth in mm	641.76		
depth for trial in mm	780		
static moment	16.00		
seismic moment	5.28		
design moment in tm	25.54		
cracked effective depth in mm	740.16		
effective depth at limit state in mm	459.24		
fix total depth in mm	780		
Ast for negative moment			
Mdes -ve in tm (LSM)	25.54		
Mdes -ve in tm (WSM)	21.28		
steel at top		steel at bottom	
dia of steel bar 1 in mm	25	dia of steel bar 1 in mm	25
numbers	4	numbers	2

dia of steel bar 2 in mm	20	dia of steel bar 2 in mm	20
numbers	0	numbers	0
area provided in mm ² -at top	1963.5	area provided in mm ² -at bottom	981.75
M- resistance of section in tm	29.8		
M- resistance of section at limit state	52.5		
Ast for positive moment			
Mdes +ve in tm	18.00		
steel at bottom		steel at top	
dia of steel bar 1	25	dia of steel bar 1	25
numbers	3	numbers	2
dia of steel bar 2	20	dia of steel bar 2	16
numbers	0	numbers	1
area provided in mm ² -at bottom	1472.63	area provided in mm ² -at top	1182.81
M- resistance of section	22.6		
M- resistance of section at limit state	41		
shear force in T	18.19		
shear stress in Mpa	0.69		
area of tension reinforcement	0.76		
allowable shear stress in Mpa	0.28		
number of legs	2		
diameter of shear bars in mm	10		
spacing of shear reinforcement in mm	250		
fix spacing in mm	200	fix spacing at joints for 2d	100
TYPICAL FLOOR BEAM-EXTERIOR-LIGHT STORAGE-FF			
loading on slab in T/m ²	1.55		
wall thickness in m	0.2		
wall height in m	3.6		
wall material density in T/m ³	2		
breadth in m	0.35		
total depth in m	0.78		
span in m	4.75		
span in m left	3.8		
span in m right	0		
loading intensity in t/m-bending moment	4.17		
loading intensity in t/m-for column loads	3.73		
fix breadth of beam in mm	350		
design moment for trial in tm	9.42		
cracked effective depth in mm	492.34		
depth for trial in mm	780		
static moment	9.42		
seismic moment	0.94		
torsional moment/m from slab in Tm	1.39		
moment in beam from torsion in	12.54		

Tm			
design moment in tm	27.48		
cracked effective depth in mm	767.75		
effective depth at limit state in mm	476.36		
fix total depth in mm	780		
Ast for negative moment			
Mdes -ve in tm (LSM)	27.48		
Mdes -ve in tm (WSM)	22.90		
steel at top		steel at bottom	
dia of steel bar 1 in mm	25	dia of steel bar 1 in mm	25
numbers	4	numbers	2
dia of steel bar 2 in mm	20	dia of steel bar 2 in mm	20
numbers	1	numbers	0
area provided in mm2-at top	2277.66	area provided in mm2-at bottom	981.75
M- resistance of section in tm	29.8		
M- resistance of section at limit state	52.5		
Ast for positive moment			
Mdes +ve in tm	24.31		
steel at bottom		steel at top	
dia of steel bar 1	25	dia of steel bar 1	25
numbers	4	numbers	2
dia of steel bar 2	20	dia of steel bar 2	20
numbers	0	numbers	0
area provided in mm2-at bottom	1963.5	area provided in mm2-at top	981.75
M- resistance of section	29.8		
M- resistance of section at limit state	52.5		
shear from torsion in T	30.18		
shear force in T	42.08		
shear stress in Mpa	1.60		
area of tension reinforcement	0.89		
allowable shear stress in Mpa	0.39		
number of legs	2		
diameter of shear bars in mm	10		
spacing of shear reinforcement in mm	85		
fix spacing in mm	85	fix spacing at joints for 2d	100
TYPICAL INTERIOR FLOOR TIE-BEAM-HEAVY STORAGE-GF			
loading on slab in T/m ²	0	(transmitted to ground)	
wall thickness in m	0.2		
wall height in m	3.6		
wall material density in T/m ³	2		
breadth in m	0.35		
total depth in m	0.60		
span in m	4.75		
span in m left	3.8		
span in m right	3.8		

loading intensity in t/m-bending moment	1.97		
loading intensity in t/m-for column loads	1.97		
fix breadth of beam in mm	350		
design moment for trial in tm	4.93		
cracked effective depth in mm	356.09		
depth for trial in mm	600		
static moment	4.93		
seismic moment	4.00		
design moment in tm	10.71		
cracked effective depth in mm	479.3		
effective depth at limit state in mm	297.39		
fix total depth in mm	600		
Ast for negative moment			
Mdes -ve in tm (LSM)	10.71		
Mdes -ve in tm (WSM)	8.93		
steel at top		steel at bottom	
dia of steel bar 1 in mm	20	dia of steel bar 1 in mm	20
numbers	3	numbers	2
dia of steel bar 2 in mm	20	dia of steel bar 2 in mm	20
numbers	0	numbers	0
area provided in mm2-at top	942.48	area provided in mm2-at bottom	628.32
M- resistance of section in tm	10.9		
M- resistance of section at limit state	20		
Ast for positive moment			
Mdes +ve in tm	5.54		
steel at bottom		steel at top	
dia of steel bar 1	20	dia of steel bar 1	20
numbers	3	numbers	2
dia of steel bar 2	20	dia of steel bar 2	16
numbers	0	numbers	1
area provided in mm2-at bottom	942.48	area provided in mm2-at top	829.38
M- resistance of section	10.9		
M- resistance of section at limit state	20		
shear force in T	5.60		
shear stress in Mpa	0.28		
area of tension reinforcement	0.49		
allowable shear stress in Mpa	0.31		
number of legs	2		
diameter of shear bars in mm	8		
spacing of shear reinforcement in mm	-2431		
fix spacing in mm	200	fix spacing at joints for 2d	100
TYPICAL EXTERIOR FLOOR TIE-BEAM-HEAVY STORAGE-GF			
loading on slab in T/m ²	0	(transmitted to ground)	

wall thickness in m	0.2		
wall height in m	3.6		
wall material density in T/m ³	2		
breadth in m	0.35		
total depth in m	0.6		
span in m	4.75		
span in m left	3.8		
span in m right	0		
loading intensity in t/m-bending moment	1.97		
loading intensity in t/m-for column loads	1.97		
fix breadth of beam in mm	350		
design moment for trial in tm	4.43		
cracked effective depth in mm	337.82		
depth for trial in mm	600		
static moment	4.43		
seismic moment	4.00		
torsional moment/m from slab in Tm	0.00		
moment in beam from torsion in Tm	0.00		
design moment in tm	10.12		
cracked effective depth in mm	465.91		
effective depth at limit state in mm	289.08		
fix total depth in mm	600		
Ast for negative moment			
Mdes -ve in tm (LSM)	10.12		
Mdes -ve in tm (WSM)	8.43		
steel at top		steel at bottom	
dia of steel bar 1 in mm	20	dia of steel bar 1 in mm	20
numbers	3	numbers	2
dia of steel bar 2 in mm	20	dia of steel bar 2 in mm	20
numbers	0	numbers	0
area provided in mm2-at top	942.48	area provided in mm2-at bottom	628.32
M- resistance of section in tm	10.9		
M- resistance of section at limit state	20		
Ast for positive moment			
Mdes +ve in tm	5.54		
steel at bottom		steel at top	
dia of steel bar 1	20	dia of steel bar 1	20
numbers	3	numbers	2
dia of steel bar 2	20	dia of steel bar 2	20
numbers	0	numbers	0
area provided in mm2-at bottom	942.48	area provided in mm2-at top	628.32
M- resistance of section	10.9		
M- resistance of section at limit state	20		

shear from torsion in T	0.00		
shear force in T	5.60		
shear stress in Mpa	0.28		
area of tension reinforcement	0.49		
allowable shear stress in Mpa	0.39		
number of legs	2		
diameter of shear bars in mm	8		
spacing of shear reinforcement in mm	-616		
fix spacing in mm	200	fix spacing at joints for 2d	100
COLUMN LOAD INTENSITY FOR FOUNDATION DESIGN-FF			
corner column			
top slab length in m	4.75	top slab breadth in m	3.8
top beam breadth in m	0.35	top beam drop in m	0.45
slab loading intensity T^2 (live load and finishes)	0.2		
top slab thickness in m	0.15		
column breadth in m	0.45	column width in m	0.45
columns height in m	3.75		
wall thickness in m	0.2	wall height in m	3.75
wall density in T/m^3	2		
water column height in m	0		
floor slab length in m	4.75	floor slab breadth in m	3.8
floor slab thickness in m	0.18		
slab loading intensity T^2 (live load and finishes)	1.1		
floor beam breadth in m	0.35	floor beam drop in m	0.6
load on column in T	21.83		
exterior column type-1			
top slab length-1 in m	4.75	top slab cross length in m	3.8
top slab length-2 in m	4.75		
top beam breadth in m	0.35	top beam drop in m	0.45
slab loading intensity T^2 (live load and finishes)	0.2		
top slab thickness in m	0.15		
column breadth in m	0.45	column width in m	0.45
columns height in m	3.75		
wall thickness in m	0.2	wall height in m	3.75
wall density in T/m^3	2		
water column height in m	0		
floor slab length-1 in m	4.75	floor slab cross length in m	3.8
floor slab length-2 in m	4.75		
floor slab thickness in m	0.18		
slab loading intensity T^2 (live load and finishes)	1.1		
floor beam breadth in m	0.35	floor beam drop in m	0.6
load on column in T	37.16		
exterior column type-2			
top slab length-1 in m	4.75	top slab cross length in	3.8

		m	
top slab length-2 in m	4.52		
top beam breadth in m	0.35	top beam drop in m	0.45
slab loading intensity T^2 (live load and finishes)	0.2		
top slab thickness in m	0.15		
column breadth in m	0.45	column width in m	0.45
columns height in m	3.75		
wall thickness in m	0.2	wall height in m	3.75
wall density in T/m^3	2		
water column height in m	0		
floor slab length-1 in m	4.75	floor slab cross length in m	3.8
floor slab length-2 in m	4.52		
floor slab thickness in m	0.18		
slab loading intensity T^2 (live load and finishes)	1.1		
floor beam breadth in m	0.35	floor beam drop in m	0.6
load on column in T	36.42		
exterior column type-3			
top slab length-1 in m	4.52	top slab cross length in m	3.8
top slab length-2 in m	4.52		
top beam breadth in m	0.35	top beam drop in m	0.45
slab loading intensity T^2 (live load and finishes)	0.2		
top slab thickness in m	0.15		
column breadth in m	0.45	column width in m	0.45
columns height in m	3.75		
wall thickness in m	0.2	wall height in m	3.75
wall density in T/m^3	2.5		
water column height in m	0		
floor slab length-1 in m	4.52		3.8
floor slab length-2 in m	4.52		
floor slab thickness in m	0.18		
slab loading intensity T^2 (live load and finishes)	1.1		
floor beam breadth in m	0.35	floor beam drop in m	0.6
load on column in T	38.08		
exterior column type-4			
top slab length-1 in m	3.8	top slab cross length in m	4.75
top slab length-2 in m	3.8		
top beam breadth in m	0.35	top beam drop in m	0.45
slab loading intensity T^2 (live load and finishes)	0.2		
top slab thickness in m	0.15		
column breadth in m	0.45	column width in m	0.45
columns height in m	3.75		
wall thickness in m	0.2	wall height in m	3.75
wall density in T/m^3	2		
water column height in m	0		

floor slab length-1 in m	3.8	floor slab cross length in m	4.75
floor slab length-2 in m	3.8		
floor slab thickness in m	0.18		
slab loading intensity T^2 (live load and finishes)	1.1		
floor beam breadth in m	0.35	floor beam drop in m	0.6
load on column in T	36.01		
interior column type-1			
top slab length-1 in m	4.75	top slab cross length-1 in m	3.8
top slab length-2 in m	4.75	top slab cross length-2 in m	3.8
top beam breadth in m	0.35	top beam drop in m	0.45
slab loading intensity T^2 (live load and finishes)	0.2		
top slab thickness in m	0.15		
column breadth in m	0.45	column width in m	0.45
columns height in m	3.75		
wall thickness in m	0.2	wall height in m	3.75
wall density in T/m^3	2		
water column height in m	0		
floor slab length-1 in m	4.75	floor slab cross length-1 in m	3.8
floor slab length-2 in m	4.75	floor slab cross length-2 in m	3.8
floor slab thickness in m	0.18		
slab loading intensity T^2 (live load and finishes)	1.1		
floor beam breadth in m	0.35	floor beam drop in m	0.6
load on column in T	60.94		
interior column type-2			
top slab length-1 in m	4.75	top slab cross length-1 in m	3.8
top slab length-2 in m	4.52	top slab cross length-2 in m	3.8
top beam breadth in m	0.35	top beam drop in m	0.45
slab loading intensity T^2 (live load and finishes)	0.2		
top slab thickness in m	0.15		
column breadth in m	0.45	column width in m	0.45
columns height in m	3.75		
wall thickness in m	0.2	wall height in m	2
wall density in T/m^3	2		
water column height in m	0		
floor slab length-1 in m	4.75	floor slab cross length-1 in m	3.8
floor slab length-2 in m	4.52	floor slab cross length-2 in m	3.8
floor slab thickness in m	0.18		
slab loading intensity T^2 (live load and finishes)	1.1		
floor beam breadth in m	0.35	floor beam drop in m	0.6

load on column in T	53.82		
interior column type-3			
top slab length-1 in m	4.52	top slab cross length-1 in m	3.8
top slab length-2 in m	4.52	top slab cross length-2 in m	3.8
top beam breadth in m	0.35	top beam drop in m	0.45
slab loading intensity T/m ² (live load and finishes)	0.2		
top slab thickness in m	0.15		
column breadth in m	0.45	column width in m	0.45
columns height in m	3.75		
wall thickness in m	0.2	wall height in m	3.75
wall density in T/m ³	2		
water column height in m	0		
floor slab length-1 in m	4.52	floor slab cross length-1 in m	3.8
floor slab length-2 in m	4.52	floor slab cross length-2 in m	3.8
floor slab thickness in m	0.18		
slab loading intensity T ² (live load and finishes)	1.1		
floor beam breadth in m	0.35	floor beam drop in m	0.6
load on column in T	58.52		
column type	load in T	number	total
corner column	21.83	4	87.3
average load in T-corner	21.83		
maximum load in T-corner	21.83		
exterior column-type-1	37.16	4	148.6
exterior column-type-2	36.42	4	145.7
exterior column-type-3	38.08	4	152.3
exterior column-type-4	36.01	4	144.0
average load in T-exterior	36.92		
maximum load in T-exterior	38.08		
interior column-type-1	60.94	4	243.7
interior column-type-2	53.82	4	215.3
interior column-type-3	58.52	4	234.1
average load in T-interior	57.8		
maximum load in T-interior	60.94		
INTERIOR COLUMNS		EXTERIOR COLUMN	
axial load in t	60.9	axial load in t	38.1
		axial load in t for corner column	21.8
factored axial load in t	91	factored axial load in t	57
static moment in tm	1.22	static moment in tm	0.76
seismic moment in tm	4.50	seismic moment in tm	2.25
breadth of the column adopted in mm	450	breadth of the column adopted in mm	450
depth of the column adopted in mm	450	depth of the column adopted in mm	450
dia of steel bars 1	25	dia of steel bars 1	25
numbers	8		8

dia of steel bars 2	12	dia of steel bars 2	12
numbers	0		0
total area of steel in mm ²	3927	total area of steel in mm ²	3927
% steel	1.94	% steel	1.94
axial load capacity in t	307.76	axial load capacity in t	307.76
ratio	0.3	ratio	0.19
unsupported length in m	3.75	unsupported length in m	3.75
L/d ratio	8.33	L/d ratio	8.33
Pu/fck b d	0.18	Pu/fck b d	0.11
p/fck	0.078	p/fck	0.078
d'/B	0.09	d'/B	0.09
d'/D	0.09	d'/D	0.09
Mu/fck D b ² from chart	0.13		0.125
Mu/fck b D ² from chart	0.13	Mu/fck b D ² from chart	0.125
<i>seismic force in X direction</i>		<i>seismic force in X direction</i>	
Mux l	296156250	Mux l	284765625
Mux	67320536.4	Mux	35453452.82
Muy l	296156250	Muy l	284765625
Muy	67320536.4	Muy	35453452.82
Puz in t	350.04	Puz in t	350.04
Pu/Puz	0.26	Pu/Puz	0.16
alfa n	1.1	alfa n	1.00
check	0.39	check	0.25
<i>seismic force in Y direction</i>		<i>seismic force in Y direction</i>	
Mux l	296156250	Mux l	284765625
Mux	67320536.4	Mux	35453452.82
Muy l	296156250	Muy l	284765625
Muy	67320536.4	Muy	35453452.82
Puz in t	350.04	Puz in t	350.04
Pu/Puz	0.26	Pu/Puz	0.16
alfa n	1.1	alfa n	1
check	0.39	check	0.25
COLUMN LOAD INTENSITY FOR FOUNDATION DESIGN-GF			
corner column			
top slab length in m	4.75	top slab breadth in m	3.8
top beam breadth in m	0	top beam drop in m	0.45
slab loading intensity T ² (live load and finishes)	0		
top slab thickness in m	0		
column breadth in m	0.45	column width in m	0.45
columns height in m	3.75		
wall thickness in m	0.2	wall height in m	3.75
wall density in T/m ³	2		
water column height in m	0		
floor slab length in m	4.75	floor slab breadth in m	3.8
floor slab thickness in m	0		
slab loading intensity T ² (live load and finishes)	0		

floor beam breadth in m	0.35	floor beam drop in m	0.6
load on column in T	10.56		
exterior column type-1			
top slab length-1 in m	4.75	top slab cross length in m	3.8
top slab length-2 in m	4.75		
top beam breadth in m	0	top beam drop in m	0.45
slab loading intensity T^2 (live load and finishes)	0		
top slab thickness in m	0		
column breadth in m	0.45	column width in m	0.45
columns height in m	3.75		
wall thickness in m	0.2	wall height in m	3.75
wall density in T/m^3	2		
water column height in m	0		
floor slab length-1 in m	4.75	floor slab cross length in m	3.8
floor slab length-2 in m	4.75		
floor slab thickness in m	0		
slab loading intensity T^2 (live load and finishes)	0		
floor beam breadth in m	0.35	floor beam drop in m	0.6
load on column in T	15.36		
exterior column type-2			
top slab length-1 in m	4.75	top slab cross length in m	3.8
top slab length-2 in m	4.52		
top beam breadth in m	0	top beam drop in m	0.45
slab loading intensity T^2 (live load and finishes)	0		
top slab thickness in m	0		
column breadth in m	0.45	column width in m	0.45
columns height in m	3.75		
wall thickness in m	0.2	wall height in m	3.75
wall density in T/m^3	2		
water column height in m	0		
floor slab length-1 in m	4.75	floor slab cross length in m	3.8
floor slab length-2 in m	4.52		
floor slab thickness in m	0		
slab loading intensity T^2 (live load and finishes)	0		
floor beam breadth in m	0.35	floor beam drop in m	0.6
load on column in T	15.13		
exterior column type-3			
top slab length-1 in m	4.52	top slab cross length in m	3.8
top slab length-2 in m	4.52		
top beam breadth in m	0	top beam drop in m	0.45
slab loading intensity T^2 (live load and finishes)	0		
top slab thickness in m	0		

column breadth in m	0.45	column width in m	0.45
columns height in m	3.75		
wall thickness in m	0.2	wall height in m	3.75
wall density in T/m ³	2.5		
water column height in m	0		
floor slab length-1 in m	4.52		3.8
floor slab length-2 in m	4.52		
floor slab thickness in m	0		
slab loading intensity T/2 (live load and finishes)	0		
floor beam breadth in m	0.35	floor beam drop in m	0.6
load on column in T	17.31		
exterior column type-4			
top slab length-1 in m	3.8	top slab cross length in m	4.75
top slab length-2 in m	3.8		
top beam breadth in m	0	top beam drop in m	0.45
slab loading intensity T/2 (live load and finishes)	0		
top slab thickness in m	0		
column breadth in m	0.45	column width in m	0.45
columns height in m	3.75		
wall thickness in m	0.2	wall height in m	3.75
wall density in T/m ³	2		
water column height in m	0		
floor slab length-1 in m	3.8	floor slab cross length in m	4.75
floor slab length-2 in m	3.8		
floor slab thickness in m	0		
slab loading intensity T/2 (live load and finishes)	0		
floor beam breadth in m	0.35	floor beam drop in m	0.6
load on column in T	14.40		
interior column type-1			
top slab length-1 in m	4.75	top slab cross length-1 in m	3.8
top slab length-2 in m	4.75	top slab cross length-2 in m	3.8
top beam breadth in m	0	top beam drop in m	0.45
slab loading intensity T/2 (live load and finishes)	0		
top slab thickness in m	0		
column breadth in m	0.45	column width in m	0.45
columns height in m	3.75		
wall thickness in m	0.2	wall height in m	3.75
wall density in T/m ³	2		
water column height in m	0		
floor slab length-1 in m	4.75	floor slab cross length-1 in m	3.8
floor slab length-2 in m	4.75	floor slab cross length-2 in m	3.8
floor slab thickness in m	0		

slab loading intensity $T/2$ (live load and finishes)	0		
floor beam breadth in m	0.35	floor beam drop in m	0.6
load on column in T	19.21		
interior column type-2			
top slab length-1 in m	4.75	top slab cross length-1 in m	3.8
top slab length-2 in m	4.52	top slab cross length-2 in m	3.8
top beam breadth in m	0	top beam drop in m	0.45
slab loading intensity $T/2$ (live load and finishes)	0		
top slab thickness in m	0		
column breadth in m	0.45	column width in m	0.45
columns height in m	3.75		
wall thickness in m	0.2	wall height in m	2
wall density in T/m^3	2		
water column height in m	0		
floor slab length-1 in m	4.75	floor slab cross length-1 in m	3.8
floor slab length-2 in m	4.52	floor slab cross length-2 in m	3.8
floor slab thickness in m	0		
slab loading intensity $T/2$ (live load and finishes)	0		
floor beam breadth in m	0.35	floor beam drop in m	0.6
load on column in T	13.07		
interior column type-3			
top slab length-1 in m	4.52	top slab cross length-1 in m	3.8
top slab length-2 in m	4.52	top slab cross length-2 in m	3.8
top beam breadth in m	0	top beam drop in m	0.45
slab loading intensity T/m^2 (live load and finishes)	0		
top slab thickness in m	0		
column breadth in m	0.45	column width in m	0.45
columns height in m	3.75		
wall thickness in m	0.2	wall height in m	3.75
wall density in T/m^3	2		
water column height in m	0		
floor slab length-1 in m	4.52	floor slab cross length-1 in m	3.8
floor slab length-2 in m	4.52	floor slab cross length-2 in m	3.8
floor slab thickness in m	0		
slab loading intensity $T/2$ (live load and finishes)	0		
floor beam breadth in m	0.35	floor beam drop in m	0.6
load on column in T	18.75		
column type	load in T	number	total
corner column	10.56	4	42.2
average load in T-corner	10.56		

maximum load in T-corner	10.56		
exterior column-type-1	15.36	4	61.5
exterior column-type-2	15.13	4	60.5
exterior column-type-3	17.31	4	69.2
exterior column-type-4	14.40	4	57.6
average load in T-exterior	15.55		
maximum load in T-exterior	17.31		
interior column-type-1	19.21	4	76.8
interior column-type-2	13.07	4	52.3
interior column-type-3	18.75	4	75.0
average load in T-interior	17.0		
maximum load in T-interior	19.21		
INTERIOR COLUMNS		EXTERIOR COLUMNS	
axial load in t	80.1	axial load in t	55.4
		axial load in t for corner column	32.4
factored axial load in t	120	factored axial load in t	83
static moment in tm	1.60	static moment in tm	1.11
seismic moment in tm	4.50	seismic moment in tm	2.25
breadth of the column adopted in mm	450	breadth of the column adopted in mm	450
depth of the column adopted in mm	450	depth of the column adopted in mm	450
dia of steel bars 1	25	dia of steel bars 1	25
numbers	8		8
dia of steel bars 2	12	dia of steel bars 2	12
numbers	0		0
total area of steel in mm ²	3927	total area of steel in mm ²	3927
% steel	1.94	% steel	1.94
axial load capacity in t	307.76	axial load capacity in t	307.76
ratio	0.39	ratio	0.27
unsupported length in m	3.75	unsupported length in m	3.75
L/d ratio	8.33	L/d ratio	8.33
Pu/fck b d	0.24	Pu/fck b d	0.16
p/fck	0.078	p/fck	0.078
d'/B	0.09	d'/B	0.09
d'/D	0.09	d'/D	0.09
Mu/fck D b ² from chart	0.1		0.13
Mu/fck b D ² from chart	0.1	Mu/fck b D ² from chart	0.13
<i>seismic force in X direction</i>		<i>seismic force in X direction</i>	
Mux l	227812500	Mux l	296156250
Mux	71843853.83	Mux	39528080.46
Muy l	227812500	Muy l	296156250
Muy	71843853.83	Muy	39528080.46
Puz in t	350.04	Puz in t	350.04
Pu/Puz	0.34	Pu/Puz	0.24
alfa n	1.23	alfa n	1.07
check	0.48	check	0.23
<i>seismic force in Y direction</i>		<i>seismic force in Y</i>	

		<i>direction</i>	
Mux l	227812500	Mux l	296156250
Mux	71843853.83	Mux	39528080.46
Muy l	227812500	Muy l	296156250
Muy	71843853.83	Muy	39528080.46
Puz in t	350.04	Puz in t	350.04
Pu/Puz	0.34	Pu/Puz	0.24
alfa n	1.23	alfa n	1.07
check	0.48	check	0.23
design of isolated footing-interior			
axial load from column in t	80		
moment at column base in tm	1.60		
SBC value of soil in t/m2	12		
size column in mm	450		
area of footing in m2	7.35		
side of square footing in m	2.71		
fix side of square footing	3		
upward thrust in t/m2	9.8		
factored axial load in kN	943.49		
factored moment in kNm	18.87		
eccentricity in mm	17.39		
maximum stress in kN/m2	124.75		
minimum stress in kN/m2	116.36		
enhanced SBC value in kN/m2	180		
thickness of footing based on shear			
factored net soil pressure kN/m2-max	109.03		
factored net soil pressure kN/m2-min	100.64		
trial footing thickness in mm	750		
effective depth in mm	705		
factored soil pressure at deff	107.44		
average soil pressure in kN/m2	108.24		
bearing area in m2	1.7100		
shear in kN	185.09		
shear stress in N/mm2	0.09		
assumed steel percentage	0.2		
allowable shear stress in N/mm2	0.325		
factored two way shear			
average soil pressure in kN/m2	104.84		
two way shear in kN	803.7		
two way shear stress in N/mm2	0.38		
limiting shear stress in Mpa	1.25		
check for maximum soil pressure			
depth of footing in m	1.5		
q max in kN/m2	156.28		
enhanced SBC value in kN/m2	180		
design of flexural reinforcement			
cantilever projection in m	1.47		
width in m	3		

d eff in m	0.705		
qu at footing edge in kN/m ²	124.75		
qu at face of column in kN/m ²	120.63		
moment at column base in kNm	401.63		
required depth at limit state in mm	405.77		
Ast required for bal section in mm ²	1971.24		
pt for one way shear	0.2		
Ast required in mm ²	4230		
select dia of bars	16		
numbers	21.04		
fix numbers	21		
spacing in mm	139		
development length required	784		
design of isolated footing-exterior and corner			
axial load from column in t	55		
moment at column base in tm	1.11		
SBC value of soil in t/m ²	12		
size column in mm	450		
area of footing in m ²	5.08		
side of square footing in m	2.25		
fix side of square footing	2.5		
upward thrust in t/m ²	9.75		
factored axial load in kN	652.05		
factored moment in kNm	13.04		
eccentricity in mm	17.39		
maximum stress in kN/m ²	124.98		
minimum stress in kN/m ²	114.97		
enhanced SBC value in kN/m ²	180		
thickness of footing based on shear			
factored net soil pressure kN/m ² -max	109.34		
factored net soil pressure kN/m ² -min	99.32		
trial footing thickness in mm	650		
effective depth in mm	605		
factored soil pressure at deff	107.66		
average soil pressure in kN/m ²	108.5		
bearing area in m ²	1.0500		
shear in kN	113.93		
shear stress in N/mm ²	0.08		
assumed steel percentage	0.2		
allowable shear stress in N/mm ²	0.325		
factored two way shear			
average soil pressure in kN/m ²	104.33		
two way shear in kN	535.94		
two way shear stress in N/mm ²	0.37		
limiting shear stress in Mpa	1.25		
check for maximum soil pressure			
depth of footing in m	1.5		

q max in kN/m ²	155.69		
enhanced SBC value in kN/m ²	180		
design of flexural reinforcement			
cantilever projection in m	1.25		
width in m	2.5		
d eff in m	0.605		
qu at footing edge in kN/m ²	124.98		
qu at face of column in kN/m ²	119.98		
moment at column base in kNm	240.79		
required depth at limit state in mm	339.16		
Ast required for bal section in mm ²	1377.16		
pt for one way shear	0.2		
Ast required in mm ²	3025		
select dia of bars	16		
numbers	15.05		
fix numbers	15		
spacing in mm	161		
development length required	784		
ALUM AND LIME STORAGE UNIT (BLOCK-2)			
TYPICAL ROOF SLAB			
assumed thickness in m	0.15		
long span in m	4.52		
short span in m	4.16		
live load in t/m ²	0.15		
finishes in t/m ²	0.05		
total load in t/m ²	0.575		
Ly/Lx	1.09		
condition as per IS: 456 (2000)	two adjacent edges discontinuous		
Mx-	0.053	moment in tm	0.53
Mx+	0.04	moment in tm	0.4
My-	0.047	moment in tm	0.47
My+	0.035	moment in tm	0.35
design moment	0.53	non-crack depth in mm	130.8
		cracked section	69.1
fix depth of roof slab in mm	150	effective depth in mm	120
Ast for negative moment in mm ²	213		
Ast for positive moment in mm ²	163		
minimum steel area in mm ²	225		
fix dia for top steel	8	spacing	200
fix dia for bottom steel	8	spacing	200
area of steel given in mm ²	top	251.33	0.17
	bottom	251.33	0.17
L/d ratio	34.67		
fs	156.11		
modification factor	2	OK	
moment of resistance of section in ws	0.52	tm	
moment of resistance of section in LS	1.05	tm	

TYPICAL ROOF BEAM-INTERIOR			
loading on slab in T/m ²	0.575		
breadth in m	0.35		
total depth in m	0.60		
span in m	4.52		
span in m left	4.16		
span in m right	4.16		
loading intensity in t/m-bending moment	2.139		
loading intensity in t/m-for column loads	1.816		
fix breadth of beam in mm	350		
design moment for trial in tm	4.86		
cracked effective depth in mm	353.54		
depth for trial in mm	600		
static moment	4.86		
seismic moment	1.60		
design moment in tm	7.75		
cracked effective depth in mm	407.72		
effective depth at limit state in mm	252.98		
fix total depth in mm	600		
Ast for negative moment			
Mdes -ve in tm (LSM)	7.75		
Mdes -ve in tm (WSM)	6.46		
steel at top		steel at bottom	
dia of steel bar 1 in mm	16	dia of steel bar 1 in mm	16
numbers	4	numbers	2
dia of steel bar 2 in mm	20	dia of steel bar 2 in mm	20
numbers	0	numbers	0
area provided in mm ² -at top	804.25	area provided in mm ² -at bottom	402.12
M- resistance of section in tm	7.84		
M- resistance of section at limit state	17.2		
Ast for positive moment			
Mdes +ve in tm	5.46		
steel at bottom		steel at top	
dia of steel bar 1	16	dia of steel bar 1	16
numbers	4	numbers	2
dia of steel bar 2	20	dia of steel bar 2	20
numbers	0	numbers	0
area provided in mm ² -at bottom	804.25	area provided in mm ² -at top	402.12
M- resistance of section	7.84		
M- resistance of section at limit state	17.2		
shear force in T	5.80		
shear stress in Mpa	0.29		
area of tension reinforcement	0.41		
allowable shear stress in Mpa	0.28		
number of legs	2		

diameter of shear bars in mm	8		
spacing of shear reinforcement in mm	5094		
fix spacing in mm	200	fix spacing at joints for 2d	100
TYPICAL ROOF BEAM-EXTERIOR			
loading on slab in T/m ²	0.575		
breadth in m	0.35		
total depth in m	0.6		
span in m	4.52		
span in m left	4.16		
span in m right	0		
loading intensity in t/m-bending moment	1.332		
loading intensity in t/m-for column loads	1.171		
fix breadth of beam in mm	350		
design moment for trial in tm	2.72		
cracked effective depth in mm	264.67		
depth for trial in mm	600		
static moment	2.72		
seismic moment	0.90		
torsional moment/m from slab in Tm	0.52		
moment in beam from torsion in Tm	3.75		
design moment in tm	8.85		
cracked effective depth in mm	435.7		
effective depth at limit state in mm	270.33		
fix total depth in mm	600		
Ast for negative moment			
Mdes -ve in tm (LSM)	8.85		
Mdes -ve in tm (WSM)	7.38		
steel at top		steel at bottom	
dia of steel bar 1 in mm	16	dia of steel bar 1 in mm	16
numbers	4	numbers	2
dia of steel bar 2 in mm	20	dia of steel bar 2 in mm	20
numbers	0	numbers	0
area provided in mm ² -at top	804.25	area provided in mm ² -at bottom	402.12
M- resistance of section in tm	7.84		
M- resistance of section at limit state	17.2		
Ast for positive moment			
Mdes +ve in tm	7.15		
steel at bottom		steel at top	
dia of steel bar 1	16	dia of steel bar 1	16
numbers	4	numbers	2
dia of steel bar 2	20	dia of steel bar 2	20
numbers	0	numbers	0
area provided in mm ² -at bottom	804.25	area provided in mm ² -at	402.12

		top	
M- resistance of section	7.84		
M- resistance of section at limit state	17.2		
shear from torsion in T	10.74		
shear force in T	14.36		
shear stress in Mpa	0.73		
area of tension reinforcement	0.41		
allowable shear stress in Mpa	0.28		
number of legs	2		
diameter of shear bars in mm	8		
spacing of shear reinforcement in mm	148		
fix spacing in mm	100	fix spacing at joints for 2d	100
TYPICAL INTERIOR FLOOR TIE-BEAM-HEAVY STORAGE-GF			
loading on slab in T/m ²	0	(Transmitted to ground)	
wall thickness in m	0.2		
wall height in m	3.6		
wall material density in T/m ³	2		
breadth in m	0.35		
total depth in m	0.60		
span in m	4.52		
span in m left	4.16		
span in m right	4.16		
loading intensity in t/m-bending moment	1.97		
loading intensity in t/m-for column loads	1.97		
fix breadth of beam in mm	350		
design moment for trial in tm	4.46		
cracked effective depth in mm	338.85		
depth for trial in mm	600		
static moment	4.46		
seismic moment	4.00		
design moment in tm	10.15		
cracked effective depth in mm	466.6		
effective depth at limit state in mm	289.51		
fix total depth in mm	600		
Ast for negative moment			
Mdes -ve in tm (LSM)	10.15		
Mdes -ve in tm (WSM)	8.46		
steel at top		steel at bottom	
dia of steel bar 1 in mm	20	dia of steel bar 1 in mm	20
numbers	3	numbers	2
dia of steel bar 2 in mm	20	dia of steel bar 2 in mm	20
numbers	0	numbers	0
area provided in mm ² -at top	942.48	area provided in mm ² -at bottom	628.32
M- resistance of section in tm	10.9		
M- resistance of section at limit	20		

state			
Ast for positive moment			
Mdes +ve in tm	5.02		
steel at bottom		steel at top	
dia of steel bar 1	20	dia of steel bar 1	20
numbers	3	numbers	2
dia of steel bar 2	20	dia of steel bar 2	16
numbers	0	numbers	1
area provided in mm2-at bottom	942.48	area provided in mm2-at top	829.38
M- resistance of section	10.9		
M- resistance of section at limit state	20		
shear force in T	5.33		
shear stress in Mpa	0.27		
area of tension reinforcement	0.49		
allowable shear stress in Mpa	0.31		
number of legs	2		
diameter of shear bars in mm	8		
spacing of shear reinforcement in mm	-1616		
fix spacing in mm	200	fix spacing at joints for 2d	100
TYPICAL EXTERIOR FLOOR TIE-BEAM-HEAVY STORAGE-GF			
loading on slab in T/m ²	0	(Transmitted to ground)	
wall thickness in m	0.2		
wall height in m	3.6		
wall material density in T/m ³	2		
breadth in m	0.35		
total depth in m	0.6		
span in m	4.52		
span in m left	4.16		
span in m right	0		
loading intensity in t/m-bending moment	1.97		
loading intensity in t/m-for column loads	1.97		
fix breadth of beam in mm	350		
design moment for trial in tm	4.01		
cracked effective depth in mm	321.46		
depth for trial in mm	600		
static moment	4.01		
seismic moment	4.00		
torsional moment/m from slab in Tm	0.00		
moment in beam from torsion in Tm	0.00		
design moment in tm	9.62		
cracked effective depth in mm	454.26		
effective depth at limit state in mm	281.85		
fix total depth in mm	600		

Ast for negative moment			
Mdes -ve in tm (LSM)	9.62		
Mdes -ve in tm (WSM)	8.02		
steel at top		steel at bottom	
dia of steel bar 1 in mm	20	dia of steel bar 1 in mm	20
numbers	3	numbers	2
dia of steel bar 2 in mm	20	dia of steel bar 2 in mm	20
numbers	0	numbers	0
area provided in mm2-at top	942.48	area provided in mm2-at bottom	628.32
M- resistance of section in tm	10.9		
M- resistance of section at limit state	20		
Ast for positive moment			
Mdes +ve in tm	5.02		
steel at bottom		steel at top	
dia of steel bar 1	20	dia of steel bar 1	20
numbers	3	numbers	2
dia of steel bar 2	20	dia of steel bar 2	20
numbers	0	numbers	0
area provided in mm2-at bottom	942.48	area provided in mm2-at top	628.32
M- resistance of section	10.9		
M- resistance of section at limit state	20		
shear from torsion in T	0.00		
shear force in T	5.33		
shear stress in Mpa	0.27		
area of tension reinforcement	0.49		
allowable shear stress in Mpa	0.39		
number of legs	2		
diameter of shear bars in mm	8		
spacing of shear reinforcement in mm	-547		
fix spacing in mm	200	fix spacing at joints for 2d	100
COLUMN LOAD INTENSITY FOR FOUNDATION DESIGN-FF			
corner column			
top slab length in m	4.52	top slab breadth in m	4.16
top beam breadth in m	0.35	top beam drop in m	0.45
slab loading intensity T^2 (live load and finishes)	0.2		
top slab thickness in m	0.15		
column breadth in m	0.45	column width in m	0.45
columns height in m	3.75		
wall thickness in m	0.2	wall height in m	3.75
wall density in T/m^3	2		
water column height in m	0		
floor slab length in m	4.52	floor slab breadth in m	4.16
floor slab thickness in m	0		
slab loading intensity T^2 (live load and finishes)	0		

floor beam breadth in m	0.35	floor beam drop in m	0.6
load on column in T	15.10		
exterior coulumn type-1			
top slab length-1 in m	4.16	top slab cross length in m	4.52
top slab length-2 in m	4.16		
top beam breadth in m	0.35	top beam drop in m	0.45
slab loading intensity T^2 (live load and finishes)	0.2		
top slab thickness in m	0.15		
column beadh in m	0.45	column width in m	0.45
columns height in m	3.75		
wall thickness in m	0.2	wall height in m	3.75
wall density in T/m^3	2		
water column height in m	0		
floor slab length-1 in m	4.16	floor slab cross length in m	4.52
floor slab length-2 in m	4.16		
floor slab thickness in m	0		
slab loading intensity T^2 (live load and finishes)	0		
floor beam breadth in m	0.35	floor beam drop in m	0.6
load on column in T	22.83		
interior column type-1			
top slab length-1 in m	4.16	top slab cross length-1 in m	4.52
top slab length-2 in m	4.16	top slab cross length-2 in m	4.52
top beam breadth in m	0.35	top beam drop in m	0.45
slab loading intensity T^2 (live load and finishes)	0.2		
top slab thickness in m	0.15		
column breadth in m	0.45	column width in m	0.45
columns height in m	3.75		
wall thickness in m	0.2	wall height in m	3.75
wall density in T/m^3	2		
water column height in m	0		
floor slab length-1 in m	4.16	floor slab cross length-1 in m	4.52
floor slab length-2 in m	4.16	floor slab cross length-2 in m	4.52
floor slab thickness in m	0		
slab loading intensity T^2 (live load and finishes)	0		
floor beam breadth in m	0.35	floor beam drop in m	0.6
load on column in T	33.71		
column type	load in T	number	total
corner column	15.10	2	30.2
average load in T-corner	15.10		
maximum load in T-corner	15.10		
exterior column-type-1	22.83	6	137.0
average load in T-exterior	22.83		

maximum load in T-exterior	22.83		
interior column-type-1	33.71	4	134.8
average load in T-interior	33.7		
maximum load in T-interior	33.71		
INTERIOR COLUMNS		EXTERIOR COLUMNS	
axial load in t	33.7	axial load in t	22.8
		axial load in t for corner column	15.1
factored axial load in t	51	factored axial load in t	34
static moment in tm	0.67	static moment in tm	0.46
seismic moment in tm	4.50	seismic moment in tm	2.25
breadth of the column adopted in mm	450	breadth of the column adopted in mm	450
depth of the column adopted in mm	450	depth of the column adopted in mm	450
dia of steel bars 1	25	dia of steel bars 1	25
numbers	8		8
dia of steel bars 2	12	dia of steel bars 2	12
numbers	0		0
total area of steel in mm ²	3927	total area of steel in mm ²	3927
% steel	1.94	% steel	1.94
axial load capacity in t	307.76	axial load capacity in t	307.76
ratio	0.16	ratio	0.11
unsupported length in m	3.75	unsupported length in m	3.75
L/d ratio	8.33	L/d ratio	8.33
Pu/fck b d	0.1	Pu/fck b d	0.07
p/fck	0.078	p/fck	0.078
d'/B	0.09	d'/B	0.09
d'/D	0.09	d'/D	0.09
Mu/fck D b ² from chart	0.13		0.125
Mu/fck b D ² from chart	0.13	Mu/fck b D ² from chart	0.125
<i>seismic force in X direction</i>		<i>seismic force in X direction</i>	
Mux l	296156250	Mux l	284765625
Mux	60909511.67	Mux	31862738.54
Muy l	296156250	Muy l	284765625
Muy	60909511.67	Muy	31862738.54
Puz in t	350.04	Puz in t	350.04
Pu/Puz	0.14	Pu/Puz	0.1
alfa n	1	alfa n	1.00
check	0.41	check	0.22
<i>seismic force in Y direction</i>		<i>seismic force in Y direction</i>	
Mux l	296156250	Mux l	284765625
Mux	60909511.67	Mux	31862738.54
Muy l	296156250	Muy l	284765625
Muy	60909511.67	Muy	31862738.54
Puz in t	350.04	Puz in t	350.04
Pu/Puz	0.14	Pu/Puz	0.1
alfa n	1	alfa n	1

check	0.41	check	0.22
design of isolated footing-interior			
axial load from column in t	34		
moment at column base in tm	0.67		
SBC value of soil in t/m ²	12		
size column in mm	450		
area of footing in m ²	3.09		
side of square footing in m	1.76		
fix side of square footing	2		
upward thrust in t/m ²	9.27		
factored axial load in kN	396.78		
factored moment in kNm	7.94		
eccentricity in mm	17.4		
maximum stress in kN/m ²	120.03		
minimum stress in kN/m ²	108.12		
enhanced SBC value in kN/m ²	180		
thickness of footing based on shear			
factored net soil pressure kN/m ² -max	105.15		
factored net soil pressure kN/m ² -min	93.24		
trial footing thickness in mm	650		
effective depth in mm	605		
factored soil pressure at deff	104.14		
average soil pressure in kN/m ²	104.65		
bearing area in m ²	0.3400		
shear in kN	35.58		
shear stress in N/mm ²	0.03		
assumed steel percentage	0.2		
allowable shear stress in N/mm ²	0.325		
factored two-way shear			
average soil pressure in kN/m ²	99.2		
two-way shear in kN	286.39		
two-way shear stress in N/mm ²	0.1		
limiting shear stress in Mpa	1.25		
check for maximum soil pressure			
depth of footing in m	1.5		
q max in kN/m ²	151.5		
enhanced SBC value in kN/m ²	180		
design of flexural reinforcement			
cantilever projection in m	0.70		
width in m	2		
d eff in m	0.605		
qu at footing edge in kN/m ²	120.03		
qu at face of column in kN/m ²	115.86		
moment at column base in kNm	58.14		
required depth at limit state in mm	166.66		
Ast required for bal section in mm ²	332.52		
pt for one way shear	0.2		

Ast required in mm ²	2420		
select dia of bars	16		
numbers	12.04		
fix numbers	12		
spacing in mm	159		
development length required	784		
design of isolated footing-exterior and corner			
axial load from column in t	23		
moment at column base in tm	0.46		
SBC value of soil in t/m ²	12		
size column in mm	450		
area of footing in m ²	2.09		
side of square footing in m	1.45		
fix side of square footing	2		
upward thrust in t/m ²	6.28		
factored axial load in kN	268.79		
factored moment in kNm	5.38		
eccentricity in mm	17.4		
maximum stress in kN/m ²	81.31		
minimum stress in kN/m ²	73.24		
enhanced SBC value in kN/m ²	180		
thickness of footing based on shear			
factored net soil pressure kN/m ² -max	71.23		
factored net soil pressure kN/m ² -min	63.16		
trial footing thickness in mm	650		
effective depth in mm	605		
factored soil pressure at deff	70.54		
average soil pressure in kN/m ²	70.89		
bearing area in m ²	0.3400		
shear in kN	24.1		
shear stress in N/mm ²	0.02		
assumed steel percentage	0.2		
allowable shear stress in N/mm ²	0.325		
factored two way shear			
average soil pressure in kN/m ²	67.2		
two way shear in kN	194		
two way shear stress in N/mm ²	0.07		
limiting shear stress in Mpa	1.25		
check for maximum soil pressure			
depth of footing in m	1.5		
q max in kN/m ²	117.58		
enhanced SBC value in kN/m ²	180		
design of flexural reinforcement			
cantilever projection in m	0.70		
width in m	2		
d eff in m	0.605		
qu at footing edge in kN/m ²	81.31		
qu at face of column in kN/m ²	78.49		

moment at column base in kNm	39.39		
required depth at limit state in mm	137.18		
Ast required for bal section in mm ²	225.29		
pt for one way shear	0.2		
Ast required in mm ²	2420		
select dia of bars	16		
numbers	12.04		
fix numbers	12		
spacing in mm	159		
development length required	784		
ALUM AND LIME SOLUTION MAKING UNIT (BLOCK-3)			
TYPICAL ROOF SLAB			
assumed thickness in m	0.15		
long span in m	4.52		
short span in m	4.16		
live load in t/m ²	0.15		
finishes in t/m ²	0.05		
total load in t/m ²	0.575		
Ly/Lx	1.09		
condition as per IS: 456 (2000)	two adjacent edges discontinuous		
Mx-	0.053	moment in tm	0.53
Mx+	0.04	moment in tm	0.4
My-	0.047	moment in tm	0.47
My+	0.035	moment in tm	0.35
design moment	0.53	non-crack depth in mm	130.8
		cracked section	69.1
fix depth of roof slab in mm	150	effective depth in mm	120
Ast for negative moment in mm ²	213		
Ast for positive moment in mm ²	163		
minimum steel area in mm ²	225		
fix dia for top steel	8	spacing	200
fix dia for bottom steel	8	spacing	200
area of steel given in mm ²	top	251.33	0.17
	bottom	251.33	0.17
L/d ratio	34.67		
fs	156.11		
modification factor	2	OK	
moment of resistance of section in ws	0.52	tm	
moment of resistance of section in LS	1.05	tm	
TYPICAL ROOF BEAM-INTERIOR			
loading on slab in T/m ²	0.575		
breadth in m	0.35		
total depth in m	0.60		
span in m	4.52		
span in m left	4.16		
span in m right	4.16		
loading intensity in t/m-bending	2.139		

moment			
loading intensity in t/m-for column loads	1.816		
fix breadth of beam in mm	350		
design moment for trial in tm	4.86		
cracked effective depth in mm	353.54		
depth for trial in mm	600		
static moment	4.86		
seismic moment	1.60		
design moment in tm	7.75		
cracked effective depth in mm	407.72		
effective depth at limit state in mm	252.98		
fix total depth in mm	600		
Ast for negative moment			
Mdes -ve in tm (LSM)	7.75		
Mdes -ve in tm (WSM)	6.46		
steel at top		steel at bottom	
dia of steel bar 1 in mm	16	dia of steel bar 1 in mm	16
numbers	4	numbers	2
dia of steel bar 2 in mm	20	dia of steel bar 2 in mm	20
numbers	0	numbers	0
area provided in mm2-at top	804.25	area provided in mm2-at bottom	402.12
M- resistance of section in tm	7.84		
M- resistance of section at limit state	17.2		
Ast for positive moment			
Mdes +ve in tm	5.46		
steel at bottom		steel at top	
dia of steel bar 1	16	dia of steel bar 1	16
numbers	4	numbers	2
dia of steel bar 2	20	dia of steel bar 2	20
numbers	0	numbers	0
area provided in mm2-at bottom	804.25	area provided in mm2-at top	402.12
M- resistance of section	7.84		
M- resistance of section at limit state	17.2		
shear force in T	5.80		
shear stress in Mpa	0.29		
area of tension reinforcement	0.41		
allowable shear stress in Mpa	0.28		
number of legs	2		
diameter of shear bars in mm	8		
spacing of shear reinforcement in mm	5094		
fix spacing in mm	200	fix spacing at joints for 2d	100
TYPICAL ROOF BEAM-EXTERIOR			
loading on slab in T/m ²	0.575		
breadth in m	0.35		

total depth in m	0.6		
span in m	4.52		
span in m left	4.16		
span in m right	0		
loading intensity in t/m-bending moment	1.332		
loading intensity in t/m-for column loads	1.171		
fix breadth of beam in mm	350		
design moment for trial in tm	2.72		
cracked effective depth in mm	264.67		
depth for trial in mm	600		
static moment	2.72		
seismic moment	0.90		
torsional moment/m from slab in Tm	0.52		
moment in beam from torsion in Tm	3.75		
design moment in tm	8.85		
cracked effective depth in mm	435.7		
effective depth at limit state in mm	270.33		
fix total depth in mm	600		
Ast for negative moment			
Mdes -ve in tm (LSM)	8.85		
Mdes -ve in tm (WSM)	7.38		
steel at top		steel at bottom	
dia of steel bar 1 in mm	16	dia of steel bar 1 in mm	16
numbers	4	numbers	2
dia of steel bar 2 in mm	20	dia of steel bar 2 in mm	20
numbers	0	numbers	0
area provided in mm2-at top	804.25	area provided in mm2-at bottom	402.12
M- resistance of section in tm	7.84		
M- resistance of section at limit state	17.2		
Ast for positive moment			
Mdes +ve in tm	7.15		
steel at bottom		steel at top	
dia of steel bar 1	16	dia of steel bar 1	16
numbers	4	numbers	2
dia of steel bar 2	20	dia of steel bar 2	20
numbers	0	numbers	0
area provided in mm2-at bottom	804.25	area provided in mm2-at top	402.12
M- resistance of section	7.84		
M- resistance of section at limit state	17.2		
shear from torsion in T	10.74		
shear force in T	14.36		
shear stress in Mpa	0.73		
area of tension reinforcement	0.41		

allowable shear stress in Mpa	0.28		
number of legs	2		
diameter of shear bars in mm	8		
spacing of shear reinforcement in mm	148		
fix spacing in mm	100	fix spacing at joints for 2d	100
TYPICAL FLOOR SLAB-ABOVE HOPPER SOLUTION UNITS			
assumed thickness in m	0.15		
long span in m	4.52		
short span in m	4.16		
live load in t/m ²	0.15		
finishes in t/m ²	0.05		
total load in t/m ²	0.575		
Ly/Lx	1.09		
condition as per IS: 456 (2000)	two adjacent edges discontinuous		
Mx-	0.064	moment in tm	0.64
Mx+	0.048	moment in tm	0.48
My-	0.043	moment in tm	0.43
My+	0.035	moment in tm	0.35
design moment	0.64	non-crack depth in mm	143.7
		cracked section	75.9
fix depth of roof slab in mm	150	effective depth in mm	120
Ast for negative moment in mm ²	258		
Ast for positive moment in mm ²	195		
minimum steel area in mm ²	225		
fix dia for top steel	8	spacing	160
fix dia for bottom steel	8	spacing	160
area of steel given in mm ²	top	314.16	0.21
	bottom	314.16	0.21
L/d ratio	34.67		
fs	149.4		
modification factor	2	OK	
moment of resistance of section in ws	0.66	tm	
moment of resistance of section in LS	1.6	tm	
TYPICAL FLOOR BEAM--INTERIOR			
loading on slab in T/m ²	0.575		
breadth in m	0.35		
total depth in m	0.60		
span in m	4.52		
span in m left	4.16		
span in m right	4.16		
loading intensity in t/m-bending moment	2.139		
loading intensity in t/m-for column loads	1.816		
fix breadth of beam in mm	350		
design moment for trial in tm	4.86		
cracked effective depth in mm	353.54		

depth for trial in mm	600		
static moment	4.86		
seismic moment	1.60		
design moment in tm	7.75		
cracked effective depth in mm	407.72		
effective depth at limit state in mm	252.98		
fix total depth in mm	600		
Ast for negative moment			
Mdes -ve in tm (LSM)	7.75		
Mdes -ve in tm (WSM)	6.46		
steel at top		steel at bottom	
dia of steel bar 1 in mm	16	dia of steel bar 1 in mm	16
numbers	4	numbers	2
dia of steel bar 2 in mm	20	dia of steel bar 2 in mm	20
numbers	0	numbers	0
area provided in mm2-at top	804.25	area provided in mm2-at bottom	402.12
M- resistance of section in tm	7.84		
M- resistance of section at limit state	17.2		
Ast for positive moment			
Mdes +ve in tm	5.46		
steel at bottom		steel at top	
dia of steel bar 1	16	dia of steel bar 1	16
numbers	4	numbers	2
dia of steel bar 2	20	dia of steel bar 2	20
numbers	0	numbers	0
area provided in mm2-at bottom	804.25	area provided in mm2-at top	402.12
M- resistance of section	7.84		
M- resistance of section at limit state	17.2		
shear force in T	5.80		
shear stress in Mpa	0.29		
area of tension reinforcement	0.41		
allowable shear stress in Mpa	0.28		
number of legs	2		
diameter of shear bars in mm	8		
spacing of shear reinforcement in mm	5094		
fix spacing in mm	200	fix spacing at joints for 2d	100
TYPICAL FLOOR BEAM-EXTERIOR			
loading on slab in T/m ²	0.575		
breadth in m	0.35		
total depth in m	0.6		
span in m	4.52		
span in m left	4.16		
span in m right	0		
loading intensity in t/m-bending moment	1.332		

loading intensity in t/m-for column loads	1.171		
fix breadth of beam in mm	350		
design moment for trial in tm	2.72		
cracked effective depth in mm	264.67		
depth for trial in mm	600		
static moment	2.72		
seismic moment	0.90		
torsional moment/m from slab in Tm	0.52		
moment in beam from torsion in Tm	3.75		
design moment in tm	8.85		
cracked effective depth in mm	435.7		
effective depth at limit state in mm	270.33		
fix total depth in mm	600		
Ast for negative moment			
Mdes -ve in tm (LSM)	8.85		
Mdes -ve in tm (WSM)	7.38		
steel at top		steel at bottom	
dia of steel bar 1 in mm	16	dia of steel bar 1 in mm	16
numbers	4	numbers	2
dia of steel bar 2 in mm	20	dia of steel bar 2 in mm	20
numbers	0	numbers	0
area provided in mm2-at top	804.25	area provided in mm2-at bottom	402.12
M- resistance of section in tm	7.84		
M- resistance of section at limit state	17.2		
Ast for positive moment			
Mdes +ve in tm	7.15		
steel at bottom		steel at top	
dia of steel bar 1	16	dia of steel bar 1	16
numbers	4	numbers	2
dia of steel bar 2	20	dia of steel bar 2	20
numbers	0	numbers	0
area provided in mm2-at bottom	804.25	area provided in mm2-at top	402.12
M- resistance of section	7.84		
M- resistance of section at limit state	17.2		
shear from torsion in T	10.74		
shear force in T	14.36		
shear stress in Mpa	0.73		
area of tension reinforcement	0.41		
allowable shear stress in Mpa	0.28		
number of legs	2		
diameter of shear bars in mm	8		
spacing of shear reinforcement in mm	148		
fix spacing in mm	100	fix spacing at joints for 2d	100

TYPICAL FLOOR SLAB-SUPPORTING HOPPER SOLUTION UNITS			
assumed thickness in m	0.15		
long span in m	4.16		
short span in m	2.44		
live load in t/m ²	0.3		
finishes in t/m ²	0.05		
total load in t/m ²	0.725		
Ly/Lx	1.70		
condition as per IS: 456 (2000)	two adjacent edges discontinuous		
Mx-	0.064	moment in tm	0.28
Mx+	0.048	moment in tm	0.21
My-	0.043	moment in tm	0.19
My+	0.035	moment in tm	0.15
design moment	0.28	non-crack depth in mm	95
		cracked section	50.2
fix depth of roof slab in mm	150	effective depth in mm	120
Ast for negative moment in mm ²	113		
Ast for positive moment in mm ²	85		
minimum steel area in mm ²	225		
fix dia for top steel	8	spacing	160
fix dia for bottom steel	8	spacing	160
area of steel given in mm ²	top	314.16	0.21
	bottom	314.16	0.21
L/d ratio	20.33		
fs	65.12		
modification factor	2	OK	
moment of resistance of section in ws	0.66	tm	
moment of resistance of section in LS	1.6	tm	
TYPICAL FLOOR BEAM-INTERIOR			
loading on slab in T/m ²	0.725		
breadth in m	0.35		
total depth in m	0.75		
span in m	4.16		
span in m left	4.52		
span in m right	2.08		
loading intensity in t/m-bending moment	2.299		
loading intensity in t/m-for column loads	1.970		
fix breadth of beam in mm	350		
design moment for trial in tm	4.42		
cracked effective depth in mm	337.29		
depth for trial in mm	750		
static moment	4.42		
point load in t	2.50		
a	0.72		
b	3.44		
moment from point load in tm	1.97		
seismic moment	1.46		

design moment in tm	9.02		
cracked effective depth in mm	439.79		
effective depth at limit state in mm	272.87		
fix total depth in mm	750		
Ast for negative moment			
Mdes -ve in tm (LSM)	9.0		
Mdes -ve in tm (WSM)	7.51		
steel at top		steel at bottom	
dia of steel bar 1 in mm	20	dia of steel bar 1 in mm	20
numbers	4	numbers	2
dia of steel bar 2 in mm	20	dia of steel bar 2 in mm	20
numbers	0	numbers	0
area provided in mm2-at top	1256.64	area provided in mm2-at bottom	628.32
M- resistance of section in tm	10.7		
M- resistance of section at limit state	34.2		
Ast for positive moment			
Mdes +ve in tm	4.97		
steel at bottom		steel at top	
dia of steel bar 1	20	dia of steel bar 1	20
numbers	4	numbers	2
dia of steel bar 2	20	dia of steel bar 2	20
numbers	0	numbers	0
area provided in mm2-at bottom	1256.64	area provided in mm2-at top	628.32
M- resistance of section	10.7		
M- resistance of section at limit state	34.2		
shear force in T	5.74		
shear stress in Mpa	0.23		
area of tension reinforcement	0.51		
allowable shear stress in Mpa	0.28		
number of legs	2		
diameter of shear bars in mm	8		
spacing of shear reinforcement in mm	-1273		
fix spacing in mm	200	fix spacing at joints for 2d	100
TYPICAL FLOOR BEAM-EXTERIOR			
loading on slab in T/m ²	0.725		
breadth in m	0.35		
total depth in m	0.6		
span in m	4.16		
span in m left	2.44		
span in m right	0		
loading intensity in t/m-bending moment	1.306		
loading intensity in t/m-for column loads	1.150		
fix breadth of beam in mm	350		

design moment for trial in tm	2.26		
cracked effective depth in mm	241.23		
depth for trial in mm	750		
static moment	2.26		
seismic moment	0.75		
torsional moment/m from slab in Tm	0.52		
moment in beam from torsion in Tm	4.00		
design moment in tm	8.41		
cracked effective depth in mm	424.73		
effective depth at limit state in mm	263.53		
fix total depth in mm	750		
Ast for negative moment			
Mdes -ve in tm (LSM)	8.41		
Mdes -ve in tm (WSM)	7.01		
steel at top		steel at bottom	
dia of steel bar 1 in mm	20	dia of steel bar 1 in mm	20
numbers	4	numbers	2
dia of steel bar 2 in mm	20	dia of steel bar 2 in mm	20
numbers	0	numbers	0
area provided in mm2-at top	1256.64	area provided in mm2-at bottom	628.32
M- resistance of section in tm	10.7		
M- resistance of section at limit state	34.2		
Ast for positive moment			
Mdes +ve in tm	6.83		
steel at bottom		steel at top	
dia of steel bar 1	20	dia of steel bar 1	20
numbers	4	numbers	2
dia of steel bar 2	20	dia of steel bar 2	20
numbers	0	numbers	0
area provided in mm2-at bottom	1256.64	area provided in mm2-at top	628.32
M- resistance of section	10.7		
M- resistance of section at limit state	34.2		
shear from torsion in T	9.89		
shear force in T	13.15		
shear stress in Mpa	0.52		
area of tension reinforcement	0.51		
allowable shear stress in Mpa	0.28		
number of legs	2		
diameter of shear bars in mm	8		
spacing of shear reinforcement in mm	272		
fix spacing in mm	100	fix spacing at joints for 2d	100
TYPICAL UPPER TIE-BEAM-STORAGE AREA-BLOCK-3			
loading on slab in T/m ²	0		

wall thickness in m	0.2		
wall height in m	1.65		
wall material density in T/m ³	2		
breadth in m	0.35		
total depth in m	0.45		
span in m	4.52		
span in m left	0		
span in m right	0		
loading intensity in t/m-bending moment	1.05		
loading intensity in t/m-for column loads	1.05		
fix breadth of beam in mm	350		
design moment for trial in tm	2.15		
cracked effective depth in mm	235.4		
depth for trial in mm	450		
static moment	2.15		
seismic moment	4.00		
torsional moment/m from slab in Tm	0.00		
moment in beam from torsion in Tm	0.00		
design moment in tm	7.38		
cracked effective depth in mm	397.87		
effective depth at limit state in mm	246.86		
fix total depth in mm	600		
Ast for negative moment			
Mdes -ve in tm (LSM)	7.38		
Mdes -ve in tm (WSM)	6.15		
steel at top		steel at bottom	
dia of steel bar 1 in mm	20	dia of steel bar 1 in mm	20
numbers	3	numbers	3
dia of steel bar 2 in mm	20	dia of steel bar 2 in mm	20
numbers	0	numbers	0
area provided in mm2-at top	942.48	area provided in mm2-at bottom	942.48
M- resistance of section in tm	10.9		
M- resistance of section at limit state	20		
Ast for positive moment			
Mdes +ve in tm	2.69		
steel at bottom		steel at top	
dia of steel bar 1	20	dia of steel bar 1	20
numbers	3	numbers	3
dia of steel bar 2	20	dia of steel bar 2	20
numbers	0	numbers	0
area provided in mm2-at bottom	942.48	area provided in mm2-at top	942.48
M- resistance of section	10.9		
M- resistance of section at limit state	20		

shear from torsion in T	0.00		
shear force in T	2.86		
shear stress in Mpa	0.14		
area of tension reinforcement	0.49		
allowable shear stress in Mpa	0.39		
number of legs	2		
diameter of shear bars in mm	8		
spacing of shear reinforcement in mm	-269		
fix spacing in mm	200	fix spacing at joints for 2d	100
TYPICAL GL TIE-BEAM-STORAGE AREA-BLOCK-3			
loading on slab in T/m ²	0		
wall thickness in m	0.2		
wall height in m	4.2		
wall material density in T/m ³	2		
breadth in m	0.35		
total depth in m	0.6		
span in m	4.52		
span in m left	0		
span in m right	0		
loading intensity in t/m-bending moment	2.21		
loading intensity in t/m-for column loads	2.21		
fix breadth of beam in mm	350		
design moment for trial in tm	4.50		
cracked effective depth in mm	340.52		
depth for trial in mm	600		
static moment	4.50		
seismic moment	4.00		
torsional moment/m from slab in Tm	0.00		
moment in beam from torsion in Tm	0.00		
design moment in tm	10.21		
cracked effective depth in mm	467.98		
effective depth at limit state in mm	290.36		
fix total depth in mm	600		
Ast for negative moment			
Mdes -ve in tm (LSM)	10.21		
Mdes -ve in tm (WSM)	8.51		
steel at top		steel at bottom	
dia of steel bar 1 in mm	20	dia of steel bar 1 in mm	20
numbers	3	numbers	3
dia of steel bar 2 in mm	20	dia of steel bar 2 in mm	20
numbers	0	numbers	0
area provided in mm2-at top	942.48	area provided in mm2-at bottom	942.48
M- resistance of section in tm	10.9		
M- resistance of section at limit	20		

state			
Ast for positive moment			
Mdes +ve in tm	5.63		
steel at bottom		steel at top	
dia of steel bar 1	20	dia of steel bar 1	20
numbers	3	numbers	3
dia of steel bar 2	20	dia of steel bar 2	20
numbers	0	numbers	0
area provided in mm2-at bottom	942.48	area provided in mm2-at top	942.48
M- resistance of section	10.9		
M- resistance of section at limit state	20		
shear from torsion in T	0.00		
shear force in T	5.98		
shear stress in Mpa	0.30		
area of tension reinforcement	0.49		
allowable shear stress in Mpa	0.39		
number of legs	2		
diameter of shear bars in mm	8		
spacing of shear reinforcement in mm	-751		
fix spacing in mm	200	fix spacing at joints for 2d	100

COLUMN LOAD INTENSITY FOR FOUNDATION DESIGN-BLOCK-3-FF			
corner column			
top slab length in m	4.16	top slab breadth in m	2.44
top beam breadth in m	0.35	top beam drop in m	0.45
slab loading intensity T^2 (live load and finishes)	0.2		
top slab thickness in m	0.15		
column breadth in m	0.45	column width in m	0.45
columns height in m	7.65		
wall thickness in m	0.2	wall height in m	7.65
wall density in T/m^3	2		
water column height in m	0		
floor slab length in m	4.16	floor slab breadth in m	2.44
floor slab thickness in m	0.3	(combined slab)	
slab loading intensity T^2 (live load and finishes)	0.6		
floor beam breadth in m	0.35	floor beam drop in m	0.6
load on column in T	21.89		
exterior column type-1			
top slab length-1 in m	4.16	top slab cross length in m	2.44
top slab length-2 in m	4.16		
top beam breadth in m	0.35	top beam drop in m	0.45
slab loading intensity T^2 (live load and finishes)	0.2		
top slab thickness in m	0.15		
column breadth in m	0.45	column width in m	0.45

columns height in m	7.65		
wall thickness in m	0.2	wall height in m	7.65
wall density in T/m ³	2		
water column height in m	0		
floor slab length-1 in m	4.16	floor slab cross length in m	2.44
floor slab length-2 in m	4.16		
floor slab thickness in m	0.3	(combined slab)	
slab loading intensity T ² (live load and finishes)	0.6		
floor beam breadth in m	0.35	floor beam drop in m	0.6
load on column in T	35.05		
exterior column type-2			
top slab length-1 in m	2.44	top slab cross length in m	4.16
top slab length-2 in m	2.08		
top beam breadth in m	0.35	top beam drop in m	0.45
slab loading intensity T ² (live load and finishes)	0.2		
top slab thickness in m	0.15		
column breadth in m	0.45	column width in m	0.45
columns height in m	7.65		
wall thickness in m	0.2	wall height in m	7.65
wall density in T/m ³	2		
water column height in m	0		
floor slab length-1 in m	2.44	floor slab cross length in m	4.16
floor slab length-2 in m	2.08		
floor slab thickness in m	0.3	(combined slab)	
slab loading intensity T ² (live load and finishes)	0.6		
floor beam breadth in m	0.35	floor beam drop in m	0.6
point load in t	2.5		
load on column in T	32.69		
exterior column type-3			
top slab length-1 in m	2.08	top slab cross length in m	4.16
top slab length-2 in m	4.52		
top beam breadth in m	0.35	top beam drop in m	0.45
slab loading intensity T ² (live load and finishes)	0.2		
top slab thickness in m	0.15		
column breadth in m	0.45	column width in m	0.45
columns height in m	7.65		
wall thickness in m	0.2	wall height in m	7.65
wall density in T/m ³	2.5		
water column height in m	0		
floor slab length-1 in m	2.08		4.16
floor slab length-2 in m	4.52		
floor slab thickness in m	0.3	(combined slab)	
slab loading intensity T ² (live load and finishes)	0.6		
floor beam breadth in m	0.35	floor beam drop in m	0.6
point load in t	2.5		
load on column in T	45.11		

interior column type-1			
top slab length-1 in m	4.16	top slab cross length-1 in m	2.44
top slab length-2 in m	4.16	top slab cross length-2 in m	2.08
top beam breadth in m	0.35	top beam drop in m	0.45
slab loading intensity $T/2$ (live load and finishes)	0.2		
top slab thickness in m	0.15		
column breadth in m	0.45	column width in m	0.45
columns height in m	7.65		
wall thickness in m	0	wall height in m	7.65
wall density in T/m^3	2		
water column height in m	0		
floor slab length-1 in m	4.16	floor slab cross length-1 in m	2.44
floor slab length-2 in m	4.16	floor slab cross length-2 in m	2.08
floor slab thickness in m	0.3	(combined slab)	
slab loading intensity $T/2$ (live load and finishes)	0.6		
floor beam breadth in m	0.35	floor beam drop in m	0.6
point load in t	5		
load on column in T	32.87		
interior coulmn type-2			
top slab length-1 in m	4.16	top slab cross length-1 in m	2.08
top slab length-2 in m	4.16	top beam drop in m	4.52
top beam breadth in m	0.35		0.45
slab loading intensity $T/2$ (live load and finishes)	0.2		
top slab thickness in m	0.15		
column breadth in m	0.45	column width in m	0.45
columns height in m	7.65		
wall thickness in m	0	wall height in m	7.65
wall density in T/m^3	2		
water column height in m	0		
floor slab length-1 in m	4.16	floor slab cross length-1 in m	2.08
floor slab length-2 in m	4.16	floor slab cross length-2 in m	4.52
floor slab thickness in m	0.3	(combined slab)	
slab loading intensity $T/2$ (live load and finishes)	0.6		
floor beam breadth in m	0.35	floor beam drop in m	0.6
load on column in T	37.15		
column type	load in T	number	total
corner column	21.89	4	87.6
average load in T-corner	21.89		
maximum load in T-corner	21.89		
exterior column-type-1	35.05	2	70.1
exterior column-type-2	32.69	4	130.8
exterior column-type-3	45.11	4	180.4
average load in T-exterior	38.13		
maximum load in T-exterior	45.11		
interior column-type-1	32.87	4	131.5
interior column-type-2	37.15	4	148.6
average load in T-interior	35.0		

maximum load in T-interior	37.15		
INTERIOR COLUMNS		EXTERIOR COLUMNS	
axial load in t	37.2	axial load in t	45.1
		axial load in t for corner column	21.9
factored axial load in t	56	factored axial load in t	68
static moment in tm	0.74	static moment in tm	0.90
seismic moment in tm	4.50	seismic moment in tm	2.25
breadth of the column adopted in mm	450	breadth of the column adopted in mm	450
depth of the column adopted in mm	450	depth of the column adopted in mm	450
dia of steel bars 1	25	dia of steel bars 1	25
numbers	8		8
dia of steel bars 2	12	dia of steel bars 2	12
numbers	0		0
total area of steel in mm ²	3927	total area of steel in mm ²	3927
% steel	1.94	% steel	1.94
axial load capacity in t	307.76	axial load capacity in t	307.76
ratio	0.18	ratio	0.22
unsupported length in m	4.5	unsupported length in m	4.5
L/d ratio	10	L/d ratio	10
Pu/fck b d	0.11	Pu/fck b d	0.13
p/fck	0.078	p/fck	0.078
d'/B	0.09	d'/B	0.09
d'/D	0.09	d'/D	0.09
Mu/fck D b ² from chart	0.15		0.15
Mu/fck b D ² from chart	0.15	Mu/fck b D ² from chart	0.15
<i>seismic force in X direction</i>		<i>seismic force in X direction</i>	
Mux l	34171875 0	Mux l	34171875 0
Mux	61721322. 92	Mux	37107083. 31
Muy l	34171875 0	Muy l	34171875 0
Muy	61721322. 92	Muy	37107083. 31
Puz in t	350.04	Puz in t	350.04
Pu/Puz	0.16	Pu/Puz	0.19
alfa n	1	alfa n	1.00
check	0.36	check	0.22
<i>seismic force in Y direction</i>		<i>seismic force in Y direction</i>	
Mux l	34171875 0	Mux l	34171875 0
Mux	61721322. 92	Mux	37107083. 31
Muy l	34171875 0	Muy l	34171875 0
Muy	61721322. 92	Muy	37107083. 31
Puz in t	350.04	Puz in t	350.04
Pu/Puz	0.16	Pu/Puz	0.19

alfa n	1	alfa n	1
check	0.36	check	0.22
COLUMN LOAD INTENSITY FOR FOUNDATION DESIGN-BLOCK-3-GF			
corner column			
top slab length in m	4.16	top slab breadth in m	2.44
top beam breadth in m	0.35	top beam drop in m	0.45
slab loading intensity T^2 (live load and finishes)	0		
top slab thickness in m	0		
column breadth in m	0.45	column width in m	0.45
columns height in m	5.85		
wall thickness in m	0.2	wall height in m	5.85
wall density in T/m^3	2		
water column height in m	0		
floor slab length in m	4.16	floor slab breadth in m	2.44
floor slab thickness in m	0	(combined slab)	
slab loading intensity T^2 (live load and finishes)	0		
floor beam breadth in m	0.35	floor beam drop in m	0.6
load on column in T	13.72		
exterior column type-1			
top slab length-1 in m	4.16	top slab cross length in m	2.44
top slab length-2 in m	4.16		
top beam breadth in m	0.35	top beam drop in m	0.45
slab loading intensity T^2 (live load and finishes)	0		
top slab thickness in m	0		
column breadth in m	0.45	column width in m	0.45
columns height in m	5.85		
wall thickness in m	0.2	wall height in m	5.85
wall density in T/m^3	2		
water column height in m	0		
floor slab length-1 in m	4.16	floor slab cross length in m	2.44
floor slab length-2 in m	4.16		
floor slab thickness in m	0	(combined slab)	
slab loading intensity T^2 (live load and finishes)	0		
floor beam breadth in m	0.35	floor beam drop in m	0.6
load on column in T	20.49		
exterior coulmn type-2			
top slab length-1 in m	2.44	top slab cross length in m	4.16
top slab length-2 in m	2.08		
top beam breadth in m	0.35	top beam drop in m	0.45
slab loading intensity T^2 (live load and finishes)	0		
top slab thickness in m	0		
column breadth in m	0.45	column width in m	0.45
columns height in m	5.85		
wall thickness in m	0.2	wall height in m	5.85
wall density in T/m^3	2		
water column height in m	0		

floor slab length-1 in m	2.44	floor slab cross length in m	4.16
floor slab length-2 in m	2.08		
floor slab thickness in m	0	(combined slab)	
slab loading intensity T^2 (live load and finishes)	0		
floor beam breadth in m	0.35	floor beam drop in m	0.6
point load in t	0		
load on column in T	17.10		
exterior column type-3			
top slab length-1 in m	2.08	top slab cross length in m	4.16
top slab length-2 in m	4.52		
top beam breadth in m	0.35	top beam drop in m	0.45
slab loading intensity T^2 (live load and finishes)	0		
top slab thickness in m	0		
column breadth in m	0.45	column width in m	0.45
columns height in m	5.85		
wall thickness in m	0.2	wall height in m	5.85
wall density in T/m^3	2.5		
water column height in m	0		
floor slab length-1 in m	2.08		4.16
floor slab length-2 in m	4.52		
floor slab thickness in m	0	(Combined slab)	
slab loading intensity T^2 (live load and finishes)	0		
floor beam breadth in m	0.35	floor beam drop in m	0.6
point load in t	0		
load on column in T	23.64		
interior column type-1			
top slab length-1 in m	4.16	top slab cross length-1 in m	2.44
top slab length-2 in m	4.16	top slab cross length-2 in m	2.08
top beam breadth in m	0.35	top beam drop in m	0.45
slab loading intensity T^2 (live load and finishes)	0		
top slab thickness in m	0		
column breadth in m	0.45	column width in m	0.45
columns height in m	5.85		
wall thickness in m	0.2	wall height in m	5.85
wall density in T/m^3	2		
water column height in m	0		
floor slab length-1 in m	4.16	floor slab cross length-1 in m	2.44
floor slab length-2 in m	4.16	floor slab cross length-2 in m	2.08
floor slab thickness in m	0	(Combined slab)	
slab loading intensity T^2 (live load and finishes)	0		
floor beam breadth in m	0.35	floor beam drop in m	0.6
point load in t	0		
load on column in T	23.88		
interior coulumn type-2			
top slab length-1 in m	4.16	top slab cross length-1 in m	2.08
top slab length-2 in m	4.16	top beam drop in m	4.52

top beam breadth in m	0.35		0.45
slab loading intensity T^2 (live load and finishes)	0		
top slab thickness in m	0		
column breadth in m	0.45	column width in m	0.45
columns height in m	5.85		
wall thickness in m	0.2	wall height in m	5.85
wall density in T/m^3	2		
water column height in m	0		
floor slab length-1 in m	4.16	floor slab cross length-1 in m	2.08
floor slab length-2 in m	4.16	floor slab cross length-2 in m	4.52
floor slab thickness in m	0	(combined slab)	
slab loading intensity T^2 (live load and finishes)	0		
floor beam breadth in m	0.35	floor beam drop in m	0.6
load on column in T	27.27		
column type	load in T	number	total
corner column	13.72	4	54.9
average load in T-corner	13.72		
maximum load in T-corner	13.72		
exterior column-type-1	20.49	2	41.0
exterior column-type-2	17.10	4	68.4
exterior column-type-3	23.64	4	94.6
average load in T-exterior	20.40		
maximum load in T-exterior	23.64		
interior column-type-1	23.88	4	95.5
interior column-type-2	27.27	4	109.1
average load in T-interior	25.6		
maximum load in T-interior	27.27		
INTERIOR COLUMNS		EXTERIOR COLUMNS	
axial load in t	64.4	axial load in t	68.7
		axial load in t for corner column	13.7
factored axial load in t	97	factored axial load in t	103
static moment in tm	1.29	static moment in tm	1.37
seismic moment in tm	4.50	seismic moment in tm	2.25
breadth of the column adopted in mm	450	breadth of the column adopted in mm	450
depth of the column adopted in mm	450	depth of the column adopted in mm	450
dia of steel bars 1	25	dia of steel bars 1	25
numbers	8		8
dia of steel bars 2	12	dia of steel bars 2	12
numbers	0		0
total area of steel in mm ²	3927	total area of steel in mm ²	3927
% steel	1.94	% steel	1.94
axial load capacity in t	307.76	axial load capacity in t	307.76
ratio	0.31	ratio	0.34
unsupported length in m	4.2	unsupported length in m	4.2
L/d ratio	9.33	L/d ratio	9.33
$P_u/f_{ck} b d$	0.19	$P_u/f_{ck} b d$	0.2

p/fck	0.078	p/fck	0.078
d'/B	0.09	d'/B	0.09
d'/D	0.09	d'/D	0.09
Mu/fck D b ² from chart	0.15		0.15
Mu/fck b D ² from chart	0.15	Mu/fck b D ² from chart	0.15
<i>seismic force in X direction</i>		<i>seismic force in X direction</i>	
Mux1	34171875 0	Mux1	34171875 0
Mux	68142204. 34	Mux	42673105. 64
Muy1	34171875 0	Muy1	34171875 0
Muy	68142204. 34	Muy	42673105. 64
Puz in t	350.04	Puz in t	350.04
Pu/Puz	0.28	Pu/Puz	0.29
alfa n	1.13	alfa n	1.15
check	0.32	check	0.18
<i>seismic force in Y direction</i>		<i>seismic force in Y direction</i>	
Mux1	34171875 0	Mux1	34171875 0
Mux	68142204. 34	Mux	42673105. 64
Muy1	34171875 0	Muy1	34171875 0
Muy	68142204. 34	Muy	42673105. 64
Puz in t	350.04	Puz in t	350.04
Pu/Puz	0.28	Pu/Puz	0.29
alfa n	1.13	alfa n	1.15
check	0.32	check	0.18
design of isolated footing-interior			
axial load from column in t	64		
moment at column base in tm	1.29		
SBC value of soil in t/m ²	12		
size column in mm	450		
area of footing in m ²	5.91		
side of square footing in m	2.43		
fix side of square footing	2.5		
upward thrust in t/m ²	11.34		
factored axial load in kN	758.41		
factored moment in kNm	15.17		
eccentricity in mm	17.39		
maximum stress in kN/m ²	145.37		
minimum stress in kN/m ²	133.72		
enhanced SBC value in kN/m ²	180		
thickness of footing based on shear			
factored net soil pressure kN/m ² - max	127.17		
factored net soil pressure kN/m ² -min	115.52		
trial footing thickness in mm	650		
effective depth in mm	605		
factored soil pressure at deff	125.21		

average soil pressure in kN/m ²	126.19		
bearing area in m ²	1.0500		
shear in kN	132.5		
shear stress in N/mm ²	0.09		
assumed steel percentage	0.2		
allowable shear stress in N/mm ²	0.325		
factored two way shear			
average soil pressure in kN/m ²	121.35		
two way shear in kN	623.37		
two way shear stress in N/mm ²	0.42		
limiting shear stress in Mpa	1.25		
check for maximum soil pressure			
depth of footing in m	1.5		
q max in kN/m ²	173.52		
enhanced SBC value in kN/m ²	180		
design of flexural reinforcement			
cantilever projection in m	1.25		
width in m	2.5		
d eff in m	0.605		
qu at footing edge in kN/m ²	145.37		
qu at face of column in kN/m ²	139.55		
moment at column base in kNm	279.24		
required depth at limit state in mm	365.24		
Ast required for bal section in mm ²	1597.07		
pt for one way shear	0.2		
Ast required in mm ²	3025		
select dia of bars	16		
numbers	15.05		
fix numbers	21		
spacing in mm	115		
development length required	784		
design of isolated footing-exterior			
axial load from column in t	69		
moment at column base in tm	1.37		
SBC value of soil in t/m ²	12.5		
size column in mm	450		
area of footing in m ²	6.05		
side of square footing in m	2.46		
fix side of square footing	2.5		
upward thrust in t/m ²	12.1		
factored axial load in kN	809.31		
factored moment in kNm	16.19		
eccentricity in mm	17.4		
maximum stress in kN/m ²	155.13		
minimum stress in kN/m ²	142.7		
enhanced SBC value in kN/m ²	187.5		
thickness of footing based on shear			
factored net soil pressure kN/m ² - max	135.71		
factored net soil pressure kN/m ² -min	123.27		
trial footing thickness in mm	650		
effective depth in mm	605		

factored soil pressure at deff	133.62		
average soil pressure in kN/m ²	134.67		
bearing area in m ²	1.0500		
shear in kN	141.4		
shear stress in N/mm ²	0.09		
assumed steel percentage	0.2		
allowable shear stress in N/mm ²	0.325		
factored two way shear			
average soil pressure in kN/m ²	129.49		
two way shear in kN	665.19		
two way shear stress in N/mm ²	0.45		
limiting shear stress in Mpa	1.25		
check for maximum soil pressure			
depth of footing in m	1.5		
q max in kN/m ²	182.06		
enhanced SBC value in kN/m ²	187.5		
design of flexural reinforcement			
cantilever projection in m	1.25		
width in m	2.5		
d eff in m	0.605		
qu at footing edge in kN/m ²	155.13		
qu at face of column in kN/m ²	148.92		
moment at column base in kNm	298.94		
required depth at limit state in mm	377.9		
Ast required for bal section in mm ²	1709.74		
pt for one way shear	0.2		
Ast required in mm ²	3025		
select dia of bars	16		
numbers	15.05		
fix numbers	15		
spacing in mm	161		
development length required	784		

TYPICAL WALL-ALUM TANK AND LIME TANK

number of alum tank units	4		
number of lime tank units	4		
width	2		
height	2.3		
b/a	0.87		
assumed thickness in mm	200		
coefficients as per IS: 3370 for the case of spanning between columns-maximum condition			
Mx-	0.035	moment in tm	0.43
Mx+	0.013	moment in tm	0.16
My-	0.029	moment in tm	0.35
My+	0.013	moment in tm	0.16
design moment in tm-vertical	0.43	non-crack depth in mm	115.9
design moment in tm-horizontal at ends	0.35	non-crack depth in mm	104.6
design moment in tm-horizontal at middle	0.16	non-crack depth in	70.7

		mm	
fix wall thickness in mm	200	effective depth in mm	170
fix dia for inner steel vertical	8	spacing in mm	150
fix dia for outer steel vertical	8	spacing in mm	150
fix dia for inner steel horizontal	8	spacing in mm	150
fix dia for outer steel horizontal	8	spacing in mm	150
		Ast	335.1
		Ast	335.1
		Ast	335.1
		Ast	335.1
wall as cantilever			
height of liquid in m (considering overflow)	1.5		
total wall height in m	2.3		
density of liquid in t/m ³	1		
height from top where moment is required in m	2.3		
total load per metre width of wall in t	1.13		
bending moment in tm	0.56		
non-crack thickness in mm	132.58		
fix wall thickness above haunch in mm	200		
TYPICAL FLOOR SLAB-OPERATING PLATFORM-ALUM AND LIME TANKS			
assumed thickness in m	0.2		
long span in m	2.2		
short span in m	2.2		
live load in t/m ²	1.75		
finishes in t/m ²	0.1		
total load in t/m ²	2.35		
Ly/Lx	1.00		
condition as per IS: 456 (2000)	one short edge discontinuous		
Mx-	0.053	moment in tm	0.6
Mx+	0.040	moment in tm	0.45
My-	0.047	moment in tm	0.53
My+	0.035	moment in tm	0.4
design moment	0.6	non-crack depth in mm	139.1
		cracked section	73.5
fix depth of floor slab in mm	200	effective depth in mm	170
Ast for negative moment in mm ²	206		
Ast for positive moment in mm ²	229		
minimum steel area in mm ²	300		
fix dia for top steel	10	spacing	150
fix dia for bottom steel	10	spacing	150
area of steel given in mm ²	top	523.60	0.26
	bottom	523.60	0.26
L/d ratio	12.94		
fs	105.27		
modification factor	1.6	OK	
moment of resistance of section in ws	1.01	tm	

moment of resistance of section in LS	3.2	tm	
TYPICAL FLOOR BEAM-INTERIOR-SUPPORTING ALUM AND LIME TANKS			
loading on slab in T/m ²	2.35		
wall thickness in m	0.2		
wall height in m	3.75		
wall material density in T/m ³	2.2		
breadth in m	0.35		
total depth in m	0.75		
span in m	2.2	span for moment in m	4.5
span in m left	2.2		
span in m right	2.2		
loading intensity in t/m-bending moment	5.36		
loading intensity in t/m-for column loads	4.72		
reaction at centre from other beam in T	3.35		
fix breadth of beam in mm	350		
design moment for trial in tm	12.74		
cracked effective depth in mm	572.75		
depth for trial in mm	750		
static moment	12.74		
seismic moment	4.21		
design moment in tm	20.34		
cracked effective depth in mm	660.53		
effective depth at limit state in mm	409.83		
fix total depth in mm	750		
Ast for negative moment			
Mdes -ve in tm (LSM)	20.34		
Mdes -ve in tm (WSM)	16.95		
steel at top		steel at bottom	
dia of steel bar 1 in mm	20	dia of steel bar 1 in mm	16
numbers	4	numbers	4
dia of steel bar 2 in mm	20	dia of steel bar 2 in mm	20
numbers	0	numbers	0
area provided in mm ² -at top	1256.64	area provided in mm ² -at bottom	804.25
M- resistance of section in tm	18.3		
M- resistance of section at limit state	29.84		
Ast for positive moment			
Mdes +ve in tm	10.86		
steel at bottom		steel at top	
dia of steel bar 1	16	dia of steel bar 1	20
numbers	4	numbers	2
dia of steel bar 2	20	dia of steel bar 2	20
numbers	0	numbers	0
area provided in mm ² -at bottom	804.25	area provided in mm ² -at top	628.32
M- resistance of section	11.93		
M- resistance of section at limit state	19.29		
shear force in T	14.48		

shear stress in Mpa	0.58		
area of tension reinforcement	0.51		
allowable shear stress in Mpa	0.31		
number of legs	2		
diameter of shear bars in mm	8		
spacing of shear reinforcement in mm	249		
fix spacing in mm	200	fix spacing at joints for 2d	100
TYPICAL FLOOR BEAM-EXTERIOR-SUPPORTING ALUM AND LIME TANKS			
loading on slab in T/m ²	2.35		
wall thickness in m	0.2		
wall height in m	2		
wall material density in T/m ³	2.3		
breadth in m	0.35		
total depth in m	0.75		
span in m	2.2	span for moment in m	4.52
span in m left	2.2		
span in m right	0		
loading intensity in t/m-bending moment	3.02		
loading intensity in t/m-for column loads	2.69		
fix breadth of beam in mm	350		
design moment for trial in tm	6.85		
cracked effective depth in mm	419.86		
depth for trial in mm	750		
static moment	6.85		
seismic moment	2.26		
torsional moment/m from slab in Tm	0.60		
moment in beam from torsion in Tm	2.44		
design moment in tm	13.86		
cracked effective depth in mm	545.25		
effective depth at limit state in mm	338.31		
fix total depth in mm	750		
Ast for negative moment			
Mdes -ve in tm (LSM)	13.86		
Mdes -ve in tm (WSM)	11.55		
steel at top		steel at bottom	
dia of steel bar 1 in mm	20	dia of steel bar 1 in mm	20
numbers	4	numbers	2
dia of steel bar 2 in mm	20	dia of steel bar 2 in mm	20
numbers	0	numbers	0
area provided in mm ² -at top	1256.64	area provided in mm ² -at bottom	628.32
M- resistance of section in tm	18.3		
M- resistance of section at limit state	29.8		
Ast for positive moment			
Mdes +ve in tm	8.04		
steel at bottom		steel at top	
dia of steel bar 1	20	dia of steel bar 1	20

numbers	3	numbers	3
dia of steel bar 2	20	dia of steel bar 2	20
numbers	0	numbers	0
area provided in mm ² -at bottom	942.48	area provided in mm ² -at top	942.48
M- resistance of section	14		
M- resistance of section at limit state	22.52		
shear from torsion in T	6.03		
shear force in T	10.02		
shear stress in Mpa	0.40		
area of tension reinforcement	0.51		
allowable shear stress in Mpa	0.28		
number of legs	2		
diameter of shear bars in mm	8		
spacing of shear reinforcement in mm	559		
fix spacing in mm	200	fix spacing at joints for 2d	100

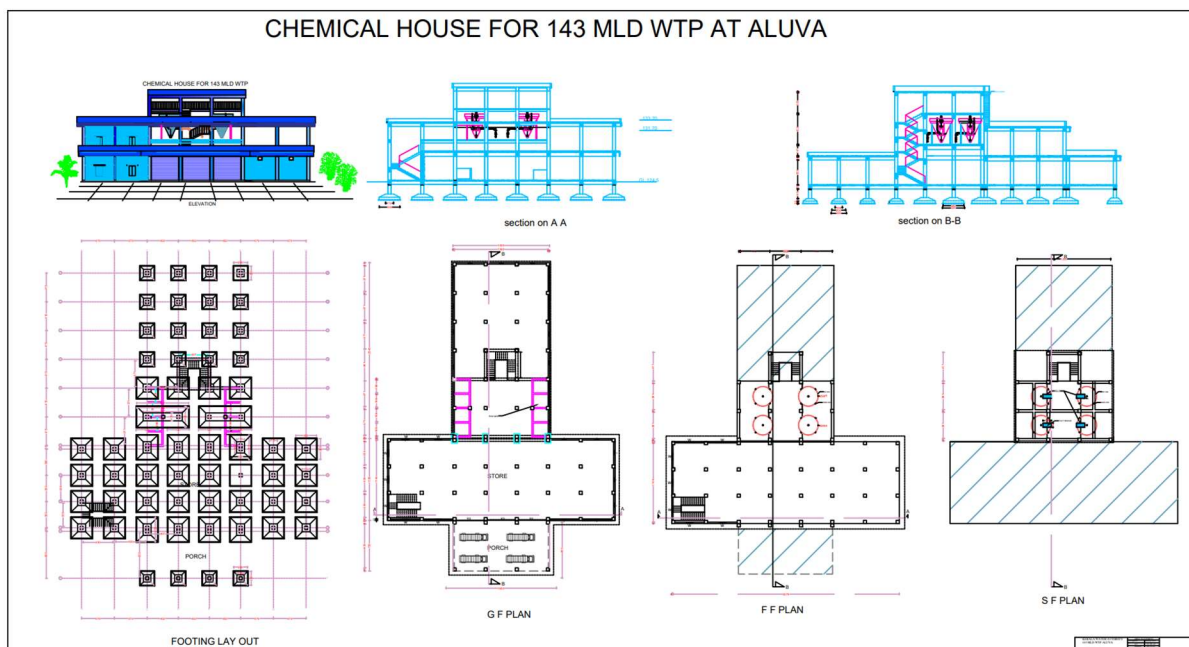


Figure 48. Chemical house building complex

4.11 DESIGN OF CLEAR WATER RESERVOIR AND CHLORINATION UNITS

Clear water reservoir is located at the under-ground floor of filter house block-1 and block-2. Detention time of 40 minutes is given for the sump. The water column is 2.80 metres, and the wall height is 4.75 metres. The side walls are designed for inside full and outside no soil contact conditions and outside full soil contact and inside empty conditions.

4.11.1 UNIT OPERATIONS

CHLORINATOR			
maximum dosage at 20% overload	2.5	ppm	

capacity required	383.03	kg/day	15.96	kg/hour
number of units to be provided	1			
rate	15.96	kg/hour		
number of chlorine cylinders to be provided	2			
capacity	1.5	tonne		
CLEAR WATER SUMP				
hours of storage	0.67	hours	40.2	minutes
number of units	2			
capacity	2159.4	m ³		
depth of water	2.8	m		
diameter required	31.34	m		
required length	25.6	m		
breadth	30.12	m	fix	30.3

4.11.2 STRUCTURAL DESIGN

CLEAR WATER RESERVOIR			
TYPICAL WALL-LARGE PANEL			
inside water pressure only condition			
width	7.8	vertical haunch height in m	0.90
wall height in m	4.53		
height	2.8	ratio haunch/wall	0.32
b/a	2.79	horizontal haunch height in m	0.60
assumed thickness in mm	350	ratio haunch/wall	0.08
coefficients as per IS: 3370 for the case of spanning between columns-maximum condition			
M _x -	0.126	moment in tm	2.77
M _x - at haunch	0.045	moment in tm	0.99
M _x +	0.01	moment in tm	0.22
M _y -	0.082	moment in tm	1.8
M _y - at haunch	0.08	moment in tm	1.76
M _y +	0.014	moment in tm	0.31
design moment in tm-vertical	2.77	non-crack depth in mm	294.2
design moment in tm-vertical above haunch	0.99	non-crack depth in mm	175.9
design moment in tm-horizontal at ends	1.8	non-crack depth in mm	237.2
design moment in tm-horizontal at middle	0.31	non-crack depth in mm	98.4
design moment in tm-horizontal at haunch	1.76	non-crack depth in mm	234.5
outside saturated soil pressure inside empty condition			
coefficients as per IS: 3370 for the case of spanning between columns-maximum condition			
M _x -	0.126	moment in tm	7.73
M _x - at haunch	0.045	moment in tm	2.76
M _x +	0.01	moment in tm	0.61
M _y -	0.082	moment in tm	5.03
M _y - at haunch	0.076	moment in tm	4.66
M _y +	0.014	moment in tm	0.86

design moment in tm-vertical	7.73	non-crack depth in mm	491.5
design moment in tm-vertical above haunch	2.76	non-crack depth in mm	293.7
design moment in tm-horizontal at ends	5.03	non-crack depth in mm	396.5
design moment in tm-horizontal at middle	0.86	non-crack depth in mm	163.9
design moment in tm-horizontal at haunch	4.66	non-crack depth in mm	381.6
fix wall thickness in mm	350	effective depth in mm	320
fix continous haunch width	300	height	600
haunch bars vertical	12	spacing in mm	110
fix dia for inner steel vertical	12	spacing in mm	110
fix dia for outer steel vertical	12	spacing in mm	150
fix dia for inner steel horizontal	12	spacing in mm	110
fix dia for outer steel horizontal	12	spacing in mm	150
		Ast	1028.16
		Ast	753.98
		Ast	1028.16
		Ast	753.98
inside water pressure only condition			
wall as propped cantilever			
height of liquid in m - normal	2.8		
total wall height in m	4.54		
density of liquid in t/m ³	1		
height from top where moment is required in m	4.54		
total load per metre width of wall in t	3.92		
axial pull on t-beam at top in t	0.33		
axial pull on t-beam at bottom in t	3.59		
bending moment in tm	-2.18		
non-crack thickness in mm	260.71		
fix wall thickness in mm	350		
outside saturated soil pressure inside empty condition			
wall as propped cantilever			
height of liquid in m - normal	4.53		
total wall height in m	4.53		
density of material in t/m ³	0.76		
height from top where moment is required in m	3.93		
total load per metre width of wall in t	10.26		
axial pull on t-beam at top in t	2.05		
axial pull on t-beam at bottom in t	8.21		
bending moment in tm	-2.05		
non-crack thickness in mm	253.21		
fix wall thickness in mm	350		
TYPICAL FLOOR SLAB			
assumed thickness in m	0.45		
long span in m	5.15		
short span in m	3.91		
live load in t/m ²	2.91		
finishes in t/m ²	0.1		

total load in t/m ²	3.01		
Ly/Lx	1.32		
condition as per IS: 456 (2000)	two adjacent edges discontinuous		
Mx-	0.065	moment in tm	2.99
Mx+	0.049	moment in tm	2.25
My-	0.047	moment in tm	2.16
My+	0.035	moment in tm	1.61
design moment	2.99	non-crack depth in mm	310.6
		cracked section	164.1
fix depth of floor slab in mm	450	effective depth in mm	420
fix dia for top steel	16	spacing	175
fix dia for bottom steel	16	spacing	175
area of steel given in mm ²	top	1148.93	0.51
	bottom	1148.93	0.51
moment of resistance of section in ws	5.11	tm	
moment of resistance of section in LS	16.8	tm	
TYPICAL LONG BEAM			
loading on slab in T/m ²	3.01		
wall thickness in m	0		
wall height in m	3.75		
wall material density in T/m ³	2.2		
breadth in m	0.6		
total depth in m	1.20		
span in m	5.15		
span in m left	3.91		
span in m right	3.91		
loading intensity in t/m-bending moment	10.39		
loading intensity in t/m-for column loads	8.56		
fix breadth of beam in mm	600		
design moment for trial in tm	30.61		
cracked effective depth in mm	677.95		
depth for trial in mm	1200		
static moment	30.61		
seismic moment	4.90		
design moment in tm	42.61		
cracked effective depth in mm	730.18		
effective depth at limit state in mm	453.05		
fix total depth in mm	1200		
Ast for negative moment			
Mdes -ve in tm (LSM)	42.61		
Mdes -ve in tm (WSM)	35.51		
steel at top		steel at bottom	
dia of steel bar 1 in mm	25	dia of steel bar 1 in mm	25
numbers	4	numbers	4
dia of steel bar 2 in mm	25	dia of steel bar 2 in mm	25
numbers	4	numbers	0
area provided in mm ² -at top	3927	area provided in mm ² -at bottom	1963.5
M- resistance of section in tm	51		

M- resistance of section at limit state	164		
Ast for positive moment			
Mdes +ve in tm	34.44		
steel at bottom		steel at top	
dia of steel bar 1	25	dia of steel bar 1	25
numbers	4	numbers	4
dia of steel bar 2	25	dia of steel bar 2	25
numbers	4	numbers	0
area provided in mm2-at bottom	3927	area provided in mm2-at top	1963.5
M- resistance of section	51		
M- resistance of section at limit state	164		
shear force in T	32.10		
shear stress in Mpa	0.45		
area of tension reinforcement	0.57		
allowable shear stress in Mpa	0.31		
number of legs	4		
diameter of shear bars in mm	8		
spacing of shear reinforcement in mm	534		
fix spacing in mm	200	fix spacing at joints for 2d	100
analysis of T/L-beam for stress stipulation			
slab depth in m	0.45	slab depth in mm	450
span in m	5.15	span in mm	5150
depth of web in m	0.75	depth of web in mm	750
width of web in m	0.6	width of web in mm	600
Ast top in mm ²	4908		
Ast bottom in mm ²	2454		
bending moment in tm	58		
T-beam			
effective flange width in mm	4158		
fix flange width	4000		
equivalent area in mm ²	2323473		
cg from top in mm	346.90		
cg from bottom in mm	853.10		
MI in mm ⁴	2.0199E+11		
stess at top in Mpa	0.98		
stress at bottom in Mpa	2.40		
TYPICAL SHORT BEAM			
loading on slab in T/m ²	3.01		
wall thickness in m	0		
wall height in m	3.75		
wall material density in T/m ³	2.2		
breadth in m	0.6		
total depth in m	1.20		
span in m	3.91		
span in m left	5.15		
span in m right	5.15		
loading intensity in t/m-bending moment	7.88		
loading intensity in t/m-for column	6.56		

loads			
fix breadth of beam in mm	600		
design moment for trial in tm	13.39		
cracked effective depth in mm	448.32		
depth for trial in mm	1200		
static moment	13.39		
seismic moment	2.14		
design moment in tm	18.63		
cracked effective depth in mm	482.81		
effective depth at limit state in mm	299.57		
fix total depth in mm	1200		
Ast for negative moment			
Mdes -ve in tm (LSM)	18.63		
Mdes -ve in tm (WSM)	15.53		
steel at top		steel at bottom	
dia of steel bar 1 in mm	20	dia of steel bar 1 in mm	20
numbers	6	numbers	4
dia of steel bar 2 in mm	25	dia of steel bar 2 in mm	25
numbers	0	numbers	0
area provided in mm2-at top	1884.96	area provided in mm2-at bottom	1256.64
M- resistance of section in tm	25		
M- resistance of section at limit state	85		
Ast for positive moment			
Mdes +ve in tm	15.06		
steel at bottom		steel at top	
dia of steel bar 1	20	dia of steel bar 1	20
numbers	6	numbers	4
dia of steel bar 2	25	dia of steel bar 2	25
numbers	0	numbers	0
area provided in mm2-at bottom	1884.96	area provided in mm2-at top	1256.64
M- resistance of section	27.8		
M- resistance of section at limit state	80		
shear force in T	18.49		
shear stress in Mpa	0.26		
area of tension reinforcement	0.27		
allowable shear stress in Mpa	0.39		
number of legs	2		
diameter of shear bars in mm	10		
spacing of shear reinforcement in mm	-469		
fix spacing in mm	200	fix spacing at joints for 2d	100
analysis of T/L-beam for stress stipulation			
slab depth in m	0.45	slab depth in mm	450
span in m	3.91	span in mm	3910
depth of web in m	0.75	depth of web in mm	750
width of web in m	0.6	width of web in mm	600
Ast top in mm ²	1884		
Ast bottom in mm ²	1256		
bending moment in tm	18		
T-beam			

effective flange width in mm	3952		
fix flange width	3900		
equivalent area in mm ²	2236337		
cg from top in mm	349.31		
cg from bottom in mm	850.69		
MI in mm ⁴	1.8971E+11		
stress at top in Mpa	0.33		
stress at bottom in Mpa	0.79		
COLUMNS INSIDE TANK			
service axial load in T	57.43		
side in mm-length	450		
side in mm-breadth	450		
dia of steel bars	25		
numbers	8		
Ast	3927		
Ac	198573		
direct compressive stress- cal in Mpa	2.27		
bending moment in tm	1.15		
bending compressive stress-cal	0.76		
permissible axial stress in Mpa	8		
permissible bending stress in Mpa	10		
check	0.36	OK	
COLUMNS INSIDE TANK			
service axial load in T	243.99		
side in mm-length	600		
side in mm-breadth	750		4.11
dia of steel bars	25		
numbers	18		
Ast	8835.75		
Ac	523601.798		
direct compressive stress- cal in Mpa	3.77	direct compressive stress-cal in Mpa	3.77
bending moment in tm	4.88	bending moment in tm	4.99
I _{XX} in mm ⁴	2.11E+10	I _{YY} in mm ⁴	1.35E+10
Z _{XX} in mm ³	5.63E+07	Z _{YY} in mm ³	4.50E+07
bending compressive stress-cal in Mpa	0.85	bending compressive stress-cal in Mpa	1.06
permissible axial stress in Mpa	8	permissible axial stress in Mpa	8
permissible bending stress in Mpa	10	permissible bending stress in Mpa	10
check	0.56	check	0.58
3/4 the modulus of rupture of concrete in Mpa	2.88		

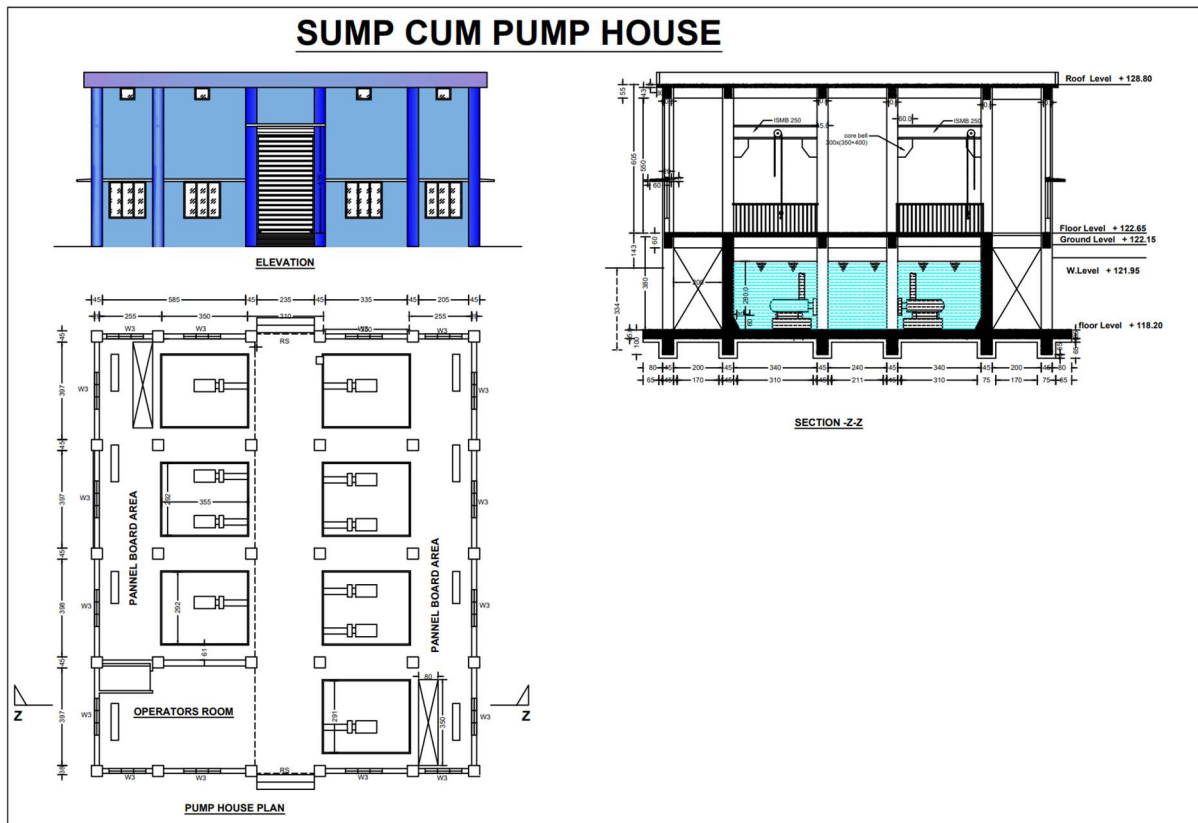


Figure 49. Clear water reservoir and chlorine units

4.12 DESIGN OF OPEARTING PLATFORM AND OFFICE FLOORS

The operating platforms are designed cantilevers spanning from filter walls. The floors to accommodate office, laboratories, retiring rooms etc. are designed satisfying the provisions for a building as per all relevant IS Codes of practice.

4.12.1 STRUCTURAL DESIGN

OPERATING PLATFORM AND OFFICE			
TYPICAL FLOOR TF AND SF SLAB WITH ACCESS			
assumed thickness in m	0.15		
long span in m	5.15		
short span in m	3.91		
live load in t/m ²	0.3		
finishes in t/m ²	0.05		
total load in t/m ²	0.725		
L _y /L _x	1.32		
condition as per IS: 456 (2000)	two adjacent edges discontinuous		
M _{x-}	0.065	moment in tm	0.72
M _{x+}	0.049	moment in tm	0.54
M _{y-}	0.047	moment in tm	0.52
M _{y+}	0.035	moment in tm	0.39
design moment	0.72	non-crack depth in mm	150
		cracked section	80.5

fix depth of roof slab in mm	150	effective depth in mm	120
Ast for negative moment in mm ²	351		
Ast for positive moment in mm ²	389		
minimum steel area in mm ²	225		
fix dia for top steel	10	spacing	140
fix dia for bottom steel	10	spacing	140
area of steel given in mm ²	top	561.00	0.37
	bottom	561.00	0.37
L/d ratio	42.92		
fs	166.9		
modification factor	1.8	OK	
moment of resistance of section in ws	0.77	tm	
moment of resistance of section in LS	2.42	tm	
TYPICAL FLOOR BEAM FOR OPEN AREA-INTERIOR-LONG			
loading on slab in T/m ²	0.725		
breadth in m	0.35		
total depth in m	0.6		
span in m	5.15		
span in m left	3.91		
span in m right	3.91		
loading intensity in t/m-bending moment	2.723		
loading intensity in t/m-for column loads	2.284		
fix breadth of beam in mm	350		
design moment for trial in tm	8.03		
cracked effective depth in mm	454.51		
depth for trial in mm	600		
static moment	8.03		
seismic moment	2.65		
design moment in tm	12.81		
cracked effective depth in mm	524.19		
effective depth at limit state in mm	325.24		
fix total depth in mm	600		
Ast for negative moment			
Mdes -ve in tm (LSM)	12.81		
Mdes -ve in tm (WSM)	10.68		
Ast-bal required in mm ²	1095.21		
Ast-bal at limit state in mm ²	777.64		
dia of steel bar 1 in mm	25		
numbers	3		
dia of steel bar 2 in mm	20		
numbers	0		
area provided in mm ² -at top	1472.63		
M- resistance of section in tm	14		
M- resistance of section at limit state	32		
area provided in mm ² -at bottom	1472.63		
Ast for positive moment			
Mdes +ve in tm	9.03		
Ast-bal required in mm ²	1353.82		
Ast-bal at limit state	986.55		
dia of steel bar 1	25		

numbers	3		
dia of steel bar 2	20		
numbers	0		
area provided in mm ² -at bottom	1472.63		
M- resistance of section	14		
M- resistance of section at limit state	32		
shear force in T	8.42		
shear stress in Mpa	0.42		
area of tension reinforcement	0.76		
allowable shear stress in Mpa	0.37		
number of legs	2		
diameter of shear bars in mm	8		
spacing of shear reinforcement in mm	1202		
fix spacing in mm	200	fix spacing at joints for 2d	100
TYPICAL FLOOR FOR OPEN AREA BEAM-EXTERIOR-LONG			
loading on slab in T/m ²	0.725		
breadth in m	0.35		
total depth in m	0.6		
span in m	5.15		
span in m left	3.1		
span in m right	0		
loading intensity in t/m-bending moment	1.507		
loading intensity in t/m-for column loads	1.311		
fix breadth of beam in mm	350		
design moment for trial in tm	4.00		
cracked effective depth in mm	320.74		
depth for trial in mm	600		
static moment	4.00		
seismic moment	1.32		
torsional moment/m from slab in Tm	0.57		
moment in beam from torsion in Tm	4.69		
design moment in tm	12		
cracked effective depth in mm	507.35		
effective depth at limit state in mm	314.79		
fix total depth in mm	600		
Ast for negative moment			
Mdes -ve in tm (LSM)	12		
Mdes -ve in tm (WSM)	10.00		
Ast-bal required in mm ²	1025.96		
Ast-bal at limit state in mm ²	728.46		
dia of steel bar 1 in mm	25		
numbers	3		
dia of steel bar 2 in mm	20		
numbers	0		
area provided in mm ² -at top	1472.63		
M- resistance of section in tm	14		
M- resistance of section at limit state	32		
area provided in mm ² -at bottom	1472.63		
Ast for positive moment			

Mdes +ve in tm	5.00		
Ast-bal required in mm2	749.12		
Ast-bal at limit state	545.9		
dia of steel bar 1	25		
numbers	3		
dia of steel bar 2	20		
numbers	0		
area provided in mm2-at bottom	1472.63		
M- resistance of section	14		
M- resistance of section at limit state	32		
shear force in T	4.66		
equivalent shear force with torsion in T	26.08		
shear stress in Mpa	1.32		
area of tension reinforcement	0.76		
allowable shear stress in Mpa	0.36		
number of legs	2		
diameter of shear bars in mm	10		
spacing of shear reinforcement in mm	108		
fix spacing in mm	100	fix spacing at joints for 2d	100
TYPICAL FLOOR BEAM FOR OPEN AREA-INTERIOR-SHORT			
loading on slab in T/m ²	0.725		
breadth in m	0.35		
total depth in m	0.6		
span in m	3.91		
loading intensity in t/m-bending moment	2.297		
loading intensity in t/m-for column loads	1.942		
fix breadth of beam in mm	350		
design moment for trial in tm	3.90		
cracked effective depth in mm	316.89		
depth for trial in mm	600		
static moment	3.90		
seismic moment	1.29		
design moment in tm	6.23		
cracked effective depth in mm	365.56		
effective depth at limit state in mm	226.82		
fix total depth in mm	600		
Ast for negative moment			
Mdes -ve in tm (LSM)	6.23		
Mdes -ve in tm (WSM)	5.19		
Ast-bal required in mm2	532.64		
Ast-bal at limit state in mm2	378.19		
dia of steel bar 1 in mm	20		
numbers	3		
dia of steel bar 2 in mm	16		
numbers	0		
area provided in mm2-at top	942.48		
M- resistance of section in tm	6.1		
M- resistance of section at limit state	17.41		
area provided in mm2-at bottom	942.48		
Ast for positive moment			

Mdes +ve in tm	4.39		
Ast-bal required in mm2	658.13		
Ast-bal at limit state	479.59		
dia of steel bar 1	20		
numbers	3		
dia of steel bar 2	16		
numbers	0		
area provided in mm2-at bottom	942.48		
M- resistance of section	6.1		
M- resistance of section at limit state	17.41		
shear force in T	5.39		
shear stress in Mpa	0.27		
area of tension reinforcement	0.49		
allowable shear stress in Mpa	0.27		
number of legs	2		
diameter of shear bars in mm	8		
spacing of shear reinforcement in mm	17700		
fix spacing in mm	200	fix spacing at joints for 2d	100
TYPICAL FLOOR FOR OPEN AREA BEAM-EXTERIOR-SHORT			
loading on slab in T/m ²	0.725		
breadth in m	0.35		
total depth in m	0.6		
span in m	3.91		
loading intensity in t/m-bending moment	1.411		
loading intensity in t/m-for column loads	1.234		
fix breadth of beam in mm	350		
design moment for trial in tm	2.16		
cracked effective depth in mm	235.63		
depth for trial in mm	600		
static moment	2.16		
seismic moment	0.71		
torsional moment/m from slab in Tm	0.43		
moment in beam from torsion in Tm	2.68		
design moment in tm	6.66		
cracked effective depth in mm	377.96		
effective depth at limit state in mm	234.51		
fix total depth in mm	600		
Ast for negative moment			
Mdes -ve in tm (LSM)	6.66		
Mdes -ve in tm (WSM)	5.55		
Ast-bal required in mm2	569.41		
Ast-bal at limit state in mm2	404.3		
dia of steel bar 1 in mm	20		
numbers	3		
dia of steel bar 2 in mm	16		
numbers	0		
area provided in mm2-at top	942.48		
M- resistance of section in tm	6.1		
M- resistance of section at limit state	17.41		
area provided in mm2-at bottom	942.48		

Ast for positive moment			
Mdes +ve in tm	5.38		
Ast-bal required in mm ²	806.81		
Ast-bal at limit state	587.94		
dia of steel bar 1	20		
numbers	3		
dia of steel bar 2	16		
numbers	0		
area provided in mm ² -at bottom	942.48		
M- resistance of section	6.1		
M- resistance of section at limit state	17.41		
shear force in T	3.31		
equivalent shear force with torsion in T	15.58		
shear stress in Mpa	0.79		
area of tension reinforcement	0.49		
allowable shear stress in Mpa	0.27		
number of legs	2		
diameter of shear bars in mm	10		
spacing of shear reinforcement in mm	200		
fix spacing in mm	150	fix spacing at joints for 2d	100
TYPICAL FLOOR SLAB FOR OFFICE FLOOR			
assumed thickness in m	0.15		
long span in m	5.15		
short span in m	3.91		
live load in t/m ²	0.25		
finishes in t/m ²	0.1		
total load in t/m ²	0.725		
Ly/Lx	1.32		
condition as per IS: 456 (2000)	one short edge discontinuous		
Mx-	0.065	moment in tm	0.72
Mx+	0.049	moment in tm	0.54
My-	0.047	moment in tm	0.52
My+	0.035	moment in tm	0.39
design moment	0.72	non-crack depth in mm	152.4
		cracked section	80.5
fix depth of roof slab in mm	150	effective depth in mm	120
Ast for negative moment in mm ²	351		
Ast for positive moment in mm ²	389		
minimum steel area in mm ²	225		
fix dia for top steel	10	spacing	140
fix dia for bottom steel	10	spacing	140
area of steel given in mm ²	top	561.00	0.37
	bottom	561.00	0.37
L/d ratio	32.58		
fs	166.9		
modification factor	1.6	OK	
moment of resistance of section in ws	0.98	tm	

moment of resistance of section in LS	2.22	tm	
TYPICAL OFFICE FLOOR BEAM-INTERIOR-LONG			
loading on slab in T/m ²	0.775		
wall thickness in m	0.2		
wall height in m	3.75		
wall material density in T/m ³	2.2		
breadth in m	0.35		
total depth in m	0.75		
span in m	5.1		
span in m left	3.9		
span in m right	3.9		
loading intensity in t/m-bending moment	4.51		
loading intensity in t/m-for column loads	4.04		
fix breadth of beam in mm	350		
design moment for trial in tm	11.73		
cracked effective depth in mm	549.41		
depth for trial in mm	750		
static moment	11.73		
seismic moment	3.87		
design moment in tm	18.72		
cracked effective depth in mm	633.68		
effective depth at limit state in mm	393.17		
fix total depth in mm	750		
Ast for negative moment			
Mdes -ve in tm (LSM)	18.72		
Mdes -ve in tm (WSM)	15.60		
steel at top		steel at bottom	
dia of steel bar 1 in mm	20	dia of steel bar 1 in mm	20
numbers	4	numbers	2
dia of steel bar 2 in mm	20	dia of steel bar 2 in mm	20
numbers	0	numbers	0
area provided in mm ² -at top	1256.64	area provided in mm ² -at bottom	628.32
M- resistance of section in tm	18.3		
M- resistance of section at limit state	34		
Ast for positive moment			
Mdes +ve in tm	10.66		
steel at bottom		steel at top	
dia of steel bar 1	20	dia of steel bar 1	20
numbers	4	numbers	2
dia of steel bar 2	20	dia of steel bar 2	20
numbers	0	numbers	0
area provided in mm ² -at bottom	1256.64	area provided in mm ² -at top	628.32
M- resistance of section	18.5		
M- resistance of section at limit state	33.4		
shear force in T	13.80		
shear stress in Mpa	0.55		
area of tension reinforcement	0.51		
allowable shear stress in Mpa	0.34		
number of legs	2		

diameter of shear bars in mm	10		
spacing of shear reinforcement in mm	495		
fix spacing in mm	200	fix spacing at joints for 2d	100
TYPICAL OFFICE FLOOR BEAM-EXTERIOR-LONG			
loading on slab in T/m ²	0.775		
wall thickness in m	0.2		
wall height in m	3.6		
wall material density in T/m ³	2.2		
breadth in m	0.35		
total depth in m	0.75		
span in m	5.15		
span in m left	3.91		
span in m right	0		
loading intensity in t/m-bending moment	3.28		
loading intensity in t/m-for column loads	3.05		
fix breadth of beam in mm	350		
design moment for trial in tm	8.71		
cracked effective depth in mm	473.49		
depth for trial in mm	750		
static moment	8.71		
seismic moment	0.87		
torsional moment/m from slab in Tm	0.77		
moment in beam from torsion in Tm	7.33		
design moment in tm	20.29		
cracked effective depth in mm	659.71		
effective depth at limit state in mm	409.33		
fix total depth in mm	750		
Ast for negative moment			
Mdes -ve in tm (LSM)	20.29		
Mdes -ve in tm (WSM)	16.91		
steel at top		steel at bottom	
dia of steel bar 1 in mm	20	dia of steel bar 1 in mm	20
numbers	4	numbers	2
dia of steel bar 2 in mm	20	dia of steel bar 2 in mm	20
numbers	0	numbers	0
area provided in mm ² -at top	1256.64	area provided in mm ² -at bottom	628.32
M- resistance of section in tm	18.5		
M- resistance of section at limit state	33.4		
Ast for positive moment			
Mdes +ve in tm	15.25		
steel at bottom		steel at top	
dia of steel bar 1	20	dia of steel bar 1	20
numbers	4	numbers	2
dia of steel bar 2	20	dia of steel bar 2	20
numbers	0	numbers	0
area provided in mm ² -at bottom	1256.64	area provided in mm ² -at top	628.32
M- resistance of section	18.5		
M- resistance of section at limit state	33		

shear from torsion in T	18.13		
shear force in T	28.28		
shear stress in Mpa	1.12		
area of tension reinforcement	0.51		
allowable shear stress in Mpa	0.31		
number of legs	2		
diameter of shear bars in mm	10		
spacing of shear reinforcement in mm	127		
fix spacing in mm	125	fix spacing at joints for 2d	100
TYPICAL OFFICE FLOOR BEAM-INTERIOR-SHORT			
loading on slab in T/m ²	0.775		
wall thickness in m	0.2		
wall height in m	3.75		
wall material density in T/m ³	2.2		
breadth in m	0.35		
total depth in m	0.6		
span in m	3.9		
span in m left	5.1		
span in m right	5.1		
loading intensity in t/m-bending moment	3.93		
loading intensity in t/m-for column loads	3.56		
fix breadth of beam in mm	350		
design moment for trial in tm	5.98		
cracked effective depth in mm	392.39		
depth for trial in mm	600		
static moment	5.98		
seismic moment	1.97		
design moment in tm	9.55		
cracked effective depth in mm	452.6		
effective depth at limit state in mm	280.82		
fix total depth in mm	600		
Ast for negative moment			
Mdes -ve in tm (LSM)	9.55		
Mdes -ve in tm (WSM)	7.96		
steel at top		steel at bottom	
dia of steel bar 1 in mm	16	dia of steel bar 1 in mm	16
numbers	4	numbers	3
dia of steel bar 2 in mm	20	dia of steel bar 2 in mm	20
numbers	0	numbers	0
area provided in mm ² -at top	804.25	area provided in mm ² - at bottom	603.19
M- resistance of section in tm	9.4		
M- resistance of section at limit state	15.05		
Ast for positive moment			
Mdes +ve in tm	7.48		
steel at bottom		steel at top	
dia of steel bar 1	16	dia of steel bar 1	16
numbers	4	numbers	3
dia of steel bar 2	20	dia of steel bar 2	20
numbers	0	numbers	0

area provided in mm ² -at bottom	804.25	area provided in mm ² -at top	603.19
M- resistance of section	9.4		
M- resistance of section at limit state	15.05		
shear force in T	9.20		
shear stress in Mpa	0.46		
area of tension reinforcement	0.41		
allowable shear stress in Mpa	0.31		
number of legs	2		
diameter of shear bars in mm	8		
spacing of shear reinforcement in mm	427		
fix spacing in mm	200	fix spacing at joints for 2d	100
TYPICAL OFFICE FLOOR BEAM-EXTERIOR-SHORT			
loading on slab in T/m ²	0.775		
wall thickness in m	0.2		
wall height in m	3.75		
wall material density in T/m ³	2.2		
breadth in m	0.35		
total depth in m	0.6		
span in m	3.91		
span in m left	5.15		
span in m right	0		
loading intensity in t/m-bending moment	2.99		
loading intensity in t/m-for column loads	2.80		
fix breadth of beam in mm	350		
design moment for trial in tm	4.57		
cracked effective depth in mm	343.06		
depth for trial in mm	600		
static moment	4.57		
seismic moment	0.46		
torsional moment/m from slab in Tm	0.56		
moment in beam from torsion in Tm	3.50		
design moment in tm	10.23		
cracked effective depth in mm	468.44		
effective depth at limit state in mm	290.65		
fix total depth in mm	600		
Ast for negative moment			
Mdes -ve in tm (LSM)	10.23		
Mdes -ve in tm (WSM)	8.53		
steel at top		steel at bottom	
dia of steel bar 1 in mm	16	dia of steel bar 1 in mm	16
numbers	4	numbers	3
dia of steel bar 2 in mm	20	dia of steel bar 2 in mm	20
numbers	0	numbers	0
area provided in mm ² -at top	804.25	area provided in mm ² -at bottom	603.19
M- resistance of section in tm	9.4		
M- resistance of section at limit state	15.05		
Ast for positive moment			
Mdes +ve in tm	7.65		

steel at bottom		steel at top	
dia of steel bar 1	16	dia of steel bar 1	16
numbers	4	numbers	3
dia of steel bar 2	20	dia of steel bar 2	20
numbers	0	numbers	0
area provided in mm ² -at bottom	804.25	area provided in mm ² -at top	603.19
M- resistance of section	9.34		
M- resistance of section at limit state	15.05		
shear from torsion in T	10.0		
shear force in T	17.03		
shear stress in Mpa	0.86		
area of tension reinforcement	0.41		
allowable shear stress in Mpa	0.31		
number of legs	2		
diameter of shear bars in mm	10		
spacing of shear reinforcement in mm	188		
fix spacing in mm	140	fix spacing at joints for 2d	100
DESIGN OF OPERATING PLATFORM CANTILEVER SLAB			
assumed thickness in m	0.125		
cantilever span in m	1		
live load in t/m ²	0.3		
finishes in t/m ²	0.1		
total load in t/m ²	0.7125		
design moment	0.35625	non-crack depth in mm	107.2
		cracked section	56.7
fix depth of roof slab in mm	125	effective depth in mm	95
fix dia for top steel	8	spacing	120
fix dia for bottom steel	8	spacing	120
area of steel given in mm ²	top	418.88	0.34
	bottom	418.88	0.34
moment of resistance of section in ws	0.9	tm	
moment of resistance of section in LS	1.75	tm	
COLUMN LOAD INTENSITY FOR FOUNDATION DESIGN-TF			
corner column			
top slab length in m	5.15	top slab breadth in m	1.58
top beam breadth in m	0	top beam drop in m	0.45
slab loading intensity T ² (live load and finishes)	0		
top slab thickness in m	0		
column breadth in m	0.35	column width in m	0.45
columns height in m	3.75		
wall thickness in m	0.15	wall height in m	1.2
wall density in T/m ³	2		
water column height in m	0		
floor slab length in m	5.15	floor slab breadth in m	1.58
floor slab thickness in m	0.15		
slab loading intensity T ² (live load and finishes)	0.3		
floor beam breadth in m	0.35	floor beam drop in m	0.5

load on column in T	5.53		
exterior coulumn type-1			
top slab length-1 in m	3.91	top slab cross length in m	5.15
top slab length-2 in m	3.91		
top beam breadth in m	0	top beam drop in m	0.45
slab loading intensity $T/2$ (live load and finishes)	0		
top slab thickness in m	0		
column beadth in m	0.35	column width in m	0.45
columns height in m	3.75		
wall thickness in m	0.15	wall height in m	1.2
wall density in T/m^3	2		
water column height in m	0		
floor slab length-1 in m	3.91	floor slab cross length in m	5.15
floor slab length-2 in m	3.91		
floor slab thickness in m	0.15		
slab loading intensity $T/2$ (live load and finishes)	0.3		
floor beam breadth in m	0.35	floor beam drop in m	0.525
load on column in T	12.66		
exterior coulumn type-2			
top slab length-1 in m	3.91	top slab cross length in m	5.15
top slab length-2 in m	3.68		
top beam breadth in m	0	top beam drop in m	0.45
slab loading intensity $T/2$ (live load and finishes)	0		
top slab thickness in m	0		
column breadth in m	0.35	column width in m	0.45
columns height in m	3.75		
wall thickness in m	0.15	wall height in m	1.2
wall density in T/m^3	2		
water column height in m	0		
floor slab length-1 in m	3.91	floor slab cross length in m	5.15
floor slab length-2 in m	3.68		
floor slab thickness in m	0.15		
slab loading intensity $T/2$ (live load and finishes)	0.3		
floor beam breadth in m	0.35	floor beam drop in m	0.525
load on column in T	12.37		
exterior coulumn type-3			
top slab length-1 in m	3.68	top slab cross length in m	5.15
top slab length-2 in m	3.68		
top beam breadth in m	0	top beam drop in m	0.45
slab loading intensity $T/2$ (live load and finishes)	0		
top slab thickness in m	0		
column beadth in m	0.35	column width in m	0.45

columns height in m	3.75		
wall thickness in m	0.15	wall height in m	1.2
wall density in T/m ³	2.5		
water column height in m	0		
floor slab length-1 in m	3.68	floor slab cross length in m	5.15
floor slab length-2 in m	3.68		
floor slab thickness in m	0.15		
slab loading intensity T/2 (live load and finishes)	0.3		
floor beam breadth in m	0.35	floor beam drop in m	0.525
load on column in T	12.40		
exterior coulumn type-4			
top slab length-1 in m	5.15	top slab cross length in m	1.58
top slab length-2 in m	5.15		
top beam breadth in m	0	top beam drop in m	0.45
slab loading intensity T/2 (live load and finishes)	0		
top slab thickness in m	0		
column breadth in m	0.35	column width in m	0.45
columns height in m	3.75		
wall thickness in m	0.15	wall height in m	1.2
wall density in T/m ³	2		
water column height in m	0		
floor slab length-1 in m	5.15	floor slab cross length in m	1.58
floor slab length-2 in m	5.15		
floor slab thickness in m	0.15		
slab loading intensity T/2 (live load and finishes)	0.3		
floor beam breadth in m	0.35	floor beam drop in m	0.525
load on column in T	8.81		
exterior coulumn type-5			
top slab length-1 in m	1.58	top slab cross length in m	5.15
top slab length-2 in m	3.91		
top beam breadth in m	0	top beam drop in m	0.45
slab loading intensity T/2 (live load and finishes)	0		
top slab thickness in m	0		
column breadth in m	0.35	column width in m	0.45
columns height in m	3.75		
wall thickness in m	0.15	wall height in m	1.2
wall density in T/m ³	2		
water column height in m	0		
floor slab length-1 in m	1.58	floor slab cross length in m	5.15
floor slab length-2 in m	3.91		
floor slab thickness in m	0.15		
slab loading intensity T/2 (live load and finishes)	0.3		

floor beam breadth in m	0.35	floor beam drop in m	0.525
load on column in T	9.68		
interior coulmn type-1			
top slab length-1 in m	3.91	top slab cross length-1 in m	5.15
top slab length-2 in m	3.91	top slab cross length-2 in m	5.15
top beam breadth in m	0	top beam drop in m	0.45
slab loading intensity $T/2$ (live load and finishes)	0		
top slab thickness in m	0		
column beadth in m	0.35	column width in m	0.45
columns height in m	3.75		
wall thickness in m	0.15	wall height in m	1.2
wall density in T/m^3	2		
water column height in m	0		
floor slab length-1 in m	3.91	floor slab cross length-1 in m	5.15
floor slab length-2 in m	3.91	floor slab cross length-2 in m	5.15
floor slab thickness in m	0.15		
slab loading intensity $T/2$ (live load and finishes)	0.3		
floor beam breadth in m	0.35	floor beam drop in m	0.525
load on column in T	22.49		
interior coulmn type-2			
top slab length-1 in m	3.91	top slab cross length-1 in m	5.15
top slab length-2 in m	3.68	top slab cross length-2 in m	5.15
top beam breadth in m	0	top beam drop in m	0.45
slab loading intensity $T/2$ (live load and finishes)	0		
top slab thickness in m	0		
column breadth in m	0.35	column width in m	0.45
columns height in m	3.75		
wall thickness in m	0.15	wall height in m	1.2
wall density in T/m^3	2		
water column height in m	0		
floor slab length-1 in m	3.91	floor slab cross length-1 in m	5.15
floor slab length-2 in m	3.68	floor slab cross length-2 in m	5.15
floor slab thickness in m	0.15		
slab loading intensity $T/2$ (live load and finishes)	0.3		
floor beam breadth in m	0.35	floor beam drop in m	0.525
load on column in T	22.00		
interior coulmn type-3			
top slab length-1 in m	3.68	top slab cross length-1 in m	5.15
top slab length-2 in m	3.68	top slab cross length-2 in m	5.15

top beam breadth in m	0	top beam drop in m	0.45
slab loading intensity $T/2$ (live load and finishes)	0		
top slab thickness in m	0		
column breadth in m	0.35	column width in m	0.45
columns height in m	3.75		
wall thickness in m	0.15	wall height in m	1.2
wall density in T/m^3	2		
water column height in m	0		
floor slab length-1 in m	3.68	floor slab cross length-1 in m	5.15
floor slab length-2 in m	3.68	floor slab cross length-2 in m	5.15
floor slab thickness in m	0.15		
slab loading intensity $T/2$ (live load and finishes)	0.3		
floor beam breadth in m	0.35	floor beam drop in m	0.525
load on column in T	21.50		
interior column type-4			
top slab length-1 in m	1.58	top slab cross length-1 in m	5.15
top slab length-2 in m	3.91	top slab cross length-2 in m	5.15
top beam breadth in m	0	top beam drop in m	0.45
slab loading intensity $T/2$ (live load and finishes)	0		
top slab thickness in m	0		
column breadth in m	0.35	column width in m	0.45
columns height in m	3.75		
wall thickness in m	0.15	wall height in m	1.2
wall density in T/m^3	2		
water column height in m	0		
floor slab length-1 in m	1.58	floor slab cross length-1 in m	5.15
floor slab length-2 in m	3.91	floor slab cross length-2 in m	5.15
floor slab thickness in m	0.15		
slab loading intensity $T/2$ (live load and finishes)	0.3		
floor beam breadth in m	0.35	floor beam drop in m	0.525
load on column in T	17.49		
column type	load in T	number	total
corner column	5.53	4	22.1
average load in T-corner	5.53		
maximum load in T-corner	5.53		
exterior column-type-1	12.66	4	50.6
exterior column-type-2	12.37	4	49.5
exterior column-type-3	12.40	2	24.8
exterior column-type-4	8.81	10	88.1
exterior column-type-5	9.68	4	38.7
average load in T-exterior	10.49		
maximum load in T-exterior	12.66		

interior column-type-1	22.49	10	224.9
interior column-type-2	22.00	10	220.0
interior column-type-3	21.50	5	107.5
interior column-type-4	17.49	10	174.9
average load in T-interior	20.8		
maximum load in T-interior	22.49		
INTERIOR COLUMNS		EXTERIOR COLUMNS	
axial load in t	22.5	axial load in t	12.7
		axial load in t for corner column	5.5
factored axial load in t	34	factored axial load in t	19
static moment in tm	0.45	static moment in tm	0.25
seismic moment in tm	3.72	seismic moment in tm	1.86
breadth of the column adopted in mm	350	breadth of the column adopted in mm	350
depth of the column adopted in mm	450	depth of the column adopted in mm	450
dia of steel bars 1	25	dia of steel bars 1	25
numbers	8		8
dia of steel bars 2	12	dia of steel bars 2	12
numbers	0		0
total area of steel in mm ²	3927	total area of steel in mm ²	3927
% steel	2.49	% steel	2.49
axial load capacity in t	262.76	axial load capacity in t	262.76
ratio	0.13	ratio	0.07
unsupported length in m	4	unsupported length in m	4
L/d ratio	11.43	L/d ratio	11.43
Pu/fck b d	0.09	Pu/fck b d	0.05
p/fck	0.1	p/fck	0.1
d'/B	0.12	d'/B	0.12
d'/D	0.09	d'/D	0.09
Mu/fck D b ² from chart	0.13		0.125
Mu/fck b D ² from chart	0.15	Mu/fck b D ² from chart	0.15
<i>seismic force in X direction</i>		<i>seismic force in X direction</i>	
Mux l	265781250	Mux l	265781250
Mux	49087412.4	Mux	24876420.44
Muy l	179156250	Muy l	172265625
Muy	49087412.4	Muy	24876420.44
Puz in t	299.42	Puz in t	299.42
Pu/Puz	0.11	Pu/Puz	0.06
alfa n	1	alfa n	1.00
check	0.46	check	0.24
<i>seismic force in Y direction</i>		<i>seismic force in Y direction</i>	
Mux l	265781250	Mux l	265781250
Mux	49087412.4	Mux	24876420.44
Muy l	179156250	Muy l	172265625
Muy	49087412.4	Muy	24876420.44
Puz in t	260.04	Puz in t	260.04

Pu/Puz	0.11	Pu/Puz	0.06
alfa n	1	alfa n	1
check	0.46	check	0.24
COLUMN LOAD INTENSITY FOR FOUNDATION DESIGN-SF			
corner column			
top slab length in m	5.15	top slab breadth in m	1.58
top beam breadth in m	0	top beam drop in m	0.45
slab loading intensity $T/2$ (live load and finishes)	0		
top slab thickness in m	0		
column breadth in m	0.35	column width in m	0.6
columns height in m	3.75		
wall thickness in m	0.2	wall height in m	2
wall density in T/m^3	2		
water column height in m	0		
floor slab length in m	5.15	floor slab breadth in m	1.58
floor slab thickness in m	0.15		
slab loading intensity $T/2$ (live load and finishes)	0.3		
floor beam breadth in m	0.35	floor beam drop in m	0.5
load on column in T	7.51		
exterior coulmn type-1			
top slab length-1 in m	3.91	top slab cross length in m	5.15
top slab length-2 in m	3.91		
top beam breadth in m	0	top beam drop in m	0.45
slab loading intensity $T/2$ (live load and finishes)	0		
top slab thickness in m	0		
column beadth in m	0.35	column width in m	0.6
columns height in m	3.75		
wall thickness in m	0.15	wall height in m	3.75
wall density in T/m^3	2		
water column height in m	0		
floor slab length-1 in m	3.91	floor slab cross length in m	5.15
floor slab length-2 in m	3.91		
floor slab thickness in m	0.15		
slab loading intensity $T/2$ (live load and finishes)	0.25		
floor beam breadth in m	0.35	floor beam drop in m	0.525
load on column in T	15.64		
exterior column type-2			
top slab length-1 in m	3.91	top slab cross length in m	5.15
top slab length-2 in m	3.68		
top beam breadth in m	0	top beam drop in m	0.45
slab loading intensity $T/2$ (live load and finishes)	0		
top slab thickness in m	0		
column breadth in m	0.35	column width in m	0.6

columns height in m	3.75		
wall thickness in m	0.15	wall height in m	3.75
wall density in T/m ³	2		
water column height in m	0		
floor slab length-1 in m	3.91	floor slab cross length in m	5.15
floor slab length-2 in m	3.68		
floor slab thickness in m	0.15		
slab loading intensity T/2 (live load and finishes)	0.25		
floor beam breadth in m	0.35	floor beam drop in m	0.525
load on column in T	15.27		
exterior column type-3			
top slab length-1 in m	3.68	top slab cross length in m	5.15
top slab length-2 in m	3.68		
top beam breadth in m	0	top beam drop in m	0.45
slab loading intensity T/2 (live load and finishes)	0		
top slab thickness in m	0		
column breadth in m	0.35	column width in m	0.6
columns height in m	3.75		
wall thickness in m	0.15	wall height in m	3.75
wall density in T/m ³	2.5		
water column height in m	0		
floor slab length-1 in m	3.68	floor slab cross length in m	5.15
floor slab length-2 in m	3.68		
floor slab thickness in m	0.15		
slab loading intensity T/2 (live load and finishes)	0.25		
floor beam breadth in m	0.35	floor beam drop in m	0.525
load on column in T	15.94		
exterior column type-4			
top slab length-1 in m	5.15	top slab cross length in m	1.58
top slab length-2 in m	5.15		
top beam breadth in m	0	top beam drop in m	0.45
slab loading intensity T/2 (live load and finishes)	0		
top slab thickness in m	0		
column breadth in m	0.35	column width in m	0.6
columns height in m	3.75		
wall thickness in m	0.15	wall height in m	3.75
wall density in T/m ³	2		
water column height in m	0		
floor slab length-1 in m	5.15	floor slab cross length in m	1.58
floor slab length-2 in m	5.15		
floor slab thickness in m	0.15		
slab loading intensity T/2 (live load and finishes)	0.25		

floor beam breadth in m	0.35	floor beam drop in m	0.525
load on column in T	13.03		
exterior column type-5			
top slab length-1 in m	1.58	top slab cross length in m	5.15
top slab length-2 in m	3.91		
top beam breadth in m	0	top beam drop in m	0.45
slab loading intensity $T/2$ (live load and finishes)	0		
top slab thickness in m	0		
column breadth in m	0.35	column width in m	0.6
columns height in m	3.75		
wall thickness in m	0.15	wall height in m	3.75
wall density in T/m^3	2		
water column height in m	0		
floor slab length-1 in m	1.58	floor slab cross length in m	5.15
floor slab length-2 in m	3.91		
floor slab thickness in m	0.15		
slab loading intensity $T/2$ (live load and finishes)	0.25		
floor beam breadth in m	0.35	floor beam drop in m	0.525
load on column in T	11.92		
interior column type-1			
top slab length-1 in m	3.91	top slab cross length-1 in m	5.15
top slab length-2 in m	3.91	top slab cross length-2 in m	5.15
top beam breadth in m	0	top beam drop in m	0.45
slab loading intensity $T/2$ (live load and finishes)	0		
top slab thickness in m	0		
column breadth in m	0.35	column width in m	0.6
columns height in m	3.75		
wall thickness in m	0.15	wall height in m	1.5
wall density in T/m^3	2		
water column height in m	0		
floor slab length-1 in m	3.91	floor slab cross length-1 in m	5.15
floor slab length-2 in m	3.91	floor slab cross length-2 in m	5.15
floor slab thickness in m	0.15		
slab loading intensity $T/2$ (live load and finishes)	0.25		
floor beam breadth in m	0.35	floor beam drop in m	0.525
load on column in T	22.79		
interior column type-2			
top slab length-1 in m	3.91	top slab cross length-1 in m	5.15
top slab length-2 in m	3.68	top slab cross length-2 in m	5.15
top beam breadth in m	0	top beam drop in m	0.45

slab loading intensity $T/2$ (live load and finishes)	0		
top slab thickness in m	0		
column breadth in m	0.35	column width in m	0.6
columns height in m	3.75		
wall thickness in m	0.15	wall height in m	1.5
wall density in T/m^3	2		
water column height in m	0		
floor slab length-1 in m	3.91	floor slab cross length-1 in m	5.15
floor slab length-2 in m	3.68	floor slab cross length-2 in m	5.15
floor slab thickness in m	0.15		
slab loading intensity $T/2$ (live load and finishes)	0.25		
floor beam breadth in m	0.35	floor beam drop in m	0.525
load on column in T	22.32		
interior column type-3			
top slab length-1 in m	3.68	top slab cross length-1 in m	5.15
top slab length-2 in m	3.68	top slab cross length-2 in m	5.15
top beam breadth in m	0	top beam drop in m	0.45
slab loading intensity $T/2$ (live load and finishes)	0		
top slab thickness in m	0		
column breadth in m	0.35	column width in m	0.6
columns height in m	3.75		
wall thickness in m	0.15	wall height in m	1.5
wall density in T/m^3	2		
water column height in m	0		
floor slab length-1 in m	3.68	floor slab cross length-1 in m	5.15
floor slab length-2 in m	3.68	floor slab cross length-2 in m	5.15
floor slab thickness in m	0.15		
slab loading intensity $T/2$ (live load and finishes)	0.25		
floor beam breadth in m	0.35	floor beam drop in m	0.525
load on column in T	21.84		
interior coulmn type-4			
top slab length-1 in m	1.58	top slab cross length-1 in m	5.15
top slab length-2 in m	3.91	top slab cross length-2 in m	5.15
top beam breadth in m	0	top beam drop in m	0.45
slab loading intensity $T/2$ (live load and finishes)	0		
top slab thickness in m	0		
column breadth in m	0.35	column width in m	0.6
columns height in m	3.75		
wall thickness in m	0.15	wall height in m	1.5

wall density in T/m ³	2		
water column height in m	0		
floor slab length-1 in m	1.58	floor slab cross length-1 in m	5.15
floor slab length-2 in m	3.91	floor slab cross length-2 in m	5.15
floor slab thickness in m	0.15		
slab loading intensity T/2 (live load and finishes)	0.25		
floor beam breadth in m	0.35	floor beam drop in m	0.525
load on column in T	17.98		
column type	load in T	number	total
corner column	7.51	4	30.0
average load in T-corner	7.51		
maximum load in T-corner	7.51		
exterior column-type-1	15.64	4	62.6
exterior column-type-2	15.27	4	61.1
exterior column-type-3	15.94	2	31.9
exterior column-type-4	13.03	10	130.3
exterior column-type-5	11.92	4	47.7
average load in T-exterior	13.90		
maximum load in T-exterior	15.94		
interior column-type-1	22.79	10	227.9
interior column-type-2	22.32	10	223.2
interior column-type-3	21.84	5	109.2
interior column-type-4	17.98	10	179.8
average load in T-interior	21.1		
maximum load in T-interior	22.79		
INTERIOR COLUMNS		EXTERIOR COLUMNS	
axial load in t	22.8	axial load in t	15.9
		axial load in t for corner column	7.5
factored axial load in t	34	factored axial load in t	24
static moment in tm	0.46	static moment in tm	0.32
seismic moment in tm	3.72	seismic moment in tm	1.86
breadth of the column adopted in mm	350	breadth of the column adopted in mm	350
depth of the column adopted in mm	600	depth of the column adopted in mm	600
dia of steel bars 1	25	dia of steel bars 1	25
numbers	8		8
dia of steel bars 2	12	dia of steel bars 2	12
numbers	0		0
total area of steel in mm ²	3927	total area of steel in mm ²	3927
% steel	1.87	% steel	1.87
axial load capacity in t	315.26	axial load capacity in t	315.26
ratio	0.11	ratio	0.08
unsupported length in m	4	unsupported length in m	4
L/d ratio	11.43	L/d ratio	11.43

Pu/fck b d	0.07	Pu/fck b d	0.05
p/fck	0.075	p/fck	0.075
d/B	0.12	d/B	0.12
d/D	0.07	d/D	0.07
Mu/fck D b ² from chart	0.13		0.125
Mu/fck b D ² from chart	0.15	Mu/fck b D ² from chart	0.15
<i>seismic force in X direction</i>		<i>seismic force in X direction</i>	
Mux l	472500000	Mux l	472500000
Mux	49158223.9	Mux	25648748.99
Muy l	238875000	Muy l	229687500
Muy	49158223.9	Muy	25648748.99
Puz in t	358.48	Puz in t	358.48
Pu/Puz	0.1	Pu/Puz	0.07
alfa n	1	alfa n	1.00
check	0.31	check	0.17
<i>seismic force in Y direction</i>		<i>seismic force in Y direction</i>	
Mux l	472500000	Mux l	472500000
Mux	49158223.9	Mux	25648748.99
Muy l	238875000	Muy l	229687500
Muy	49158223.9	Muy	25648748.99
Puz in t	260.04	Puz in t	260.04
Pu/Puz	0.1	Pu/Puz	0.07
alfa n	1	alfa n	1
check	0.31	check	0.17
COLUMN LOAD INTENSITY FOR FOUNDATION DESIGN-FF-OPERATING PLATFORM			
platform cut off is neglected			
corner column			
top slab length in m	5.15	top slab breadth in m	1.58
top beam breadth in m	0	top beam drop in m	0.45
slab loading intensity T ² (live load and finishes)	0		
top slab thickness in m	0		
column breadth in m	0.35	column width in m	0.6
columns height in m	3.75		
wall thickness in m	0.15	wall height in m	3.75
wall density in T/m ³	2		
water column height in m	0		
floor slab length in m	5.15	floor slab breadth in m	1.58
floor slab thickness in m	0.125		
slab loading intensity T ² (live load and finishes)	0.25		
floor beam breadth in m	0	floor beam drop in m	0.5
load on column in T	6.90		
exterior column type-1			
top slab length-1 in m	3.91	top slab cross length in m	5.15
top slab length-2 in m	3.91		
top beam breadth in m	0	top beam drop in m	0.45
slab loading intensity T ² (live load and finishes)	0		

top slab thickness in m	0		
column breadth in m	0.35	column width in m	0.6
columns height in m	3.75		
wall thickness in m	0.15	wall height in m	3.75
wall density in T/m ³	2		
water column height in m	0		
floor slab length-1 in m	3.91	floor slab cross length in m	5.15
floor slab length-2 in m	3.91		
floor slab thickness in m	0.125		
slab loading intensity T/2 (live load and finishes)	0.25		
floor beam breadth in m	0	floor beam drop in m	0.525
load on column in T	12.03		
exterior column type-2			
top slab length-1 in m	3.91	top slab cross length in m	5.15
top slab length-2 in m	3.68		
top beam breadth in m	0	top beam drop in m	0.45
slab loading intensity T/2 (live load and finishes)	0		
top slab thickness in m	0		
column breadth in m	0.35	column width in m	0.6
columns height in m	3.75		
wall thickness in m	0.15	wall height in m	3.75
wall density in T/m ³	2		
water column height in m	0		
floor slab length-1 in m	3.91	floor slab cross length in m	5.15
floor slab length-2 in m	3.68		
floor slab thickness in m	0.125		
slab loading intensity T/2 (live load and finishes)	0.25		
floor beam breadth in m	0	floor beam drop in m	0.525
load on column in T	11.73		
exterior column type-3			
top slab length-1 in m	3.68	top slab cross length in m	5.15
top slab length-2 in m	3.68		
top beam breadth in m	0	top beam drop in m	0.45
slab loading intensity T/2 (live load and finishes)	0		
top slab thickness in m	0		
column breadth in m	0.35	column width in m	0.6
columns height in m	3.75		
wall thickness in m	0.15	wall height in m	3.75
wall density in T/m ³	2.5		
water column height in m	0		
floor slab length-1 in m	3.68	floor slab cross length in m	5.15
floor slab length-2 in m	3.68		
floor slab thickness in m	0.125		

slab loading intensity $T/2$ (live load and finishes)	0.25		
floor beam breadth in m	0	floor beam drop in m	0.525
load on column in T	12.47		
exterior column type-4			
top slab length-1 in m	5.15	top slab cross length in m	1.58
top slab length-2 in m	5.15		
top beam breadth in m	0	top beam drop in m	0.45
slab loading intensity $T/2$ (live load and finishes)	0		
top slab thickness in m	0		
column breadth in m	0.35	column width in m	0.6
columns height in m	3.75		
wall thickness in m	0.15	wall height in m	3.75
wall density in T/m^3	2		
water column height in m	0		
floor slab length-1 in m	5.15	floor slab cross length in m	1.58
floor slab length-2 in m	5.15		
floor slab thickness in m	0.125		
slab loading intensity $T/2$ (live load and finishes)	0.25		
floor beam breadth in m	0	floor beam drop in m	0.525
load on column in T	10.05		
exterior coulmn type-5			
top slab length-1 in m	1.58	top slab cross length in m	5.15
top slab length-2 in m	3.91		
top beam breadth in m	0	top beam drop in m	0.45
slab loading intensity $T/2$ (live load and finishes)	0		
top slab thickness in m	0		
column breadth in m	0.35	column width in m	0.6
columns height in m	3.75		
wall thickness in m	0.15	wall height in m	3.75
wall density in T/m^3	2		
water column height in m	0		
floor slab length-1 in m	1.58	floor slab cross length in m	5.15
floor slab length-2 in m	3.91		
floor slab thickness in m	0.125		
slab loading intensity $T/2$ (live load and finishes)	0.25		
floor beam breadth in m	0	floor beam drop in m	0.525
load on column in T	9.03		
interior column type-1			
top slab length-1 in m	3.91	top slab cross length-1 in m	5.15
top slab length-2 in m	3.91	top slab cross length-2 in m	5.15
top beam breadth in m	0	top beam drop in m	0.45

slab loading intensity $T/2$ (live load and finishes)	0		
top slab thickness in m	0		
column breadth in m	0.35	column width in m	0.6
columns height in m	3.75		
wall thickness in m	0.15	wall height in m	1.5
wall density in T/m^3	2		
water column height in m	0		
floor slab length-1 in m	3.91	floor slab cross length-1 in m	5.15
floor slab length-2 in m	3.91	floor slab cross length-2 in m	5.15
floor slab thickness in m	0.125		
slab loading intensity $T/2$ (live load and finishes)	0.25		
floor beam breadth in m	0	floor beam drop in m	0.525
load on column in T	17.37		
interior column type-2			
top slab length-1 in m	3.91	top slab cross length-1 in m	5.15
top slab length-2 in m	3.68	top slab cross length-2 in m	5.15
top beam breadth in m	0	top beam drop in m	0.45
slab loading intensity $T/2$ (live load and finishes)	0		
top slab thickness in m	0		
column breadth in m	0.35	column width in m	0.6
columns height in m	3.75		
wall thickness in m	0.15	wall height in m	1.5
wall density in T/m^3	2		
water column height in m	0		
floor slab length-1 in m	3.91	floor slab cross length-1 in m	5.15
floor slab length-2 in m	3.68	floor slab cross length-2 in m	5.15
floor slab thickness in m	0.15		
slab loading intensity $T/2$ (live load and finishes)	0.25		
floor beam breadth in m	0.35	floor beam drop in m	0.525
load on column in T	22.32		
interior column type-3			
top slab length-1 in m	3.68	top slab cross length-1 in m	5.15
top slab length-2 in m	3.68	top slab cross length-2 in m	5.15
top beam breadth in m	0	top beam drop in m	0.45
slab loading intensity $T/2$ (live load and finishes)	0		
top slab thickness in m	0		
column breadth in m	0.35	column width in m	0.6
columns height in m	3.75		
wall thickness in m	0.15	wall height in m	1.5

wall density in T/m ³	2		
water column height in m	0		
floor slab length-1 in m	3.68	floor slab cross length-1 in m	5.15
floor slab length-2 in m	3.68	floor slab cross length-2 in m	5.15
floor slab thickness in m	0.15		
slab loading intensity T/2 (live load and finishes)	0.25		
floor beam breadth in m	0.35	floor beam drop in m	0.525
load on column in T	21.84		
interior column type-4			
top slab length-1 in m	1.58	top slab cross length-1 in m	5.15
top slab length-2 in m	3.91	top slab cross length-2 in m	5.15
top beam breadth in m	0	top beam drop in m	0.45
slab loading intensity T/2 (live load and finishes)	0		
top slab thickness in m	0		
column breadth in m	0.35	column width in m	0.6
columns height in m	3.75		
wall thickness in m	0.15	wall height in m	1.5
wall density in T/m ³	2		
water column height in m	0		
floor slab length-1 in m	1.58	floor slab cross length-1 in m	5.15
floor slab length-2 in m	3.91	floor slab cross length-2 in m	5.15
floor slab thickness in m	0.125		
slab loading intensity T/2 (live load and finishes)	0.25		
floor beam breadth in m	0	floor beam drop in m	0.525
load on column in T	13.47		
column type	load in T	number	total
corner column	6.90	4	27.6
average load in T-corner	6.90		
maximum load in T-corner	6.90		
exterior column-type-1	12.03	4	48.1
exterior column-type-2	11.73	4	46.9
exterior column-type-3	12.47	2	24.9
exterior column-type-4	10.05	10	100.5
exterior column-type-5	9.03	4	36.1
average load in T-exterior	10.69		
maximum load in T-exterior	12.47		
interior column-type-1	17.37	10	173.7
interior column-type-2	22.32	10	223.2
interior column-type-3	21.84	5	109.2
interior column-type-4	13.47	10	134.7
average load in T-interior	18.3		
maximum load in T-interior	22.32		
INTERIOR COLUMNS		EXTERIOR COLUMNS	

axial load in t	22.3	axial load in t	12.5
		axial load in t for corner column	6.9
factored axial load in t	33	factored axial load in t	19
static moment in tm	0.45	static moment in tm	0.25
seismic moment in tm	3.72	seismic moment in tm	1.86
breadth of the column adopted in mm	350	breadth of the column adopted in mm	350
depth of the column adopted in mm	600	depth of the column adopted in mm	600
dia of steel bars 1	25	dia of steel bars 1	25
numbers	8		8
dia of steel bars 2	12	dia of steel bars 2	12
numbers	0		0
total area of steel in mm ²	3927	total area of steel in mm ²	3927
% steel	1.87	% steel	1.87
axial load capacity in t	315.26	axial load capacity in t	315.26
ratio	0.11	ratio	0.06
unsupported length in m	4	unsupported length in m	4
L/d ratio	11.43	L/d ratio	11.43
Pu/fck b d	0.06	Pu/fck b d	0.04
p/fck	0.075	p/fck	0.075
d'/B	0.12	d'/B	0.12
d'/D	0.07	d'/D	0.07
Mu/fck D b ² from chart	0.12		0.11
Mu/fck b D ² from chart	0.13	Mu/fck b D ² from chart	0.12
<i>seismic force in X direction</i>		<i>seismic force in X direction</i>	
Mux l	409500000	Mux l	378000000
Mux	49046452.5	Mux	24832798.56
Muy l	220500000	Muy l	202125000
Muy	49046452.5	Muy	24832798.56
Puz in t	358.48	Puz in t	358.48
Pu/Puz	0.09	Pu/Puz	0.05
alfa n	1	alfa n	1.00
check	0.34	check	0.19
<i>seismic force in Y direction</i>		<i>seismic force in Y direction</i>	
Mux l	409500000	Mux l	378000000
Mux	49046452.5	Mux	24832798.56
Muy l	220500000	Muy l	202125000
Muy	49046452.5	Muy	24832798.56
Puz in t	260.04	Puz in t	260.04
Pu/Puz	0.09	Pu/Puz	0.05
alfa n	1	alfa n	1
check	0.34	check	0.19
COLUMN LOAD INTENSITY FOR FOUNDATION DESIGN-GF-FILTER			
corner column			
top slab length in m	5.15	top slab breadth in m	1.58
top beam breadth in m	0	top beam drop in m	0.45

slab loading intensity $T/2$ (live load and finishes)	0		
top slab thickness in m	0		
column breadth in m	0	column width in m	0.75
columns height in m	3.75		
wall thickness in m	0.35	wall height in m	3.35
wall density in T/m^3	2.5		
water column height in m	0		
floor slab length in m	5.15	floor slab breadth in m	1.58
floor slab thickness in m	0.35		
slab loading intensity $T/2$ (live load and finishes)	3.35		
floor beam breadth in m	0.35	floor beam drop in m	0.8
load on column in T	20.81		
exterior column type-1			
top slab length-1 in m	1.58	top slab cross length in m	5.15
top slab length-2 in m	3.91		
top beam breadth in m	0	top beam drop in m	0.45
slab loading intensity $T/2$ (live load and finishes)	0		
top slab thickness in m	0		
column breadth in m	0	column width in m	0.75
columns height in m	4.25		
wall thickness in m	0.35	wall height in m	3.35
wall density in T/m^3	2.5		
water column height in m	0		
floor slab length-1 in m	1.58	floor slab cross length in m	5.15
floor slab length-2 in m	3.91		
floor slab thickness in m	0.35		
slab loading intensity $T/2$ (live load and finishes)	4.765		
floor beam breadth in m	0.35	floor beam drop in m	0.8
load on column in T	45.58		
exterior column type-2			
top slab length-1 in m	3.91	top slab cross length in m	5.15
top slab length-2 in m	3.91		
top beam breadth in m	0	top beam drop in m	0.45
slab loading intensity $T/2$ (live load and finishes)	0		
top slab thickness in m	0		
column breadth in m	0	column width in m	0.75
columns height in m	4.25		
wall thickness in m	0.35	wall height in m	3.35
wall density in T/m^3	2.5		
water column height in m	0		
floor slab length-1 in m	3.91	floor slab cross length in m	5.15
floor slab length-2 in m	3.91		
floor slab thickness in m	0.35		

slab loading intensity $T/2$ (live load and finishes)	4.765		
floor beam breadth in m	0.35	floor beam drop in m	0.8
load on column in T	45.59		
exterior column type-3			
top slab length-1 in m	3.91	top slab cross length in m	5.15
top slab length-2 in m	3.68		
top beam breadth in m	0	top beam drop in m	0.45
slab loading intensity $T/2$ (live load and finishes)	0		
top slab thickness in m	0		
column breadth in m	0	column width in m	0.75
columns height in m	4.25		
wall thickness in m	0.35	wall height in m	3.35
wall density in T/m^3	2.5		
water column height in m	0		
floor slab length-1 in m	3.91	floor slab cross length in m	5.15
floor slab length-2 in m	3.68		
floor slab thickness in m	0.35		
slab loading intensity $T/2$ (live load and finishes)	4.0325		
floor beam breadth in m	0.35	floor beam drop in m	0.8
load on column in T	57.49		
exterior column type-4			
top slab length-1 in m	3.68	top slab cross length in m	5.15
top slab length-2 in m	3.68		
top beam breadth in m	0	top beam drop in m	0.45
slab loading intensity $T/2$ (live load and finishes)	0		
top slab thickness in m	0		
column breadth in m	0	column width in m	0.75
columns height in m	4.25		
wall thickness in m	0.2	wall height in m	3.35
wall density in T/m^3	2		
water column height in m	0		
floor slab length-1 in m	3.68	floor slab cross length in m	5.15
floor slab length-2 in m	3.68		
floor slab thickness in m	0.3		
slab loading intensity $T/2$ (live load and finishes)	3.13		
floor beam breadth in m	0.35	floor beam drop in m	0.7
load on column in T	45.53		
exterior column type-5			
top slab length-1 in m	5.15	top slab cross length in m	1.58
top slab length-2 in m	5.15		
top beam breadth in m	0	top beam drop in m	0.45
slab loading intensity $T/2$ (live load and finishes)	0		

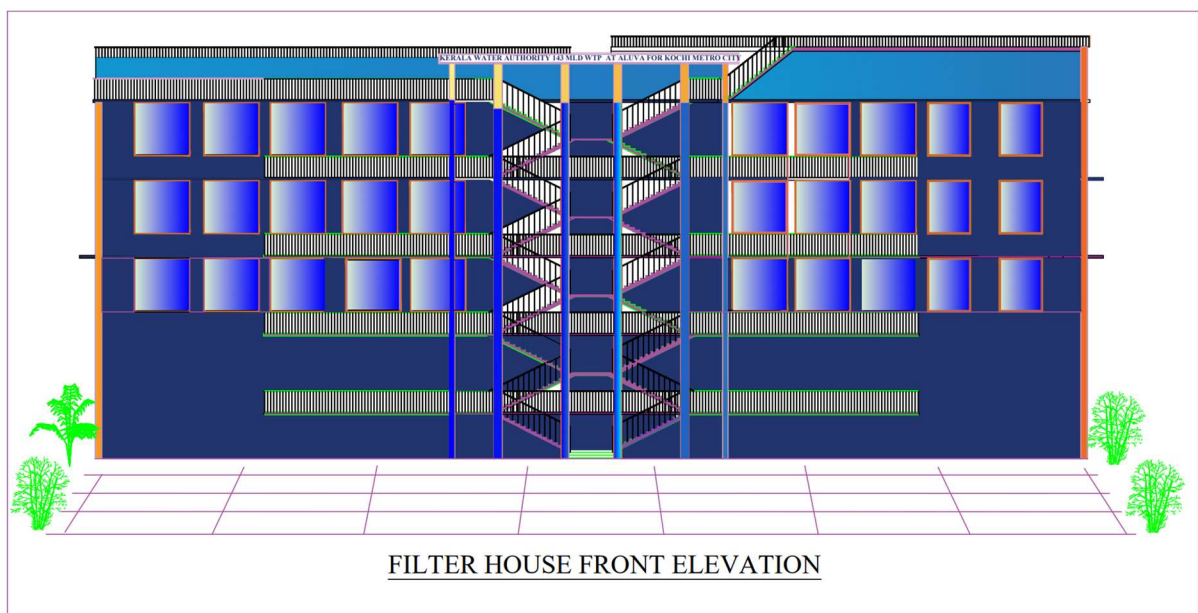
finishes)			
top slab thickness in m	0		
column breadth in m	0	column width in m	0.75
columns height in m	4.25		
wall thickness in m	0.35	wall height in m	3.35
wall density in T/m ³	2.5		
water column height in m	0		
floor slab length-1 in m	5.15	floor slab cross length in m	1.58
floor slab length-2 in m	5.15		
floor slab thickness in m	0.35		
slab loading intensity T/2 (live load and finishes)	3.35		
floor beam breadth in m	0.35	floor beam drop in m	0.8
load on column in T	36.44		
interior column type-1			
top slab length-1 in m	1.58	top slab cross length-1 in m	5.15
top slab length-2 in m	3.91	top slab cross length-2 in m	5.15
top beam breadth in m	0	top beam drop in m	0.45
slab loading intensity T/2 (live load and finishes)	0		
top slab thickness in m	0		
column breadth in m	0.35	column width in m	0.75
columns height in m	3.73		
wall thickness in m	0.35	wall height in m	3.35
wall density in T/m ³	2.5		
water column height in m	0		
floor slab length-1 in m	1.58	floor slab cross length-1 in m	5.15
floor slab length-2 in m	3.91	floor slab cross length-2 in m	5.15
floor slab thickness in m	0.35		
slab loading intensity T/2 (live load and finishes)	4.765		
floor beam breadth in m	0.35	floor beam drop in m	0.8
load on column in T	83.65		
interior column type-2			
top slab length-1 in m	3.91	top slab cross length-1 in m	5.15
top slab length-2 in m	3.91	top slab cross length-2 in m	5.15
top beam breadth in m	0	top beam drop in m	0.45
slab loading intensity T/2 (live load and finishes)	0		
top slab thickness in m	0		
column breadth in m	0.35	column width in m	0.75
columns height in m	3.73		
wall thickness in m	0.35	wall height in m	3.35
wall density in T/m ³	2.5		
water column height in m	0		

floor slab length-1 in m	3.91	floor slab cross length-1 in m	5.15
floor slab length-2 in m	3.91	floor slab cross length-2 in m	5.15
floor slab thickness in m	0.35		
slab loading intensity $T/2$ (live load and finishes)	4.765		
floor beam breadth in m	0.35	floor beam drop in m	0.8
load on column in T	79.42		
interior column type-3			
top slab length-1 in m	3.91	top slab cross length-1 in m	5.15
top slab length-2 in m	3.68	top slab cross length-2 in m	5.15
top beam breadth in m	0	top beam drop in m	0.45
slab loading intensity $T/2$ (live load and finishes)	0		
top slab thickness in m	0		
column breadth in m	0.35	column width in m	0.75
columns height in m	3.73		
wall thickness in m	0.35	wall height in m	3.35
wall density in T/m^3	2.5		
water column height in m	0		
floor slab length-1 in m	3.91	floor slab cross length-1 in m	5.15
floor slab length-2 in m	3.68	floor slab cross length-2 in m	5.15
floor slab thickness in m	0.35		
slab loading intensity $T/2$ (live load and finishes)	4.0325		
floor beam breadth in m	0.35	floor beam drop in m	0.525
load on column in T	96.10		
interior column type-4			
top slab length-1 in m	3.68	top slab cross length-1 in m	5.15
top slab length-2 in m	3.68	top slab cross length-2 in m	5.15
top beam breadth in m	0	top beam drop in m	0.45
slab loading intensity $T/2$ (live load and finishes)	0		
top slab thickness in m	0		
column breadth in m	0.35	column width in m	0.75
columns height in m	3.73		
wall thickness in m	0	wall height in m	3.35
wall density in T/m^3	2.5		
water column height in m	0		
floor slab length-1 in m	3.68	floor slab cross length-1 in m	5.15
floor slab length-2 in m	3.68	floor slab cross length-2 in m	5.15
floor slab thickness in m	0.35		
slab loading intensity $T/2$ (live load and finishes)	3.3		

floor beam breadth in m	0.35	floor beam drop in m	0.8
load on column in T	87.75		
column type	load in T	number	total
corner column	20.81	4	83.3
average load in T-corner	20.81		
maximum load in T-corner	20.81		
exterior column-type-1	45.58	4	182.3
exterior column-type-2	45.59	4	182.3
exterior column-type-3	57.49	4	230.0
exterior column-type-4	45.53	2	91.1
exterior column-type-5	36.44	10	364.4
average load in T-exterior	43.76		
maximum load in T-exterior	57.49		
interior column-type-1	83.65	10	836.5
interior column-type-2	79.42	10	794.2
interior column-type-3	96.10	10	961.0
interior column-type-4	87.75	5	438.8
average load in T-interior	86.6		
maximum load in T-interior	96.10		
INSIDE CWR			
INTERIOR COLUMNS		EXTERIOR COLUMNS	
axial load in t	244.0	axial load in t	146.4
		axial load in t for corner column	20.8
factored axial load in t	366	factored axial load in t	220
static moment in tm	4.88	static moment in tm	2.93
seismic moment in tm	3.72	seismic moment in tm	1.86
breadth of the column adopted in mm	450	breadth of the column adopted in mm	450
depth of the column adopted in mm	750	depth of the column adopted in mm	750
dia of steel bars 1	25	dia of steel bars 1	25
numbers	16		16
dia of steel bars 2	12	dia of steel bars 2	12
numbers	0		0
total area of steel in mm ²	7854	total area of steel in mm ²	7854
% steel	2.33	% steel	2.33
axial load capacity in t	613.96	axial load capacity in t	613.96
ratio	0.6	ratio	0.36
unsupported length in m	4	unsupported length in m	4
L/d ratio	8.89	L/d ratio	8.89
Pu/fck b d	0.36	Pu/fck b d	0.22
p/fck	0.093	p/fck	0.093
d'/B	0.09	d'/B	0.09
d'/D	0.06	d'/D	0.06
Mu/fck D b ² from chart	0.12		0.11
Mu/fck b D ² from chart	0.13	Mu/fck b D ² from chart	0.12
<i>seismic force in X direction</i>		<i>seismic force in X direction</i>	

Mux1	822656250	Mux1	759375000
Mux	101237699	Mux	56362427.54
Muy1	455625000	Muy1	417656250
Muy	101237699	Muy	56362427.54
Puz in t	624.14	Puz in t	624.14
Pu/Puz	0.59	Pu/Puz	0.35
alfa n	1.65	alfa n	1.25
check	0.12	check	0.12
<i>seismic force in Y direction</i>		<i>seismic force in Y direction</i>	
Mux1	822656250	Mux1	759375000
Mux	101237699	Mux	56362427.54
Muy1	455625000	Muy1	417656250
Muy	101237699	Muy	56362427.54
Puz in t	472.27	Puz in t	472.27
Pu/Puz	0.59	Pu/Puz	0.35
alfa n	1.65	alfa n	1.25
check	0.12	check	0.12
INSIDE GALLERY/FILTER			
INTERIOR COLUMNS		EXTERIOR COLUMNS	
axial load in t	157.4	axial load in t	102.6
factored axial load in t	236	factored axial load in t	154
static moment in tm	3.15	static moment in tm	2.05
seismic moment in tm	3.72	seismic moment in tm	1.86
breadth of the column adopted in mm	350	breadth of the column adopted in mm	350
depth of the column adopted in mm	750	depth of the column adopted in mm	750
dia of steel bars 1	25	dia of steel bars 1	25
numbers	14		14
dia of steel bars 2	12	dia of steel bars 2	12
numbers	0		0
total area of steel in mm ²	6872.25	total area of steel in mm ²	6872.25
% steel	2.62	% steel	2.62
axial load capacity in t	497.84	axial load capacity in t	497.84
ratio	0.47	ratio	0.31
unsupported length in m	4	unsupported length in m	4
L/d ratio	11.43	L/d ratio	11.43
Pu/fck b d	0.3	Pu/fck b d	0.2
p/fck	0.105	p/fck	0.105
d'/B	0.12	d'/B	0.12
d'/D	0.06	d'/D	0.06
Mu/fck D b ² from chart	0.11		0.11
Mu/fck b D ² from chart	0.15	Mu/fck b D ² from chart	0.15
<i>seismic force in X direction</i>		<i>seismic force in X direction</i>	
Mux1	738281250	Mux1	738281250
Mux	80852481.5	Mux	46060739.46
Muy1	252656250	Muy1	252656250

Muy	80852481.5	Muy	46060739.46
Puz in t	509.21	Puz in t	509.21
Pu/Puz	0.46	Pu/Puz	0.3
alfa n	1.43	alfa n	1.17
check	0.24	check	0.18
<i>seismic force in Y direction</i>		<i>seismic force in Y direction</i>	
Mux1	738281250	Mux1	738281250
Mux	80852481.5	Mux	46060739.46
Muy1	252656250	Muy1	252656250
Muy	80852481.5	Muy	46060739.46
Puz in t	351.71	Puz in t	351.71
Pu/Puz	0.46	Pu/Puz	0.3
alfa n	1.43	alfa n	1.17
check	0.24	check	0.18



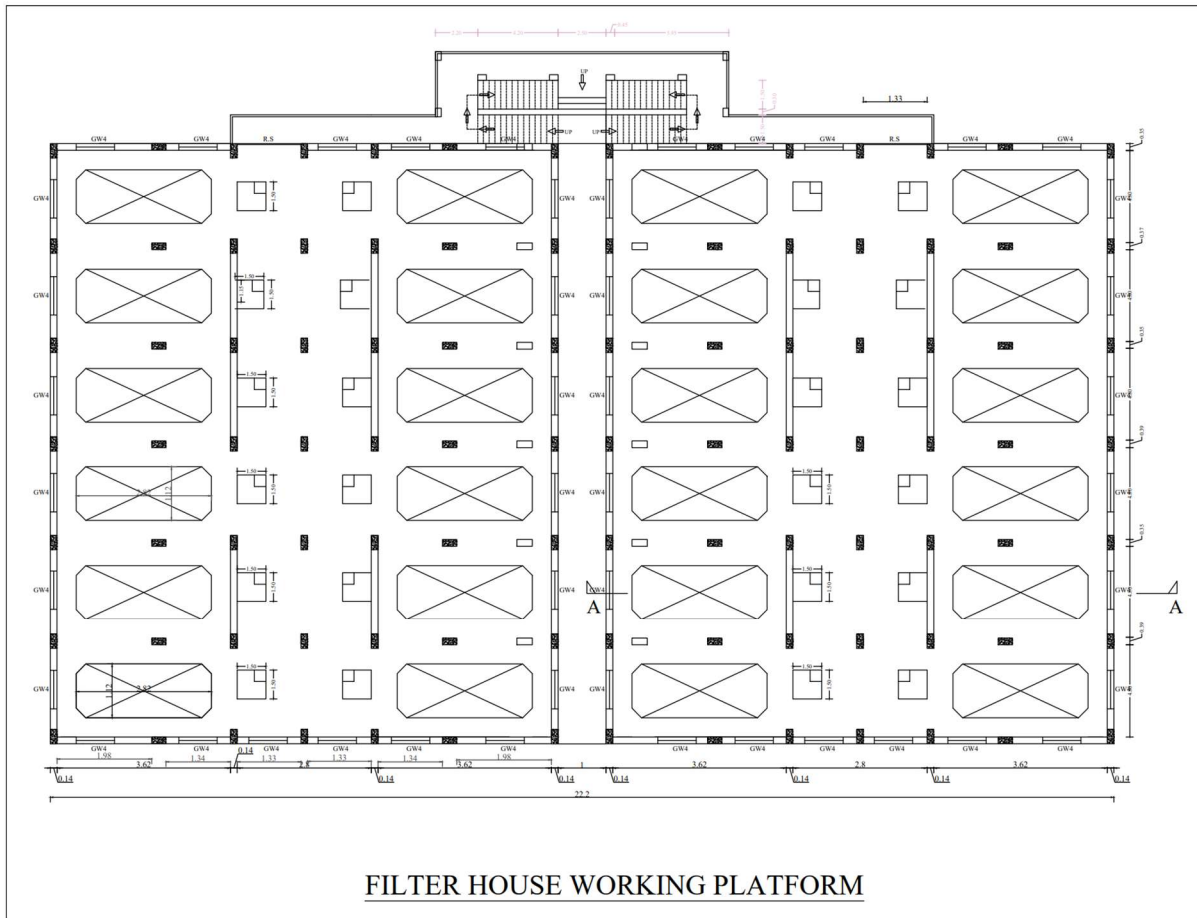
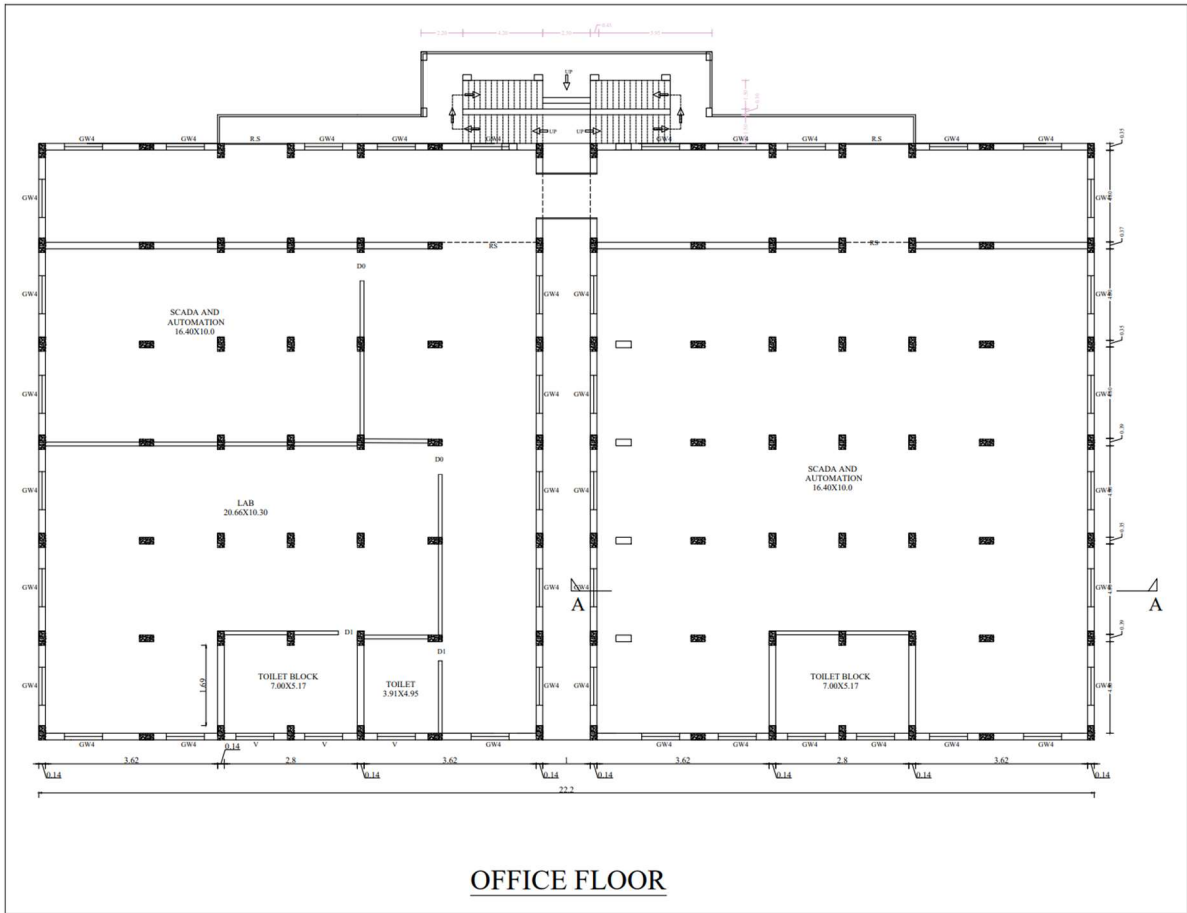


Figure 50. Filter house building

4.13 SOIL INVESTIGATION REPORTS

The soil investigations were carried out by the Department of Civil Engineering, Government Engineering College, Thrissur. As per the analysis of subsoil the followings recommendations are given:

- ✓ a safe bearing capacity of 190 kN/m² is recommended at a depth of 1.50 m in all boreholes except one.
- ✓ For the area where N value was too low, pile foundation is recommended.
- ✓ For two boreholes viz. BH V and BH IX the pressure at 6 m shall be limited to 80 kN/m²
- ✓ Recommendations assume that the soil profile found in the boreholes tested is indicative of the entire plot area.
- ✓ During the execution of work, any deviation in soil profile other than those observed in the boreholes tested is noticed, fresh recommendation shall be obtained.

4.14 DESIGN OF RAFT-ON-PILE FOUNDATIONS

For the filter house buildings of block-1 and block-2, foundations are designed as raft-on-piles. The raft slab is same as that of the floor slab of the clear water reservoir. The piles are of short length which is acting as the end bearing piles with embedment on rocky stratum.

4.14.1 STRUCTURAL DESIGN

FOUNDATION OF FILTER HOUSE-BLOCK-1 (WITH WWT)									
total foundation length c/c columns in m		30.9	offset in m		1.2				
total foundation breadth c/c columns in m		26.16	offset in m		1.2				
total contact length of foundation in m		33.							
total contact breadth of foundation in m		28.56							
floor	type	average load in T		number	total load in T		maximum load in T		
RF-TANK	corner column	18.56	4		74		18.56	0.0	
	exterior type-1 column	32.14	12		386		34.08	6.0	
	interior type-1 column	58.4	5		292		61.35	5.1	
floor	type	average load in T		number			maximum load in T		
TF	corner column	5.53	4	22			5.53	0.0	
	Ext. col.	10.49	24	252			12.66	20.7	
	Int. col.	20.78	35	727			22.5	8.2	
floor	type	Av. load in T		number			Max. load in T		
SF	corner column	7.51	4	30			7.51	0.0	
	exterior column	13.90	24	334			15.9	14.	

	type-1					4		7
	interior column type-1	21.15	35	740		22.79		7.8
floor	Col. type	average load in T	number			maximum load in T		
FF	corner column	6.90	4	28		6.90		0.0
	exterior column type-1	10.69	24	257		12.47		16.6
	interior column type-1	18.31	35	641		22.32		21.9
floor	column type	average load in T	number			maximum load in T	load	
GF	corner column	20.81	4	83		20.81		0.0
	exterior column type-1	43.76	24	1050		57.49		31.4
	interior column type-1	86.58	35	3030		96.10		11.0
DESIGN OF FOUNDATION								
total load of CWR walls in T				453.3				
total load of CWR water in T				2207				
total load of raft floor slab in T				1010				
total load of raft beams in T				140.0				
total load from filter central columns in T				1204.80				
total load from piles in T				7194				
TOTAL LOAD IN T		12210.2	% pile load	58.92				
stress beneath raft in T/m ²		12.84						
stress intensity variation factor		1.33						
enhanced stress beneath raft in T/m ²		17.08	<	19	T/m ²	(allowable)		
design stress for raft slab in T/m ²		13.21	(Deducting water and slab self-weight stress)					
in this condition floor slab will be subjected to severe stress and non-crack condition is not feasible								
hence consider pile transmit 60% load and raft slab transmit 40% load						(Conservative on raft slab)		
design stress for raft slab in T/m ²		6.83						
design of pile system								
central column points-beneath WWT and other								
total central design pile load in T		205.22	maximum	225.05	variation	9.66	%	
safe axial load capacity of 75 cm dia piles in T		115	dia in m	0.75				
number of piles per central column		2						
c/c spacing of piles in m		1.875						
edge clearance from pile cap in		0.45	length	0.45	breadth			

m									
total length of pile cap in m	3.525								
total breadth of pile cap in m	1.65	depth of pile cap in m					1.45		
contact area of pile cap in m ²	5.37	moment in pile cap in Tm					105.5		
load taken by pile cap in T	47.91	dia in mm of top steel	25	spacing in mm				135	
actual load to be taken by pile system in T	177.14	dia in mm of bottom steel	25	spacing in mm				135	
actual capacity of pile system in T	230	shear stress in Mpa			0.92				
		allowable shear stress in Mpa			0.20				
		dia of 8-legged stirrup bars in mm	12.00	spacing in mm				148	
exterior/corner column points									
total central design pile load in T	average	110.97	maximum	132.64	variation	19.53	%		
safe axial load capacity of 60 cm dia piles in T	75	dia in m	0.6						
number of piles per central column	2								
c/c spacing of piles in m	1.5								
edge clearance from pile cap in m	0.45	length	0.45	breadth					
total length of pile cap in m	3								
total breadth of pile cap in m	1.5	depth of pile cap in m				1.2			
contact area of pile cap in m ²	4.22	moment in pile cap in Tm				49.74			
load taken by pile cap in T	37.59	dia in mm of top steel	20	spacing in mm				135	
actual load to be taken by pile system in T	95.05	dia in mm of bottom steel	20	spacing in mm				135	
actual capacity of pile system in T	150	shear stress in Mpa			0.72				
		allowable shear stress in Mpa			0.20				
		dia of 8-legged stirrup bars in mm	12.00	spacing in mm					
central column points inside filter									
total central design pile load in T	Av.	114.86	maximum	114.86	variation	0.00	%		
safe axial load capacity of 60 cm dia piles in T	75	dia in m	0.6						
number of piles per central column	2								
c/c spacing of piles in m	1.5								
edge clearance from pile cap in m	0.45	length	0.45	breadth					
total length of pile cap in m	3								
total breadth of pile cap in m	1.5	depth of pile cap in m				1.2			
contact area of pile cap in m ²	4.22	moment in pile cap in Tm				43.07			
load taken by pile cap in T	37.59	dia in mm of top steel	20	spacing in mm				135	
actual load to be taken by pile system in T	77.27	dia in mm of bottom steel	20	spacing in mm				135	

actual capacity of pile system in T	150	shear stress in Mpa	0.63		
		allowable shear stress in Mpa	0.20		
		dia of 8-legged stirrup bars in mm	12.00	spacing in mm	
DESIGN OF SHORT PILE AS AXIAL LOAD CARRYING MEMBER					
INTERIOR PILES OF 75 cm DIA			EXTERIOR/FILTER PILES OF 60 cm DIA		
size of circular column in m	0.6	size of circular column in m	0.6		
height of circular column in m	8.5	height of circular column in m	8.5		
axial load in t	225.1	axial load in t	132.6		
factored axial load in t	338	factored axial load in t	199		
static moment in tm	6.75	static moment in tm	3.98		
seismic moment in tm	4.72	seismic moment in tm	4.72		
size of the column adopted in mm	750	size of the column adopted in mm	600		
dia of steel bars 1	20	dia of steel bars 1	20		
numbers	12	numbers	12		
dia of steel bars 2	12	dia of steel bars 2	12		
numbers	0	numbers	0		
total area of steel in mm ²	3770	total area of steel in mm ²	3770		
% steel	0.85	% steel	1.33		
axial load capacity in t	542.84	axial load capacity in t	383.8		
ratio	0.62	ratio	0.52		
unsupported length in m	7	unsupported length in m	7		
L/d ratio	9.33	L/d ratio	11.67		
Pu/fck d ²	0.24	Pu/fck d ²	0.22		
p/fck	0.034	p/fck	0.053		
d'/D	0.06	d'/D	0.07		
Mu/fck b D ² from chart	0.05	Mu/fck b D ² from chart	0.055		
<i>seismic force in X direction</i>			<i>seismic force in X direction</i>		
Mux1	5.27E+08	Mux1	297000000		
Mux	1.35E+08	Mux	102407224		
Muy1	5.27E+08	Muy1	297000000		
Muy	1.35E+08	Muy	102407224		
Puz in t	614.35	Puz in t	435.43		
Pu/Puz	0.55	Pu/Puz	0.46		
alfa n	1.58	alfa n	1.43		

check		0.23	check		0.44
<i>seismic force in Y direction</i>			<i>seismic force in Y direction</i>		
Mux1		5.27E+08	Mux1		297000000
Mux		1.35E+08	Mux		102407224
Muy1		5.27E+08	Muy1		297000000
Muy		1.35E+08	Muy		102407224
Puz in t		614.35	Puz in t		435.43
Pu/Puz		0.55	Pu/Puz		0.46
alfa n		1.58	alfa n		1.43
check		0.23	check		0.44

FILTER HOUSE-BLOCK-2 (WITH OH TANK)

total foundation length c/c columns in m		30.9	offset in m	1.2				
total foundation breadth c/c columns in m		26.16	offset in m	1.2				
total contact length of foundation in m		33.3						
total contact breadth of foundation in m		28.56						
floor	column type	average load in T	number	total load in T	maximum load in T			
RF-TANK	corner column	15.67	4	63	15.67		0.0	
	exterior column type-1	36.89	12	443	47.83		29.7	
	interior column type-1	72.65	5	363.27	80.29		10.5	
floor	column type	average load in T	number	total load in T	maximum load in T			
TF	corner column	5.53	4	22	5.53		0.0	
	exterior column type-1	10.49	24	252	12.66		20.7	
	interior column type-1	20.78	35	727	22.49		8.2	
floor	column type	average load in T	number	total load in T	maximum load in T			
SF	corner column	7.51	4	30	7.51		0.0	
	exterior column type-1	13.90	24	334	15.94		14.7	
	interior column	21.15	35	740	22.79		7.8	

	type-1										
floor	column type	average load in T	load in	number			maximum load in T				
FF	corner column	6.90		4	28		6.90		0.0		
	exterior column type-1	10.69		24	257		12.47		16.6		
	interior column type-1	18.31		35	641		22.32		21.9		
floor	column type	average load in T	load in	number			maximum load in T				
GF	corner column	20.81		4	83		20.81		0.0		
	exterior column type-1	43.76		24	1050		57.49		31.4		
	interior column type-1	86.58		35	3030		96.10		11.0		
	total load of CWR walls in T		453.3								
	total load of CWR water in T		2207.8								
	total load of raft floor slab in T		1010.5								
	total load of raft beams in T		140.0								
	total load from filter central columns in T		1204.80								
	total load from piles in T		8062								
	TOTAL LOAD IN T		13078.8	% pile load	61.64						
	stress beneath raft in T/m ²		13.75								
	stress intensity variation factor		1.33								
	enhanced stress beneath raft in T/m ²		18.29	<	19	T/m ²	(allowable)				
	design stress for raft slab in T/m ²		14.43	(Deducting water and slab self-weight stress)							
in this condition floor slab will be subjected to severe stress and non-crack condition is not feasible											
hence consider pile transmit 60% load and raft slab transmit 40% load (Conservative on raft slab)											
	design stress for raft slab in T/m ²		7.32								
design of pile system											
central column points-beneath WWT and other											
	total central design pile load in T	average	219.48	maximum	243.99	variation	11.17	%			
	safe axial load capacity of		115	dia in m	0.75						

75 cm dia piles in T											
number of piles per central column	2										
c/c spacing of piles in m	1.875										
edge clearance from pile cap in m	0.45	length	0.45	breadth							
total length of pile cap in m	3.525										
total breadth of pile cap in m	1.65	depth of pile cap in m					1.45				
contact area of pile cap in m ²	5.37	moment in pile cap in Tm					114.4				
load taken by pile cap in T	52.81	dia in mm of top steel	25	spacing in mm	120						
actual load to be taken by pile system in T	191.18	dia in mm of bottom steel	25	spacing in mm	120						
actual capacity of pile system in T	230	shear stress in Mpa			1.00						
		allowable shear stress in Mpa			0.20						
		dia of 8-legged stirrup bars in mm		12.00	spacing in mm	152					
exterior/corner column points											
total central design pile load in T	Av.	115.72	maximum	146.39	variation	26.51	%				
safe axial load capacity of 60 cm dia piles in T	75	dia in m	0.6								
number of piles per central column	2										
c/c spacing of piles in m	1.5										
edge clearance from pile cap in m	0.45	length	0.45	breadth							
total length of pile cap in m	3										
total breadth of pile cap in m	1.5	depth of pile cap in m					1.2				
contact area of pile cap in m ²	4.22	moment in pile cap in Tm				54.90					
load taken by pile cap in T	41.44	dia in mm of top steel	20	spacing in mm	135						
actual load to be taken by pile system in T	104.95	dia in mm of bottom steel	20	spacing in mm	135						
actual capacity of pile system in T	150	shear stress in Mpa			0.80						
		allowable shear stress in Mpa			0.20						
		dia of 8-legged stirrup bars in mm		12.00	spacing in mm	222					
central column points inside filter											
total central design pile load in T	average	114.86	maximum	114.86	variation	0.00	%				
safe axial load capacity of	75	dia in m	0.6								

60 cm dia piles in T									
number of piles per central column	2								
c/c spacing of piles in m	1.5								
edge clearance from pile cap in m	0.45	length	0.45	breadth					
total length of pile cap in m	3								
total breadth of pile cap in m	1.5	depth of pile cap in m			1.2				
contact area of pile cap in m ²	4.22	moment in pile cap in Tm			43.07			% steel	1
load taken by pile cap in T	41.44	dia in mm of top steel	20	spacing in mm	135	0.13			
actual load to be taken by pile system in T	73.42	dia in mm of bottom steel	20	spacing in mm	135				
actual capacity of pile system in T	150	shear stress in Mpa		0.63					
		allowable shear stress in Mpa		0.20					
		dia of 8-legged stirrup bars in mm		12.00	spacing in mm	312			

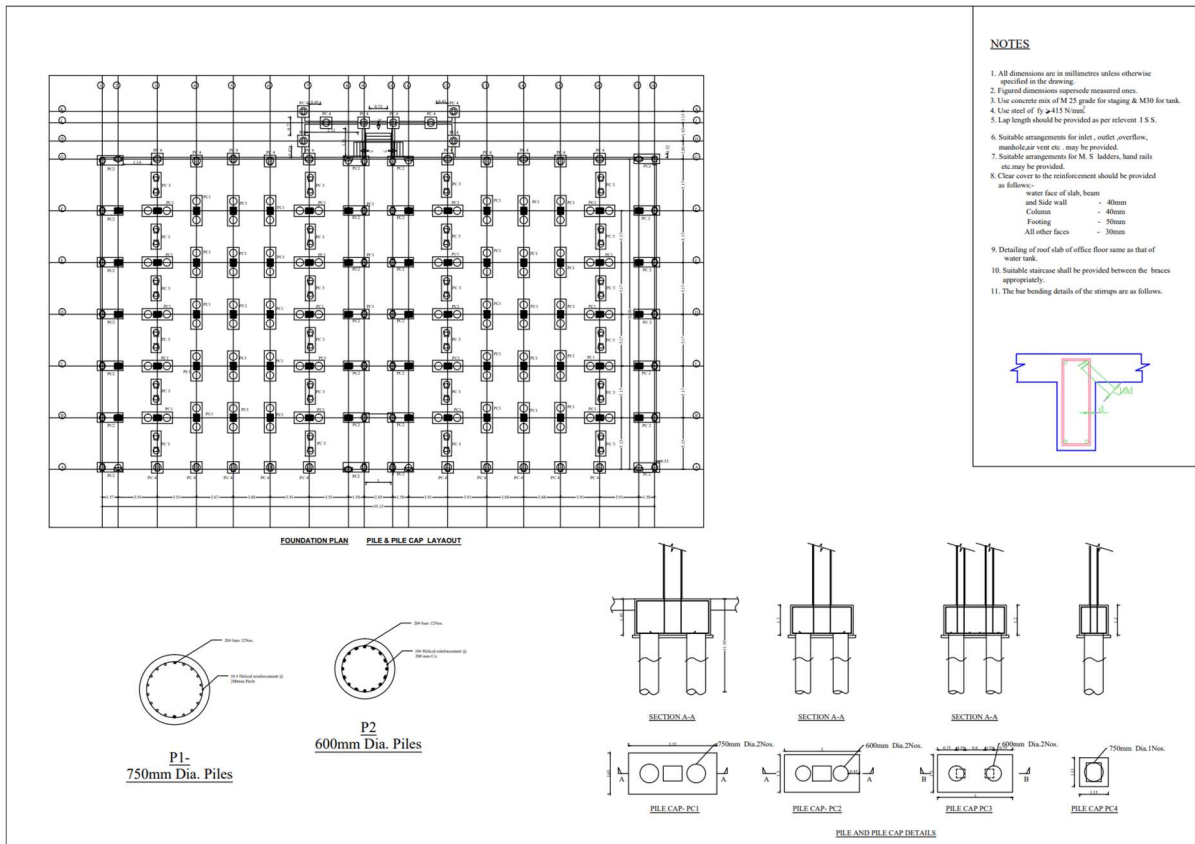


Figure 51. Pile foundations

CHAPTER 5

DETAILED ESTIMATES

5.1 GENERAL

The detailed estimate for the WTP 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. For simplicity and rapid work plan, the dimensions of the design of unit operations, chemical processes and structural dimensions of components are given as the input values for the data spread sheet and using PRICE software, detailed estimates are prepared.

5.2 DETAILED ESTIMATE OF COMPONENTS

The detailed estimates have been divided into four sections: a] civil construction b] mechanical works c] electrical works d] operation and maintenance. In following sections, the detailed estimates are illustrated. **The output of PRICE software is presented as an annexure.**

5.3 OPERATION AND MAINTENANCE COSTS

OPERATION & MAINTENANCE COSTS					
Sl. No.	Item	Rate	Nos	Unit	Expenditure
1	Power Charges for WTP @ Rs. 7.2 for kwh @	2242500.0		kwh/month	1,61,46,000
2	Scada operator/Month for WTP	83628.0	1	Nos.	83,628
3	Operators rate/month-WTP	83628.0	1	Nos.	83,628
4	Shift mazdoor rate/month	79091.1	1	Nos.	79,091
5	Watchman rate/month-WTP	87453.9	1	Nos.	87,454
6	Sweeper/month	26363.7	1	Nos.	26,364
7	Gardener/month	26363.7	1	Nos.	26,364
9	Mechanic general shift/month	24391.5	1	Nos.	24,392
10	Chemist general shift/month	27876	1	Nos.	27,876
11	Electrician general shift/month	24391.5	1	Nos.	24,392
12	Gas Chlorine/month				2,10,000
13	Alum and Lime dosing/month				9,00,000
14	Chemicals for lab tests/month				10,000
15	Total per month				1,77,29,187
16	Total per month excluding power charges				15,83,187
17	Annual Operation & Maintenance Charge				21,27,50,249
18	Annual Operation & Maintenance Charge excluding power charges				1,89,98,249
19	Treatment Cost per Day				5,82,877
20	Unit Cost of Treatment per Kilo Litre				4.08
10 YEAR ANNUAL O&M COST CONSIDERING 6% ANNUAL INCREASE EVERY YEAR					
Excluding power charges					
1	1 st year				₹ 1,89,98,249

2	2 nd year				₹ 2,01,38,144
3	3 rd year				₹ 2,13,46,432
4	4 th year				₹ 2,26,27,218
5	5 th year				₹ 2,39,84,851
6	6 th year				₹ 2,54,23,942
7	7 th year				₹ 2,69,49,379
8	8 th year				₹ 2,85,66,342
9	9 th year				₹ 3,02,80,322
10	10 th year				₹ 3,20,97,142
	Total O&M cost for 5 years				₹ 10,70,94,895
	GST @ 18%				₹ 1,92,77,081
	Total O&M cost for 10 years				₹ 25,04,12,022
	GST @ 18%				₹ 4,50,74,164
	Unforeseen items				₹ 45,13,814
	Total O&M cost for 10 years including GST				₹ 30,00,00,000

Table 13. Analysis of operation and maintenance costs

5.4 GENERAL ABSTRACT OF COST

ABSTRACT OF ESTIMATES				
Sl.No.	Est.ID		Name of work	Amount (Rs.)
1	2022/51 52	1	Relaying the existing pipelines-working charges	₹ 15,00,647
		2	Relaying the existing pipelines-cost of materials	₹ 35,31,791
		3	Clear water pumping mains-working charges	₹ 2,07,22,759
		4	Clear water pumping mains-cost of materials	₹ 6,23,24,485
		5	Valve chambers for pipelines	₹ 2,85,260
		6	Road restoration for pipelines	₹ 5,09,17,719
2	2022/51 76	1	Demolishing existing structures	₹ 32,00,049
		2	Compound walls and gate	₹ 1,06,40,552
		3	Service roads	₹ 36,34,463
		4	Yard lighting	₹ 25,36,313
		5	Solar energy installations	₹ 72,00,000
		6	CC TV camera installation	₹ 4,52,400
		7	Landscaping and gardening	₹ 12,88,207
		8	Drainage arrangements	₹ 18,97,884
3	2022/57 34	1	SCADA and Automation	₹ 4,16,44,521
		2	Supply, erection and commissioning of 1000KVA and 500KVA transformer	₹ 1,23,30,922
		3	Supply, erection and commissioning of clear water pump sets	₹ 1,02,51,348
		4	Power allocation and UG cabling	₹ 90,00,000
4	2022/38 54	1	Aerator	₹ 1,15,32,008
		2	Raw water channels	₹ 98,76,979
		3	3D models for display etc.	₹ 5,01,660

5	2022/50 70	1	Flocculator, clarifier and channels	₹ 18,31,76,535
		2	Sludge pit 6m Dia	₹ 20,93,169
6	2022/50 56	1	Filter house block-1, block-2 and block-3	₹ 39,44,27,944
		2	Water supply and sanitary fittings	₹ 6,33,206
		3	Supply and fixing of laboratory items	₹ 10,16,585
7	2022/51 43	1	Clear water pump house	₹ 2,47,24,233
		2	Clear water channels	₹ 89,04,653
		3	Building for Substation and transformer	₹ 43,95,859
8	2022/49 83	1	Chemical house	₹ 2,30,63,446
		2	Chlorine room	₹ 34,37,213
		3	Chlorinator	₹ 24,00,000
9	2022/56 42	1	Supply and fixing of pipes and fittings and pumps and motors	₹ 3,92,55,992
		3	Electrical items for WTP	₹ 1,82,90,261
			TOTAL	₹ 97,10,89,065
			GST @ 18%	₹ 17,47,96,032
			Unforeseen items	₹ 2,41,14,904
			GRAND TOTAL FOR WTP AND ALLIED WORKS	₹ 1,17,00,00,000
11		1	Ten-year maintenance of the WTP and other connected components. (Only the electrical energy charges payable to KSEB during the maintenance period shall be borne by KWA.)	₹ 25,04,12,022
			GST @ 18%	₹ 4,50,74,164
			Unforeseen items	₹ 45,13,814
			Total	₹ 30,00,00,000
			GRAND TOTAL (including 10 years O&M expenditure)	₹ 1,47,00,00,000
12		1	Cost of construction cost of WTP alone	₹ 79,70,24,085
			GST @ 18%	₹ 14,34,64,335
			TOTAL	₹ 94,04,88,420
1	2019/86 05	1	Intake well cum pump house, pump set and 1829 mm raw water pumping main	₹ 19,98,37,803
2	2022/80 78	1	Clear water pumping main from WTP to Kalamassery areas	₹ 72,07,92,761
3	2022/80 73	1	Laying of equivalent pipeline of 1626 mm dia from headworks to Nirmala School Junction	₹ 22,81,00,054
			TOTAL FOR INTAKE WELL AND PIPELINES	₹ 1,14,87,30,618
			GST @ 18%	₹ 20,67,71,511
			Unforeseen items	₹ 2,44,97,871
			TOTAL	₹ 1,38,00,00,000
			GRAND TOTAL (including 10 years O&M expenditure + intake and pipelines)	₹ 2,85,00,00,000

Table 14. Abstract of estimates

CHAPTER 6

OPERATION, MAINTENANCE, QUALITY CONTROL AND COST ANALYSIS

6.1 GENERAL

For the success of a water treatment system, it is inherent to note that meticulous operation and maintenance planning is the key. In the following sections various aspects of effective operation and maintenance, cost analysis, application of modern technologies for monitoring and process control and maintenance of an eco-friendly system are illustrated.

In engineering parlance, the term operation refers to the daily operation of the components of a water treatment system such as intake system, raw water pumping stations, channels, treatment units, machinery and equipment, etc., in an effective manner by various technical personnel, and is a routine function. The term maintenance refers to the art of keeping the structures, plants, machinery and equipment and other facilities in optimum working order and includes preventive maintenance or corrective maintenance of mechanical adjustments, repairs, and planned maintenance. However, replacements, correction of defects etc., are considered as actions excluded from preventive maintenance.

6.2 PLANNING FOR EFFECTIVE OPERATION AND MAINTENANCE

Three categories of variability that can affect the design, performance and reliability of a water treatment plant are

- a] variability of the influent quality parameters such as turbidity and flowrate and characteristics,
- b] inherent variability in wastewater treatment processes and
- c] variability caused by mechanical breakdown, design deficiencies and operational failures.

It may be noted that effective use of the redundancies employed in design of units will balance most of the issues related with the variability of the influent flowrate and abnormal water quality levels at certain points of time. Many of the treatment units exhibit variability in performance despite the efficient planning and design. However, these problems can be eliminated at the design stage itself by adopting some conservative values. At the operational stage, some of the design deficiencies can be addressed by few additions in the system which will not affect the total operational cost. Occurrence of mechanical and electrical breakdown can be addressed by careful planning of maintenance activities. It is recommended to form an internal monitoring committee for periodical inspection and control of activities related to the function, efficiency and operation of the WTP. Operation and maintenance for 10 years is to be performed by the firm who carries out the construction and commissioning of the STP.

6.3 TYPE OF MAINTENANCE

There are three types of maintenance of a water treatment system— preventive, routine and emergency. Preventive or routine maintenance should be carried out to prevent any breakdown of the system and to avoid emergency operations to deal with clogged lines or overflowing chambers/channels or structural

failure of the system. Preventive maintenance is more economical and provides for reliability in operations of the treatment facilities. Emergency repairs, which would be very rare if proper maintenance is carried out well, also, must be provided for. Proper inspection and preventive maintenance are necessary.

6.4 WATER QUALITY ANALYSIS

Samples of raw and treated water will be taken at regular intervals for analysis. In a large waterworks with its own laboratory, sampling will almost certainly be carried out daily, since the effluent analysis constitutes the only certain check that the filter is operating satisfactorily, and the raw water analysis provides what is possibly the only indication of a change in quality that might adversely affect the efficiency of treatment.

6.5 FILTER CLEANING

While the filter is in operation, a stage comes when the bed resistance increases so much that the regulating valve must be fully opened, and it is the right time to plan the cleaning of the filter bed since any further resistance is bound to reduce the filtration rate. Resistance accelerates rapidly as the time for cleaning approaches. Indicators may be installed showing the inlet and outlet heads, from which the head loss can be regularly checked; this gives a clear picture of the progress of choking and the imminence of the end of the run. Without any measurement of the head loss the only true indicator of build-up of resistance is the degree of opening of the regulating valve, though the experienced operator may be able to recognize preliminary visual warnings in the condition of the filter bed surface. A slight deterioration in the effluent quality may be a reason for the need for cleaning.

6.6 SELECTION OF COAGULANTS

Coagulation is a physical and chemical reaction occurring between the alkalinity of the water and the coagulant added to the water, which results in the formation of insoluble flocs. The most important consideration is the selection of the proper type and amount of coagulant chemical to be added to the water to be treated. Overdosing as well as underdosing of coagulants may lead to reduced solids removal efficiency. This condition may be corrected by carefully performing Jar tests and verifying process performance after making any change in the process of the coagulation process.

6.7 START UP AND SHUT DOWN PROCEDURES

In the event of requirement for shut down or start-up of processes on account of maintenance or a major equipment failure, proper procedures must be followed as per recommendations of the manufacturer of the plant and equipment. The procedures, in general, are given below:

(a) Start up Procedure

1. Check operational status and mode of operation of equipment and physical facilities. Check that basin valves are closed. Check that basin isolation gates are closed. Check that launder weir plates are set at equal elevations. Check to ensure that all trash, debris and tools have been removed from basin.
2. Test sludge removal equipment. Check that mechanical equipment is properly lubricated and ready for operation. Observe operation of sludge removal equipment.
3. Fill sedimentation basin with water. Observe proper depth of water in basin. Remove floating debris from basin water surface.
4. Start sample pumps.
5. Perform water quality analyses.
6. Operate sludge removal equipment. Be sure that all valves are in the proper position.

(b) Shut Down Procedures

1. Stop flow to sedimentation basin. Install basin isolation gates.
2. Turn off sample pump.
3. Turn off sludge removal equipment. Shut off mechanical equipment and disconnect where appropriate. Check that valves are in proper position.
4. Lock out electrical switches and equipment.
5. Dewater basin if necessary. Be sure that the water table is not high enough to float the empty basin. Open basins drain valves.
6. Grease and lubricate all gears, sprockets and mechanical moving parts which have been submerged immediately following dewatering to avoid seize up.

6.8 PREVENTIVE MAINTENANCE

Such programmes are designed to assure the continued satisfactory operation of treatment plant by reducing the frequency of breakdown failures. Typical functions include.

1. Keeping electric motors free of dirt and moisture.
2. Assuring good ventilation.
3. Checking pumps and motors for leaks, unusual noise and vibrations, overheating or signs of wear.
4. Maintaining proper lubrication and oil levels.
5. Inspecting alignment of shafts and couplings.
6. Checking bearings for overheating and proper lubrication.

7. Checking for proper valve operation.
8. Checking for free flow of sludge in sludge removal collection and discharge systems.
9. Good House Keeping.

6.9 SAFETY PRACTICES

As in any utility or industry, dangers are associated with Water Supply System Operation and Maintenance. There is therefore a need for safety practices. Physical injuries, cuts, bruises, and infection are common. However serious injuries necessitating long layoff, loss of limbs, eyesight, death due to accident or electrocution may also occur though not so frequently. Adoption of safe practices and use of safety equipment may largely minimise occupational hazards. Accidents do not happen – they are caused. Safety practices require good management. For years, there may be minor injuries like cuts and bruises, but suddenly there could be a loss of limb, eyesight or even death. Safety organisation is what you make of it. It may be a full-fledged safety organization with a Safety Officer with necessary staff. It could be only the person in charge of the plant with a few personnel picked out for special assignments. Everybody on the job knows what can happen under certain conditions but each is busy with his own duties and responsibilities. A Safety Committee may also be constituted.

In developing a safety programme, it is necessary to know the source of accidents. It is then possible to take precautions and corrective action. Besides knowledge of accidents in the utility itself, review of records or information at other water supply systems or in other utilities is helpful. Record of injuries/accidents maintained by the concerned department of labour, industries or factory department of the state can also be consulted. Other sources of information are safety manuals, insurance company brochures etc.

The first step in controlling an unsafe condition is to remove the hazard mechanically. A secondary measure of protection is to provide personal protective equipment to the workman. Study of records has indicated the large number of injuries to various parts of the body. Personal safety equipment is designed to help protect the person's eyes, face, head, nose throat, lungs, ears, hands, feet and body. Such safety equipment cannot protect the worker from unsafe actions or conditions. It can only supplement safe work or work habits.

Every employee must practice personal cleanliness to prevent body infections. A clean plant is safer, both from physical accidents and infection. Hands must be washed with soap after working and before eating or smoking. Use the first-aid kit for immediate treatment of minor cuts, bruises and scratches.

Plant maintenance also called housekeeping or cleaning up is an important function of the treatment plant and essential for plant equipment. Maintenance requires an operator to handle machinery, manual and power tools, repair electrical equipment, enter pits, sumps, manholes etc. All these functions can pose a hazard and cause injury, fire, disease or death. Fixed safety features are designed or built into the

structures. However, there are instances where the maintenance engineer may alter or augment the existing structure. Prompt effective maintenance can prevent many accidents.

Keeping the entire plant clean will provide a much nicer place to work. Just keeping the working areas free of tripping hazards will add safety in the plant. Cleaning should be performed when others are not exposed to danger or inconvenience. Wet floors become slippery. Use notices to warn people. Provide and use trashcans for used oily rags. Hazardous waste, acids and caustics should be cleaned up immediately. Doorways, aisles, stairways and workplaces must be kept free of rubbish to reduce hazards of tripping and fire.

6.9.1 SAFETY IN CONFINED SPACES

Any place where oxygen deficiency or dangerous air contamination can occur and where ready ingress or egress for removal of a person is not available can be defined as a confined space. Some of such places are pits, manholes, basins and tanks. Accumulation of gases and vapours in confined spaces can produce explosive mixtures. Oxygen deficiency occurs when oxygen is removed or when another gas displaces it. Oxygen is removed from air when it is used up due to bacterial action; by the oxidation of metals; combustion and when inert or toxic gases displace it. When oxygen in air is reduced to less than 17%, shortness of breath takes place and further reduction leads to loss of consciousness. Death occurs at 10% or less. Toxic gases cause injury or death by their own action. Safety checks must be carried out when working in such spaces. When working in confined spaces ensure that sufficient air changes as required takes place.

6.9.2 SAFETY ASPECTS OF CHLORINE

Chlorine is potentially dangerous. It is, therefore, important that person engaged in a chlorine plant or in any activity involving handling of chlorine should understand the hazards of chlorine and should know preventive measures needed.

6.10 FIRE PROTECTION

Very little attention is paid to fires. Three elements cause a fire – fuel, oxygen and a means of ignition. If anyone is missing, there is no fire. Firefighting is based on removing one of these elements. In any fire, only the cause or fuel for burning varies. There is no one extinguisher that is effective for all fires, so it is important that you understand the class of fire you are trying to control. One must be trained in the use of the different types of extinguishers, and the proper type should be located near the area where that class of fire may occur. A preventive maintenance program for fire extinguishers requires a considerable amount of time from the operator and requires a system of record keeping.

6.11 OPERATION AND MAINTENANCE OF PUMP HOUSE

Pumping machinery is subjected to wear & tear, erosion and corrosion due to its nature of functioning, and therefore it is vulnerable to failures. Generally, failures or interruptions are mostly attributed to

pumping machinery rather than any other component. Therefore, correct operation and timely maintenance and upkeep of pumping stations and pumping machinery are of vital importance. Sudden failures can be avoided by timely inspection, follow up actions on observations of inspection and planned periodical maintenance. Downtime can be reduced by maintaining inventory of fast-moving spare parts. Obviously due attention needs to be paid to all such aspects for efficient and reliable functioning of pumping machinery.

6.12 TRAINING FOR OPERATION AND MAINTENANCE STAFF

Training is a planned process to modify attitude, knowledge or skill through learning experience to achieve effective performance in activity and to develop abilities of the individual to satisfy the current and future needs of the organization. The personnel who are already available or chosen to carry out the actions contained in the O&M programme may have to be trained through special courses or by “on the job training” to ensure that these personnel are thoroughly trained to carry out the actions listed in the plan of maintenance. This training is essential to prevent experimentation by operating personnel to meddle with equipment since often these operating personnel may not be capable to take up the required maintenance. On the job training is preferred to classroom training. The supervisors can be trained initially; they can later train their operators. A systematic plan of action of any training programme include:

- Identification and assessment of the need for planned training.
- Defined training objectives.
- Appropriate strategy for training.
- Provision for assessing effectiveness of training.

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

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

For the WTP, a network of various sensors can capture the variations of values of parameters like temperature, residual chlorine, chemical composition, TDS etc. at different control points of the system. The continuous data obtained through IoT is used by a customised 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 water management can also be used to calculate residual chemicals after the treatment. This data can be further used to calculate the efficiency of the treatment process and ensure that water quality standards are met.

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 WTP, provision for implementing a IoT based control of the units have been suggested.

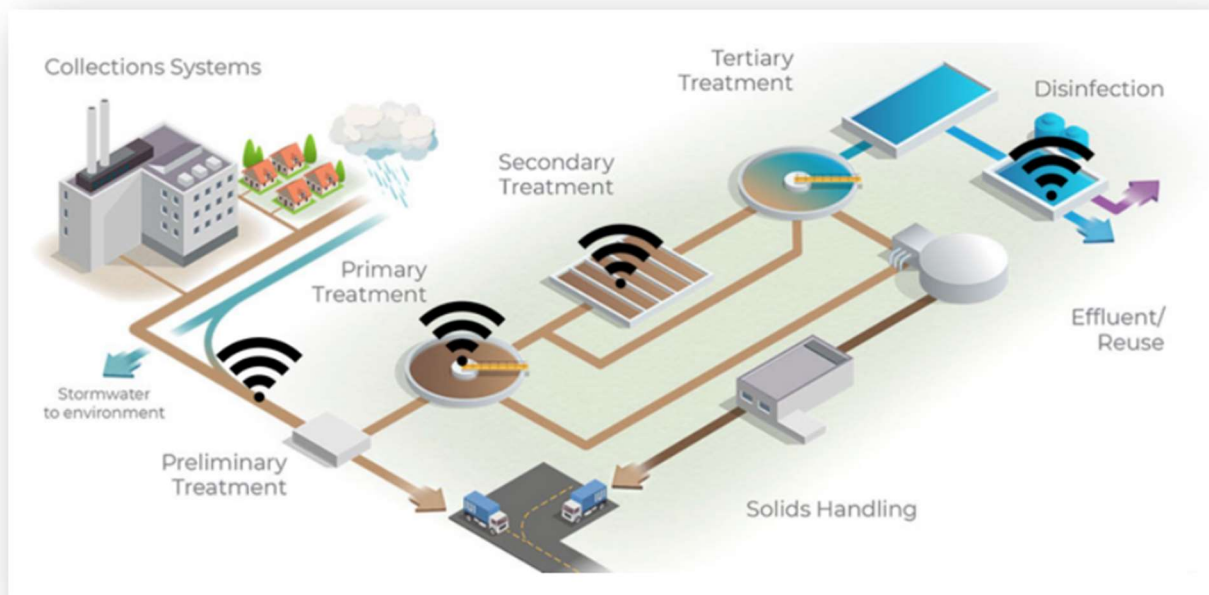


Figure 52. The continuous data obtained through IoT is used by a customised algorithm for synthesis to impart a smart decision-making procedure for water/wastewater treatment (photo courtesy-google)

6.14 MAINTAINING AN ECO-FRIENDLY SYSTEM

In the proposed system of water treatment, care has been taken to treat the raw water effectively and efficiently. 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 WTP units with special methods of growing plants at the exterior of WTP components and space between units. Maximum utilisation of space has been taken at the planning and design stage itself.

Some aspects of the green landscaping eco-friendly unit management are described below for the proposed WTP:

Odour management: Special attention is also given to proper odour management by using green belt inspired landscaping and chemical application whenever needed at extreme cases.

Trees: barrier formed with fast growing trees are planned for protection against pollution, for defining boundaries and for assisting in the creation of beautiful landscaping. Some of the plants are Casuarina Equisetifolia, golden bamboo, Grevillea Robusta etc.

Shrubs: the use of shrubs in the mass as a basic constituent in the planning of landscape is important. Shrubs with properties of hardiness, vigorous growth and an emphasis on evergreen plants are selected.

Creeping plants for exterior of units: plants like climbing hydrangea attaches itself to walls and grow to impart a green environment.

Air purifying plants: Polluted air contains particles, odours and harmful gases like nitrogen oxides, sulphur dioxide and ammonia. These pollutants settle on the leaves of trees and plants. The leaves and plant surface absorb these pollutants and through their stomata (pores) and filter these harmful substances from the air. Trees also trap heat and reduce greenhouse gases in the atmosphere. They also reduce the ground level ozone level and enrich the air around us with life giving oxygen. For combating a variety of respiratory troubles and other illnesses caused by air pollution, there can be no better way than planting some chosen varieties of plants that can cleanse the air and make our environment better.

The bamboo palm is a popular purifying houseplant due to its tropical look and insect-repelling quality. The bamboo palm can remove substances like benzene, formaldehyde, chloroform, carbon monoxide, and xylene.

6.15 FORMATION OF PUBLIC RELATIONS UNIT

The following services may be offered under public relations Information and Facilitation:

- ❖ Registration and redressal of public complaints with feedback from complainant with help of reply to cards, maintenance of suggestion books for customers to record their suggestions/remarks on the function of public relations counter.
- ❖ Guidance to the public to meet the concerned officer to make their representations and redressal of their grievances.
- ❖ Information regarding disruption of water supply due to urgent repair works.
- ❖ Obtaining feedback from the consumers in redressal of their complaints/grievances.
- ❖ Creation of a single window system for redressal of grievances.
- ❖ A separate telephone line should be available round the clock to record complaints for addressing them.

6.16 COURTEOUS BEHAVIOUR OF PUBLIC RELATIONS

Since public relation and field staff are at the cutting-edge level they should be properly trained. Courteous behaviour towards the public-by-public relation staff will give a better image of the utility in the minds of public. Since the first impression of the consumer is always the best impression it is necessary to impress on the consumer at the very first contact itself. Public relation staff should follow simple guidelines while answering telephone calls from consumers to create a positive image in the minds of public.

6.17 COST ANALYSIS

The operation and maintenance cost anticipated for the proposed WTP has already been discussed in the Chapter of detailed estimates.

In the following Table, average monthly consumption and revenue obtained in the directly benefitted project area is presented. It may be noted a gap of 143 MLD is assessed by the end of 2050 for the total project area of Kochi. However, for the areas surrounding the proposed WTP, the total demand by the end of 2050 is also observed to be 143 MLD. Hence the water distribution can be effectively planned.

PRESENT AVERAGE MONTHLY CONSUMPTION AND REVENUE IN THE DIRECTLY BENEFITTED AREA				
LSGIs	Billed Quantity in KL/month (average for 6 months)	Billed Amount in Rs. (Average for 6 months)	Consumption in MLD as per billed quantity	Average Unit cost in Rs.
ALUVA MUNICIPALITY	125284	2343488.5	4.18	18.71
EDATHALA GP	83016	743697.83	2.77	8.96
CHOORNIKARA GP	96857	981236.83	3.23	10.13
KEEZHMADU GP	110027	1208828.5	3.67	10.99
UC COLLEGE (OTHER)	17866	162205	0.60	9.08
KALAMASSERY MUNICIPALITY	285722	4085631.33	9.52	14.30
THRIKKAKARA MUNICIPALITY	325562	7231143.83	10.85	22.21
VARAPPUZHA	74223	565223.33	2.47	7.62
ELOOR	85903	509884.5	2.86	5.94
PACHALAM	52334	891817.83	1.74	17.04
Total	1256794	18723157.48	41.89	14.90

Table 15. Present average monthly consumption and revenue in the directly benefitted area

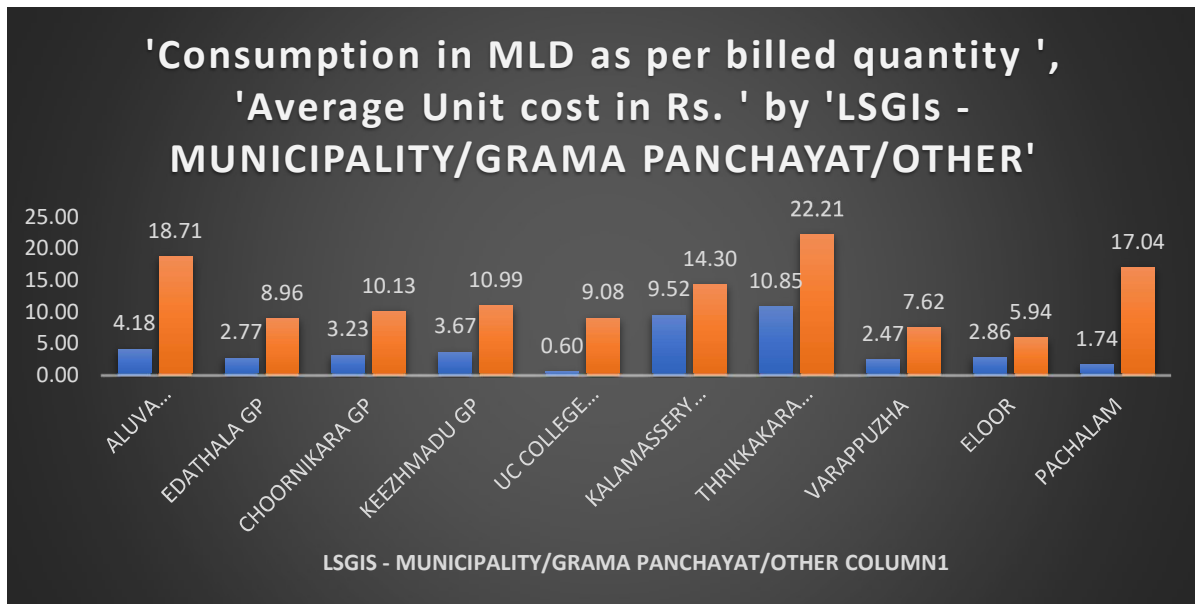


Figure 53. Analysis of revenue collection for average values

CONNECTION DETAILS IN THE DIRECTLY BENEFITTED PROJECT AREA					
Name of Municipality/ panchayath	Domestic connection	Non-domestic & Industrial connections	Expected population by 2050	Number of domestic connections expected by 2050	Number of Non-domestic and Industrial connections expected by 2050
Aluva	5753	2116	22428	6408	2645
Keezhmad	7004	866	54170	12038	1082.5
Choornikkara	6168	857	46732	10385	1071.25
Edathala	5637	604	73871	16416	755
Kalamassery	14563	2396	99846	22188	2995
Thrikkakara	18151	2176	117939	26209	2720
Varappuzha	4921	321	24723	5494	401.25
Eloor	3662	330	43534	9674	412.5
Pachalam	2789	249	56032	3113	311.25
	68648	9915	539275	111924	12394

Table 16. Connection details of Directly Benefitted Project Area (DBPA)

Sl. No.	Year	Expected consumption DBPA	Unit cost (per KL) in with increase	Revenue obtained per year in Crores of Rs. expected
1	2024	102.11	17.25	64.29
2	2025	102.74	18.11	67.92
3	2026	103.37	19.02	71.75
4	2027	103.99	19.97	75.80
5	2028	104.62	20.97	80.06
6	2029	105.24	22.02	84.57
7	2030	105.87	23.12	89.33

8	2031	106.49	24.27	94.35
9	2032	107.12	25.49	99.65
10	2033	107.74	26.76	105.24
11	2034	108.37	28.10	111.14
12	2035	109.00	29.50	117.37
13	2036	109.81	30.98	124.16
14	2037	110.62	32.53	131.33
15	2038	111.43	34.15	138.91
16	2039	112.24	35.86	146.91
17	2040	113.05	37.65	155.38
18	2041	113.86	39.54	164.31
19	2042	114.67	41.51	173.76
20	2043	115.48	43.59	183.74
21	2044	116.29	45.77	194.28
22	2045	117.10	48.06	205.41
23	2046	117.92	50.46	217.18
24	2047	118.73	52.98	229.61
25	2048	119.54	55.63	242.73
26	2049	120.35	58.41	256.60
27	2050	121.16	61.34	271.24
Total revenue generated at the end of 2050 in Crores of Rs.				3897.02

Table 17. Analysis of expected revenue in future for the Directly Benefitted Project Area (DBPA)

YEAR	Cumulative OPEX in Crores of Rs.	CAPEX+OPEX in Crores of Rs.	Cumulative Revenue Collected in Crores of Rs.
2024	21.62	276.62	64.29
2025	44.54	299.54	132.22
2026	68.84	323.84	203.97
2027	94.59	349.59	279.76
2028	121.89	376.89	359.83
2029	150.82	405.82	444.40
2030	181.49	436.49	533.72
2031	214.00	469.00	628.07
2032	248.47	503.47	727.72
2033	285.00	540.00	832.96
2034	323.72	578.72	944.10
2035	364.76	619.76	1061.47
2036	408.27	663.27	1185.63
2037	454.39	709.39	1316.97
2038	503.27	758.27	1455.87
2039	555.09	810.09	1602.79
2040	610.02	865.02	1758.16
2041	668.24	923.24	1922.48
2042	729.96	984.96	2096.24
2043	795.38	1050.38	2279.97
2044	864.72	1119.72	2474.25
2045	938.23	1193.23	2679.66

2046	1016.14	1271.14	2896.84
2047	1098.73	1353.73	3126.45
2048	1186.28	1441.28	3369.18
2049	1279.08	1534.08	3625.78
2050	1377.45	1632.45	3897.02

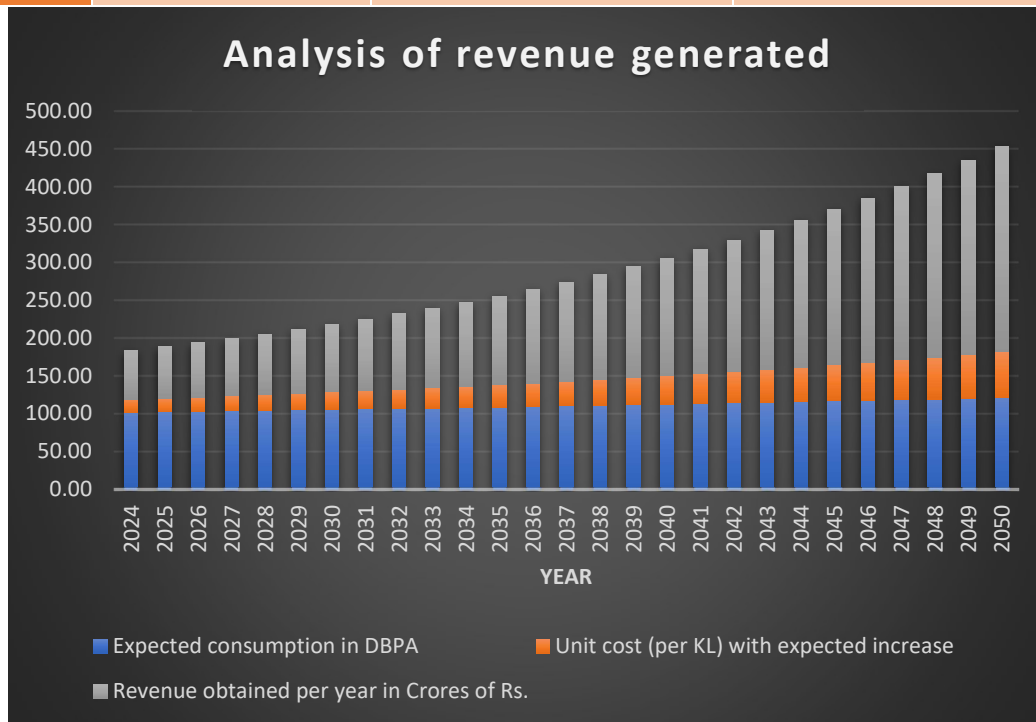


Figure 54. Analysis of expected revenue generated from new WTP

Table 18. Capital and cumulative operating expenditure versus cumulative revenue collected

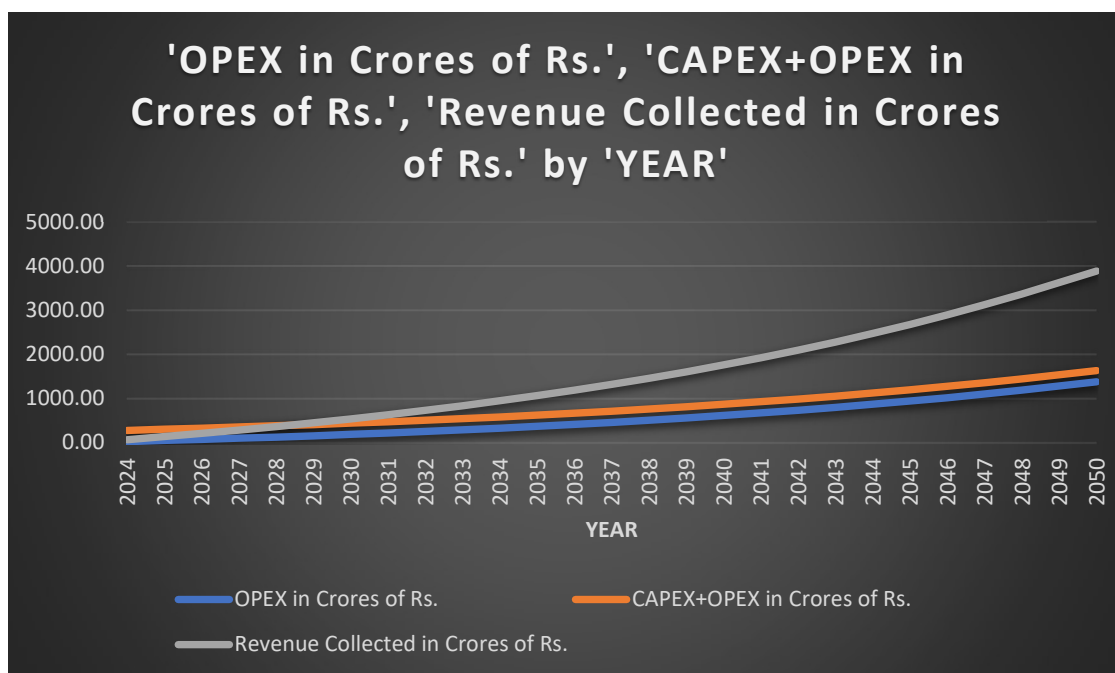


Figure 55. Capital and cumulative operating expenditure versus cumulative revenue collected

CHAPTER 7

CONCLUSIONS

7.1 OBSERVATIONS FROM ANALYSIS

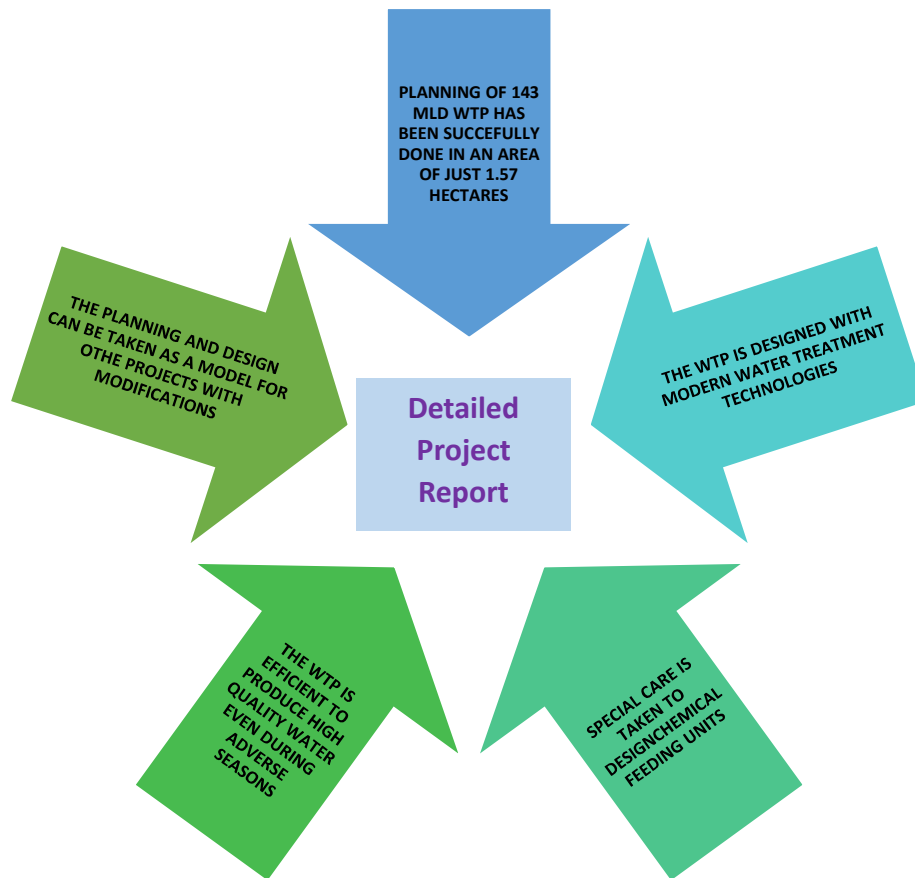


Figure 56. Features of DPR

From the analysis performed for the proposed 190 MLD WTP at Aluva with respect to the planning designing and implementation of a water treatment system, it can be observed that both the LSGIs and society mutually benefits substantially once the project is realised. Adopting a meticulous operation and maintenance plan, the system can be successfully run for a longer period without experiencing any troubles. The revenue generated within a short span of time will balance the construction and operational costs. Since there are many innovative digital technologies for controlling the performance of the system, it is an easy task for the institution to own and run the water treatment system. This will also pave the way for a wider acceptance in the society for similar applications. Adopting non-conventional energy sources like solar energy, it will be an easy affair to run many of the low energy demanding devices. Also, a building envelope with eco-friendly materials and construction technologies will give an aesthetically pleasing and healthy system.

7.2 INSTITUTIONAL ARRANGEMENTS

The project is monitored and executed in the following Project Management structure:

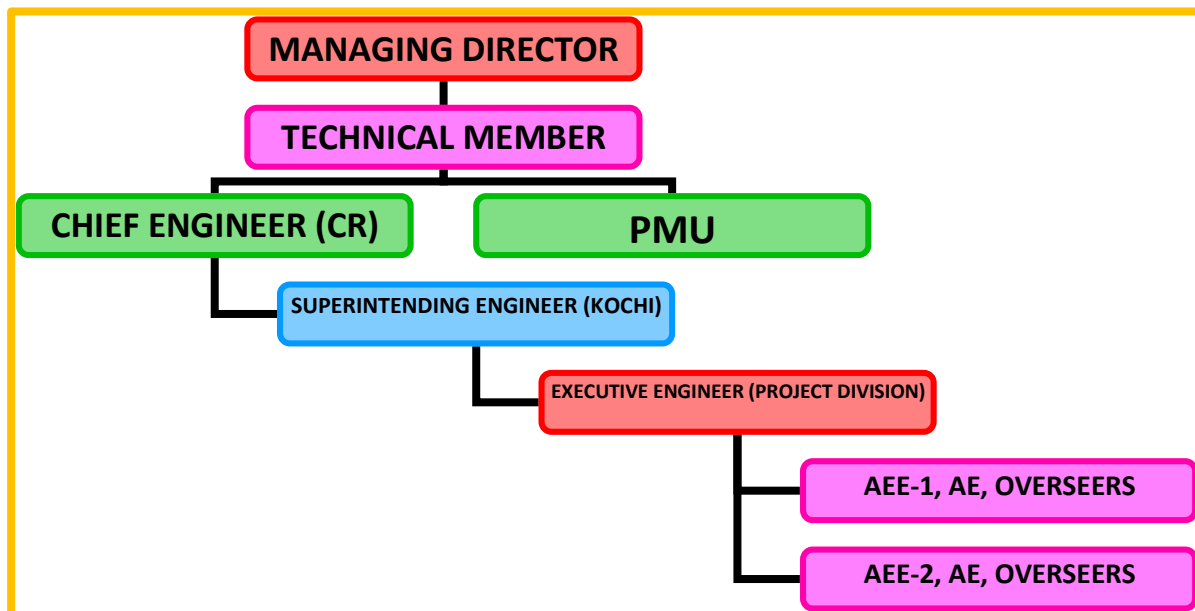


Figure 57. Project management structure

It is imperative that the institutional structures for the delivery of water supply services are streamlined. For the proposed project, planning and complete design has been performed by Kerala Water Authority using the inhouse expertise and vast experience in this field. An exclusive team of engineers and other technical support group was formed for the preparation of DPR within a short span time and the task was achieved within time. Similar works can be carried out in KWA using the inhouse experience and expertise of engineers and technical staff. It is also planned to create many technical sessions, trainings and preparation of a detailed Manual of Planning and Design of WTPs. For the effective operation and maintenance of the WTPs, the concept of water treatment process and principles of working of various units of WTPs are to be conveyed to the technical staff. For this task, several training, site visit and practice sessions are to be planned.

7.3 DATA INFORMATION AND MANAGEMENT

Accurate and reliable data information and management is a prerequisite for successful operation and maintenance of water supply systems. Modern technologies can be utilised for upgrading the existing systems and informed decision-making process can be sorted out for maintaining desirable level of performance of water supply schemes. Similarly, it may be noted that all officials dealing with the operation and management of WTP are to be trained to make latest state of art maps of adequate resolution (1:10,000 and better) and uses WGS84 (World Global System 1984) as the datum for all their spatial information. Such an information system shall make best use of the GIS and MIS platforms that are rapid to access and retrievable for use in planning for urban and rural infrastructure, creates compatible data formats and transforms MIS information (e.g., for property mapping, census etc.) into spatial geo-referenced GIS files for further analysis and interpretation for all the important sectors.

7.4 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 WTP must be properly disposed of by transforming it into fertilizer products or bricks for low impact construction activities. Recycled water generated from the WTP is to be used as per the guidelines already given.

7.5 GENDER EQUALITY AND SOCIAL IMPLICATIONS

The project is envisaged to provide substantial improvements in the life of the people belong to the project area, especially for the womanhood. During the operation of the WTP and the associated water supply network, the LSGIs can form a special monitoring group comprising of dedicated workforce especially from “Kudumbasree” units or similar groups for continuous appraisal of the water supply schemes in their area and obtain suggestions for subsequent upgradations. There must be special programmes organised for capacity building of the beneficiaries and all workforce associated with the operation and maintenance of the WTP.

7.6 FINANCIAL PLANNING AND OUTCOMES

It may be noted that overall costs (capital and operating) and financial sustainability must be determined to arrive at the most optimum solution. Hence during the preparation of DPR these factors were considered for better performance of the system.

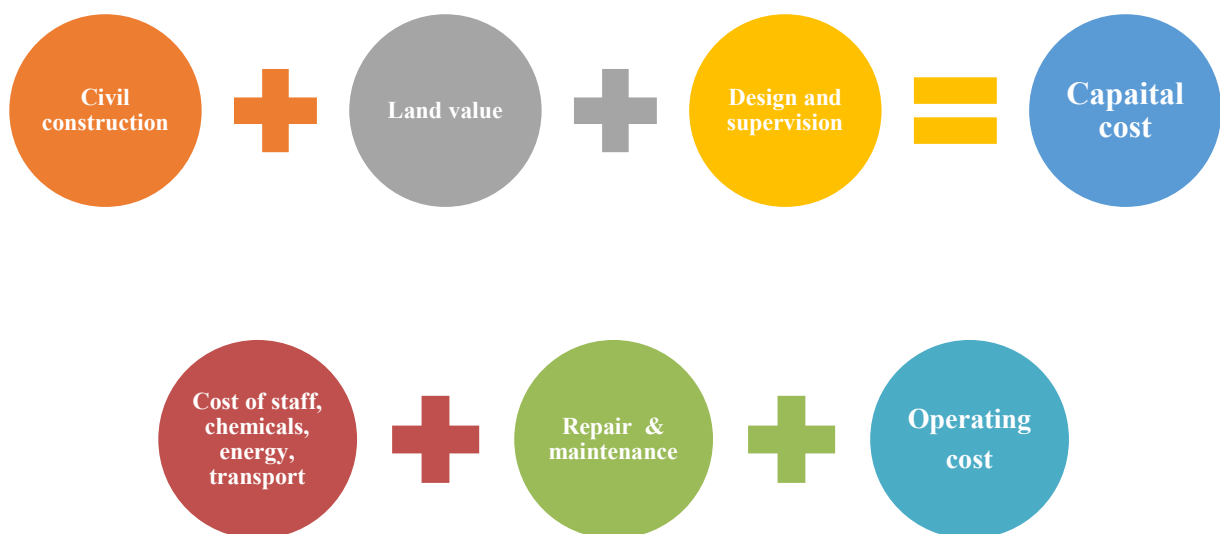


Figure 58. Capital and operating cost planning

For the present project of new WTP, the revenue generated will balance the capital and operational cost within a short span of time (within 8 years of operation from the year 2024) from its starting of

commissioning. In addition to this there are plenty of indirect benefit also. Availability of high-quality treated water will pave the way for overall development of the society. As per the WHO report, 80% of the diseases in human being are water-borne and water-related. It is mainly due to water pollution or water contamination and water logging. Though water logging may be location and weather specific, but water pollution and contamination is a common phenomenon which can occur at any place at any point of time if community is not careful about adverse impact of indiscriminate disposal of sewage. Improvements in water supply and sanitation including management of municipal solid waste can substantially reduce the incidences and severity of these diseases, as well as infant mortality. Hence a better planned society with desirable provisions of water supply will indirectly benefit for the socio-economic progress.

7.7 ACTION PLAN FOR IMPLEMENTATION AND MODIFICATIONS

The following sequence of implementation plan for the project may be more effective in realising the goals of providing the new WTP.

Priority	Plan
I	Preparation of a detailed engineering report
II	Appraisal of the report
III	Sanction of the project
IV	Fund mobilisation
V	Invitation of Tender for work
VI	Execution of work
VII	Formation of monitoring committee
VIII	Regular maintenance
IX	Assessment of performance
X	Modifications in process/unit operations

Table 19. Action plan for implementation

7.8 IMPLEMENTATION SCHEDULE

The entire project is planned to be completed within 14 months positively. The preparation of DPR will be over by March 2022 itself. Invitation of competitive bid, evaluation and awarding of work will require at least two months, and hence the works is expected to be started in June 2022. The work is to be performed with simultaneous operations for various units. The implementation schedule is illustrated below:

IMPLEMENTATION SCHEDULE															
ACTIVITY	Month-1	Month-2	Month-3	Month-4	Month-5	Month-6	Month-7	Month-8	Month-9	Month-10	Month-11	Month-12	Month-13	Month-14	Month-15
1 SITE PREPARATION AND LAYOUT FIXING															
2 CONSTRUCTION OF INTAKE WELL															
3 LAYING OF RE-ALIGNMENT OF PIPELINES															
4 LAYING OF RAW WATER															
5 LAYING OF TRANSMISSION LINES															
6 CONSTRUCTION OF AERATOR															
7 CONSTRUCTION OF RAW WATER CHANNEL															
8 CONSTRUCTION OF BAFFLED FLOCCULATORS															
9 CONSTRUCTION OF CLARIFIERS															
10 CONSTRUCTION OF CLARIFIED WATER CHANNEL															
11 CONSTRUCTION OF PILE FOUNDATION															
12 CONSTRUCTION OF CWR															
13 CONSTRUCTION OF FILTER HOUSE															
14 CONSTRUCTION OF OPERATING FLOOR															
15 CONSTRUCTION OF OFFICES															
16 CONSTRUCTION OF WWT															
17 CONSTRUCTION OF OH TANK															
18 CONSTRUCTION OF PUMP HOUSE															
19 CONSTRUCTION OF CHLORINATION UNITS															
20 CONSTRUCTION OF CHEMICAL HOUSE															
21 CONSTRUCTION OF TRANSFORMER YARD															
22 CONSTRUCTION OF SUB-STATION															
23 COMMISSIONING															

Table 20. Implementation schedule

7.9 RECOMMENDATIONS

The success of the water treatment system designed and executed largely depends upon the commitment and attitude of the people benefitted from it and hence it is inherent that the LSGIs as well as officers and technical staff investigate every detail of the water treatment plant and its supporting units to render a model of its kind in the State. Some of the points of action to be taken to enhance the performance of the system are outlined as follows:

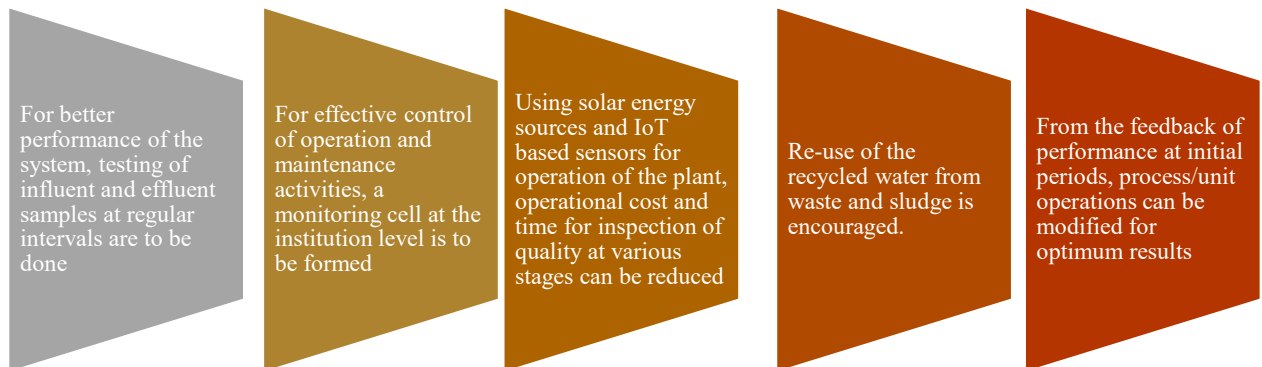


Figure 59. Recommendations for better performance

7.10 MAJOR REFERENCES

1. CPHEEO Manual of Water Supply and Treatment, Ministry of Jal-Shakthi and Drinking Water and Sanitation, Government of India
2. CPHEEO Manual of Operation and Maintenance of Water Supply System, Ministry of Housing and Urban Affairs, Government of India
3. Water and Wastewater Engineering by Fair, Geyer and Okun
4. Indian Standard Plain and Reinforced Concrete - Code of Practice, IS 456:2000
5. Indian Standard Concrete Structures for Storage of Liquids - Code of Practice Part 1 General Requirements, IS 3370 (Part-1 to 4)
6. Indian Standard General Construction in Steel- Code of Practice, IS:800 (2007)
7. Ductile Design and Detailing of Reinforced Concrete Structures Subjected to Seismic Forces- Code of Practice, IS 13920:2016
8. Criteria for Earthquake Resistant Design of Structures, Part-1, General Provisions and Buildings, IS 1893 Part-1: 2016
9. Criteria for Earthquake Resistant Design of Structures, Part-2, Liquid Retaining Tanks, IS 1893 Part-2: 2014
10. Design and Construction of Pile Foundations — Code of Practice, Part-1, Concrete Piles, Section-2, Bored Cast in-situ Concrete Piles, IS 2911: 2010
11. Dr. R.K. Ingle, Dr. Sudhir K. Jain, Explanatory Examples for Ductile Detailing of RC Buildings, IITK-GSDMA Project on Building Codes
12. Seismic Design of Liquid Storage Tanks, Explanatory Examples, IITK-GSDMA Project, October 2007

ANNEXURE

**DETAILED
ESTIMATES**

General Abstract

**STATE PLAN 2021-22 - INTERIM AUGMENTATION OF WSS TO KOCHI CITY
AND ADJOINING MUNICIPALITIES AND PANCHAYATHS - CONSTRUCTION OF
18M DIA INTAKE WELL CUM PUMP HOUSE AT ALUVA AND
SUPPLY,LAYING,CHARGING & COMMISSIONING OF 1829 mm MS RAW
WATER PUMPING MAIN.**

(Dsor year: 2018)

SI No	Heading Description	Amount
1	CONSTRUCTION OF WELL 18 M Dia	44135708.02
2	Providing of 1829mm Dia Raw Water Pumping Main	0.00
3	Cost of materials	46900112.90
4	RWPM - Working charges	25639498.96
5	PUSH THROUGH CROSSING	3816277.27
6	RAW WATER PUMP SET	45142950.00
7	Gantry System	2500000.00
8	Road Restoration	31703256.00
	Total	199837803.15
	Centage @	0.0%
	Centage Amount	0.00
	Provision for GST payments (in %) @	18.0%
	Amount reserved for GST payments	35970804.57
	Total & Centage	235808607.72
	Lumpsum for round off	191392.28
	GRAND TOTAL Rs	236000000.00
	Rounded Grand Total Rs	23,60,00,000
	Rupees Twenty Three Crore Sixty Lakh Only	

Detailed Estimate

**STATE PLAN 2021-22 - INTERIM AUGMENTATION OF WSS TO KOCHI CITY
AND ADJOINING MUNICIPALITIES AND PANCHAYATHS - CONSTRUCTION OF
18M DIA INTAKE WELL CUM PUMP HOUSE AT ALUVA AND
SUPPLY,LAYING,CHARGING & COMMISSIONING OF 1829 mm MS RAW
WATER PUMPING MAIN.**

(Dsr year: 2018)

Sl No	Description	No	L	B	D	CF	Quantity	Remark
1 CONSTRUCTION OF WELL 18 M Dia (Cost Index:35.59 %)								
1	2.31 Clearing jungle including uprooting of rank vegetation, grass, brush wood, trees and saplings of girth up to 30 cm measured at a height of 1 m above ground level and removal of rubbish up to a distance of 50 m outside the periphery of the area cleared							
	At over side area	1	25.000	15.000			375.000	
	Total Quantity						375.000 sqm	
	Total Deducted Quantity						0.000 sqm	
	Net Total Quantity						375.000 sqm	
	Say 375.000 sqm @ Rs 14.78 / sqm						Rs 5542.50	
2	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							
	trees	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 9252.59 / No						Rs 46262.95	
3	15.3 Demolishing R.C.C. work manually / by mechanical means including stacking of steel bars and disposal of unserviceable material with in 50 metres lead as per direction of Engineer -in-Charge.							
	Retaining wall	1	15.000	0.600	6.000		54.000	
	Foundation	1	15.000	1.500	0.750		16.875	
	Total Quantity						70.875 cum	
	Total Deducted Quantity						0.000 cum	

	Net Total Quantity						70.875 cum
	Say 70.875 cum @ Rs 2983.59 / cum						Rs 211461.94
4	<p>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.</p>						
	river facing areas	1	26.600*3. 142			0.7	58.505
	Total Quantity						58.505 sqm
	Total Deducted Quantity						0.000 sqm
	Net Total Quantity						58.505 sqm
	Say 58.505 sqm @ Rs 749.13 / sqm						Rs 43827.85
5	<p>od347142/2021_2022 Providing Ring bund by Earth filled cement bags including cutting of the Earth, filling, conveying and placing in position, Filling with contractor's own earth (excluding rock) in the core portion of the earthen bund by consolidating each deposited layer by ramming and watering, as per direction of the departmental officers , conveying and covering using best quality polythene sheet on bund to protect bund from seasonal changes, and providing bamboo poles for reinforcing the temporary bund including the cost materials and labour charges etc. , Dismantling the sand / earth filled cement bag from the foundation site of bund, apron on both sides, counter wall and removing the sand/earth from the bag and disposing the damaged cement bags properly as per the direction of the department officers including all cost of labour charges etc complete.</p>						
	river facing areas	1	28.60*3.1 42			0.7	62.903
	Total Quantity						62.903 metre
	Total Deducted Quantity						0.000 metre
	Net Total Quantity						62.903 metre
	Say 62.903 metre @ Rs 13849.47 / metre						Rs 871173.21
6	<p>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</p>						

	Cutting & dumping from upstream ground of river bank to make platform within the area of ring bund for setting well kerb	1	26.60*26.60*3.142/4		7.500	0.33	1388.082	1/3rd portion of 26.60m dia for 7.5m	
	Total Quantity						1388.082 cum		
	Total Deducted Quantity						0.000 cum		
	Net Total Quantity						1388.082 cum		
	Say 1388.082 cum @ Rs 214.03 / cum						Rs 297091.19		
7	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.								
	forming working platform at river bank low level	1	26*26*3.142/4		2.500	0.5	663.748	average depth of 2.5m	
	Total Quantity						663.748 cum		
	Total Deducted Quantity						0.000 cum		
	Net Total Quantity						663.748 cum		
	Say 663.748 cum @ Rs 258.57 / cum						Rs 171625.32		
8	20.2.4 Boring, providing and installing bored cast-in-situ reinforced cement concrete piles of grade M-25 of specified diameter and length below the pile cap to carry a safe working load not less than specified, excluding the cost of steel reinforcement but including the cost of boring, with bentonite solution and temporary casing of appropriate length for setting out and removal of same and the length of the pile to be embedded in the pile cap etc. all complete, including removal of excavated earth with all lifts and leads (Length of pile for payment shall be measured upto bottom of pile cap).500 mm dia piles								
	piles around the well	12	15.000				180.000	approx	
	piles at center	2*4	5.000				40.000	approx	
	Total Quantity						220.000 metre		
	Total Deducted Quantity						0.000 metre		
	Net Total Quantity						220.000 metre		
	Say 220.000 metre @ Rs 2500.08 / metre						Rs 550017.60		
9	od345562/2021_2022 Earthwork for RCC well sinking including clearing out the earth underneath to the well kerb by jetting,comping etc (in or under water) for wells of dia. above 18m and upto 21.0 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.								

	First lift up to 1.50m	1	19.4*19.4/ 4		1.500	3.14	443.447	
	Total Quantity						443.447 cum	
	Total Deducted Quantity						0.000 cum	
	Net Total Quantity						443.447 cum	
	Say 443.447 cum @ Rs 462.77 / cum						Rs 205213.97	
10	od347044/2021_2022 Earthwork excavation for RCC well sinking including clearing out the earth underneath to the well curb by jetting,comping etc (in or under water) for wells of dia. above 18.0m and upto 21.0 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							
	second lift 1.5m - 3m	1	19.4*19.4/ 4		1.500	3.14	443.447	
	Total Quantity						443.447 cum	
	Total Deducted Quantity						0.000 cum	
	Net Total Quantity						443.447 cum	
	Say 443.447 cum @ Rs 552.26 / cum						Rs 244898.04	
11	od347045/2021_2022 Earthwork excavation for RCC well sinking including clearing out the earth underneath to the well curb by jetting, comping etc.. (in or under water) for wells of dia. above 18.0m and upto 21.0 m in all kinds of soil and conveying and depositing the spoil within initial lead of 50m and lift from 3.0m to 4.50m including neat banking. NEW DATA							
	third lift 3m -4.5m	1	19.4*19.4/ 4		1.500	3.14	443.447	
	Total Quantity						443.447 cum	
	Total Deducted Quantity						0.000 cum	
	Net Total Quantity						443.447 cum	
	Say 443.447 cum @ Rs 552.26 / cum						Rs 244898.04	
12	od347051/2021_2022 Earthwork excavation for RCC well sinking including clearing out the earth underneath to the well curb by jetting, comping etc.. (in or under water) for wells of dia. above 18.0m and upto 21.0 m in all kinds of soil and conveying and depositing the spoil within initial lead of 50m and lift from 4.50m to 6.00m including neat banking. NEW DATA							
	fourth lift 4.5m-6m	1	19.4*19.4/ 4		1.500	3.14	443.447	
	Total Quantity						443.447 cum	
	Total Deducted Quantity						0.000 cum	
	Net Total Quantity						443.447 cum	

	Say 443.447 cum @ Rs 552.26 / cum							Rs 244898.04
13	od347066/2021_2022 Earthwork excavation for RCC well sinking including clearing out the earth underneath to the well curb by jetting, comping etc.. (in or under water) for wells of dia. above 18.0m and upto 21.0 m in all kinds of soil and conveying and depositing the spoil within initial lead of 50m and lift from 6.0m to 7.5m including neat banking. NEW DATA (Prepared based on PHED SDB - Item No.1073 & 1076 Details of Cost For 10 m3							
	fifth lift 6m-7.5m	1	19.4*19.4/ 4		1.500	3.14	443.447	
	Total Quantity							443.447 cum
	Total Deducted Quantity							0.000 cum
	Net Total Quantity							443.447 cum
	Say 443.447 cum @ Rs 552.26 / cum							Rs 244898.04
14	od347086/2021_2022 Earthwork excavation for RCC well sinking including clearing out the earth underneath to the well curb by jetting, comping etc.. (in or under water) for wells of dia. above 18.0m and upto 21.0 m in all kinds of soil and conveying and depositing the spoil within initial lead of 50m and lift from 7.5m to 9.0m including neat banking. NEW DATA (Prepared based on PHED SDB - Item No.1073 & 1076							
	sixth lift 7.5m-9m	1	19.4*19.4/ 4		1.500	3.14	443.447	
	Kerala Water Authority Total Quantity							443.447 cum
	Total Deducted Quantity							0.000 cum
	Net Total Quantity							443.447 cum
	Say 443.447 cum @ Rs 552.26 / cum							Rs 244898.04
15	od347088/2021_2022 Earthwork excavation for RCC well sinking including clearing out the earth underneath to the well curb by jetting, comping etc.. (in or under water) for wells of dia. above 18.0m and upto 21.0 m (in or under water)in all kinds of soil and conveying and depositing the spoil within initial lead of 50m and lift from 9.0m to 10.50m including neat banking. NEW DATA							
	seventh lift 9m-10.5m	1	19.4*19.4/ 4		1.500	3.14	443.447	
	Total Quantity							443.447 cum
	Total Deducted Quantity							0.000 cum
	Net Total Quantity							443.447 cum
	Say 443.447 cum @ Rs 552.26 / cum							Rs 244898.04
16	od347150/2021_2022 Providing Cutting edge for setting well kerb using MS angle of section ISA 150x150x16mm cut, levelling, bend to required curvature at site and joining by arc welding (2run) and providing stifnner plates of 20mm							

	thick welded jointed to the angle at 1.50m intervals, and fabricated and placed in position for setting RCC well kerb of 19.40m outer dia as per the designs, including cost & labour charges, hire for tools, plants etc complete.						
	FOR SETTING WELL KERB	1	19.40*3.1 42				60.955
	Total Quantity						60.955 metre
	Total Deducted Quantity						0.000 metre
	Net Total Quantity						60.955 metre
	Say 60.955 metre @ Rs 4052.73 / metre						Rs 247034.16
17	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 to 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)						
	Rcc for well curb	1	18.70*3.1 42	0.700	0.650		26.734
	Rcc for well stening of 1.50m height each upto a total depth of 9.30m	6	18.60*3.1 42	0.600	1.500		315.583
	Do	1	18.60*3.1 42	0.600	1.300		45.585
	Rcc pile cap cum lateral beam below river bed level	1	20.600*3. 142	2.600	0.600		100.972
	Rcc well stening (over pile) above plinth beam upto floor slab of pump house	6	22.000*3. 142	0.600	1.500		373.270
		1	22.00*3.1 42	0.600	0.850		35.254
	Pile cap for center columns at bed of well	4	1.500	1.500	0.800		7.200
	Foundation beam for center columns	4	3.170	0.300	0.600		2.283
	floor beams cum slab for infiltration gallery	3	9.100	2.300	(0.60+0.30)/2		28.256
	side walls for infiltration gallery	3	13.400	0.300	4.350		52.461

	Rcc over bottom plugging of well	1	3.142*(18.00*18.00)/4		0.150		38.176	
	Columns at center portion of the well	4	0.60*0.60*3.142/4		20.560		23.256	
	Columns at center portion of pumphouse	4	0.60*0.60*3.142/4		5.500		6.222	
	Columns at side wall portion of pumphouse upto gantry beam	16	4.300	0.500	0.300		10.320	
	Columns at side wall portion of pumphouse above gantry beam	16	1.000	0.300	0.300		1.440	
	Columns at side wall portion of control rooms	6	3.600	0.300	0.300		1.944	
		1					1.000	
		1					1.000	
	deduction for cutting edge for RCC curb	1	18.30*3.142	0.30/2	0.500		-4.312	
	deduction for inlet pipes on infiltration gallery wall	3*3	3.142*1.00*1.00/4		0.300		-2.120	
	deduction for inlet pipes on well stening	3*3	3.142*1.00*1.00/4		0.600		-4.241	
						Total Quantity	1070.956 cum	
						Total Deducted Quantity	-10.673 cum	
						Net Total Quantity	1060.283 cum	
						Say 1060.283 cum @ Rs 10954.04 / cum	Rs 11614382.39	
18	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).							
	Rcc for well curb	1	18.70*3.142	0.700	0.650		26.734	
	Rcc for well stening (inner well) of 1.50m hight each upto a total depth of 9.30m	6	18.60*3.142	0.600	1.500		315.583	

		1	18.60*3.1 42	0.600	0.620		21.741	
	Rcc pile cap cum lateral beam	1	20.600*3. 142	2.600	0.600		100.972	
	Rcc well stening (mother well) above plinth beam upto floor slab of pump house	6	22.000*3. 142	0.600	1.500		373.270	
		1	22.00*3.1 42	0.600	0.850		35.254	
	Pile cap for center columns at bed of well	4	1.500	1.500	0.800		7.200	
	Foundation beam for center columns	4	3.170	0.300	0.600		2.283	
	floor beams cum slab for infiltration gallery	3	9.100	2.300	(0.60+0.30)/2		28.256	
	side walls for infiltration gallery	3	13.400	0.300	4.350		52.461	
	Rcc over bottom plugging of well	1	3.142*(18.00*18.00)/4		0.150		38.176	
	Columns at center portion of the well	4	0.60*0.60*3.142/4		20.560		23.256	
	Columns at center portion of pumphouse	4	0.60*0.60*3.142/4		5.500		6.222	
	Columns at side wall portion of pumphouse upto gantry beam	16	4.300	0.500	0.300		10.320	
	Columns at side wall portion of pumphouse above gantry beam	16	1.000	0.300	0.300		1.440	
	Columns at side wall portion of control rooms	6	3.600	0.300	0.300		1.944	
		1					1.000	
		1					1.000	
	deduction for cutting edge for RCC curb	1	18.30*3.1 42	0.30/2	0.500		-4.312	

	deduction for inlet pipes on infiltration gallery wall	3*3	3.142*1.0 0*1.00/4		0.300		-2.120		
	deduction for inlet pipes on well stening	3*3	3.142*1.0 0*1.00/4		0.600		-4.241		
	Total Quantity						1047.112 cum		
	Total Deducted Quantity						-10.673 cum		
	Net Total Quantity						1036.439 cum		
	Say 1036.439 cum @ Rs 82.10 / cum							Rs 85091.64	
19	5.22B.1 Steel reinforcement for R.C.C. work ready to use "cut and bend" rebars of approved make from factory/workshop to construction site including placing in position and binding all complete upto plinth level Thermo-Mechanically Treated bars of grade Fe-500D or more.								
	Quantity of steel reinforcement for RCC vide item 1142.443m3 @100kg/m3	1	1363.648		1.15	1568.196	@1.15Qtl/ m3		
	Total Quantity						1568.196 quintal		
	Total Deducted Quantity						0.000 quintal		
	Net Total Quantity						1568.196 quintal		
	Say 1568.196 quintal @ Rs 9141.61 / quintal							Rs 14335836.24	
20	5.3 Reinforced cement concrete work in beams, suspended floors, roofs, having slope up to 15 ⁰ 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).								
	Brace beams connecting central columns at 5 levels	5*4	4.070	0.250	0.400		8.141		
	Beams for Floor slabs of pump house	4	20.200	0.300	0.600		14.544		
		2	21.200	0.300	0.600		7.632		
	Beams for Floor slabs of control room	2*3	5.350	0.300	0.600		5.778		
	cross Beams for Floor slabs of pump house	12	3.200	0.300	0.300		3.456		
	floor slab - pump house	1	3.142*22.40*22.40/4		0.250		98.534		

	floor slab - pump house control rooms	2	7.100	4.700	0.150		10.011	
	slab for walk way - Entry slab	1	4.500	3.500	0.200		3.151	
	cantilever walk way slab alround	1	14.000	1.500	0.100		2.100	
	Do	1	32.700	1.500	0.100		4.906	
	Lintels	4	4.800	0.200	0.200		0.768	
	Do	2	11.600	0.200	0.200		0.928	
	Do	1	27.700	0.200	0.200		1.108	
	Gantry beam outer wing	1	68.960	0.650	0.700		31.377	
	Gantry beam inner wings	1	6.5*3.14	1.000	0.700		14.287	
	sunshades	2	7.850	0.750	0.100		1.178	
	Do	4	4.400	0.750	0.100		1.321	
	Do	2	13.250	1.500	0.100		3.975	
	Do	1	31.250	1.500	0.100		4.688	
	Roof slab for control rooms	12	7.400	5.230	0.120		55.731	
	Roof slab for pump house	1	3.142*23.00*23.00/4		0.120		49.864	
	staircase landing (above pile cap)	4	0.750	0.750	0.150		0.338	
	steps	12*4	0.750	0.420	0.120		1.815	
	extra	11*4	0.750	0.050	0.120		0.198	
	steps	10	0.750	0.420	0.120		0.378	
	extra	10	0.750	0.050	0.120		0.046	
	staircase landing (below pile cap)	4	0.750	0.750	0.150		0.338	
	steps	12*5	0.750	0.420	0.120		2.268	
	extra	12*5	0.750	0.050	0.120		0.270	
	manhole deduction	12	0.800	0.800	0.250		-1.920	
						Total Quantity	329.129 cum	
						Total Deducted Quantity	-1.920 cum	

	Net Total Quantity						327.209 cum	
	Say 327.209 cum @ Rs 11492.88 / cum						Rs 3760573.77	
21	5.9.1 Centering and shuttering including strutting, etc. and removal of form for:Foundations, footings, bases of columns, etc for mass concrete							
	Rcc pile cap cum lateral beam	2	20.600*3.142		0.600		77.671	
	Pile cap for center columns at bed of well	4*4	1.500		0.800		19.201	
	Foundation beam for center columns	4*2	3.170		0.600		15.216	
	floor beams cum slab for infiltration gallery	3*1	9.000	2.300			62.100	
		16*2	4.300	0.300			41.280	
	deduction for inlet pipes on infiltration gallery wall (outside)	3*3	3.142*1.00*1.00/4				-7.069	
	deduction for inlet pipes on infiltration gallery wall (inside)	3*3	3.142*1.00*1.00/4				-7.069	
	Kerala Water Authority Total Quantity						215.468 sqm	
	Total Deducted Quantity						-14.138 sqm	
	Net Total Quantity						201.330 sqm	
	Say 201.330 sqm @ Rs 335.31 / sqm						Rs 67507.96	
22	5.9.12 Centering and shuttering including strutting, etc. and removal of form for:Well steining							
	well curb (out side)	1	19.40*3.142		0.650		39.621	
	well curb (slanting)	1	18.61*3.142		0.450		26.313	
	well curb(vertical inner)	1	18*3.142		0.200		11.312	
	well steining (inner well) of 1.50m hight each upto a total depth of 9.30m(inside)	6	18*3.142		1.500		509.004	
	inside	1	18*3.142		0.670		37.893	

	well steining (inner well) of 1.50m hight each upto a total depth of 9.30m(outside)	6	19.2*3.14 2		1.500		542.938		
	outside	1	19.2*3.14 2		0.670		40.419		
	well steining (mother well) abover plinth beam upto floor slab of pump house(inside)	6	21.4*3.14 2		1.500		605.150		
		1	21.4*3.14 2		0.850		57.153		
	well steining (mother well) abover plinth beam upto floor slab of p u m p house(outside)	6	22.6*3.14 2		1.500		639.083		
		1	22.6*3.14 2		0.850		60.358		
	deduction for inlet pipes on well stening	3*3	3.142*1.0 0*1.00/4		0.600		-4.241		
		Total Quantity						2569.244 sqm	
		Total Deducted Quantity						-4.241 sqm	
		Net Total Quantity						2565.003 sqm	
		Say 2565.003 sqm @ Rs 249.69 / sqm						Rs 640455.60	
23	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.								
	side walls for infiltration gallery (inside)	3	12.970		4.350		169.259		
	side walls for infiltration gallery(outside)	3	14.380		4.350		187.659		
		Total Quantity						356.918 sqm	
		Total Deducted Quantity						0.000 sqm	
		Net Total Quantity						356.918 sqm	
		Say 356.918 sqm @ Rs 717.20 / sqm						Rs 255981.59	

24	5.9.3 Centering and shuttering including strutting, etc. and removal of form for:Suspended floors, roofs, landings, balconies and access platform							
	floor slab - pump house bottom	1	3.142*21.20*21.20/4					353.036
	floor slab - pump house control rooms	2	7.100	4.400				62.481
	slab for walk way - Entry slab	1	4.500+2.03+2.03	2.030				17.377
	cantilever walk way slab alround	1	14.000		0.100			1.401
	Do	1	30.500		1.500			45.750
	Roof slab for control rooms bottom	2	6.060	4.500				54.540
	Roof slab for pump house bottom	1	3.142*21.2*21.2/4					353.036
	sides of manholes	12*4	0.800		0.250			9.601
	staircase landing	8	0.750	0.750				4.500
	staircase landing (side)	8	0.750		0.150			0.900
	manhole deduction	12	0.800	0.800				-7.680
							Total Quantity	902.622 sqm
							Total Deducted Quantity	-7.680 sqm
							Net Total Quantity	894.942 sqm
							Say 894.942 sqm @ Rs 815.78 / sqm	Rs 730075.78
25	5.9.5 Centering and shuttering including strutting, etc. and removal of form for:Lintels, beams, plinth beams, girders bressumers and cantilevers							
	Brace beams connecting central columns at 5 levels	5*4*2	4.070		0.400			65.121
		5*4	4.070		0.250			20.350
	Beams for Floor slabs of pump house(side)	4*2	20.200		0.600			96.960
	Beams for Floor slabs of pump house (bottom)	4	20.200	0.300				24.240

	diagonal beam side	2*2	21.200		0.600		50.880	
	bottom	2	21.200	0.300			12.720	
	cantilever side	2*3*2	5.350		0.600		38.520	
	cantilever bottom	2*3	5.350	0.300			9.630	
	side	12*2	3.200		0.300		23.040	
	bottom	12	3.200	0.300			11.520	
	Lintels	4*2	4.800		0.200		7.680	
		4	4.800	0.200			3.840	
	side	2*2	11.600		0.200		9.280	
	bottom	2	11.600	0.200			4.640	
	Do side	2*2	11.600		0.200		9.280	
	bottom	2	11.600	0.200			4.640	
	Do side	2*2	27.700		0.200		22.160	
	bottom	1	27.700		0.200		5.540	
	Gantry beams outer wing (outer)	1	70.990		0.700		49.693	
	Gantry beams outer wing (inner)	1	66.920		0.720		48.183	
						Total Quantity	517.917 sqm	
						Total Deducted Quantity	0.000 sqm	
						Net Total Quantity	517.917 sqm	
						Say 517.917 sqm @ Rs 649.82 / sqm	Rs 336552.82	
26	5.9.6							
	Centering and shuttering including strutting, etc. and removal of form for:Columns, Pillars, Piers, Abutments, Posts and Struts							
	Columns at center portion of the well	4*1	0.60*3.14 2		20.560		155.039	
	Columns at center portion of pumphouse	4	0.60*3.14 2		5.500		41.475	
	Columns at side wall portion of pumphouse upto gantry beam	16*2	4.300		0.500		68.800	
	Columns at side wall portion of pumphouse above gantry beam	16*4	1.000		0.300		19.200	

	Columns at side wall portion of control rooms	16*4	3.600		0.300		69.120		
	Total Quantity						353.634 sqm		
	Total Deducted Quantity						0.000 sqm		
	Net Total Quantity						353.634 sqm		
	Say 353.634 sqm @ Rs 863.64 / sqm						Rs 305412.47		
27	5.9.7 Centering and shuttering including strutting, etc. and removal of form for:Stairs, (excluding landings) except spiral - staircases)								
	bottom thread (above pile cap)	12*4	0.750	0.300			10.800		
	do	10	0.750	0.300			2.250		
	riser	11*4	0.750		0.1739		5.739		
	do	9	0.750		0.1739		1.174		
	bottom thread (below pile cap)	12*5	0.750	0.300			13.500		
	riser	11*5	0.750		0.1745		7.199		
	Total Quantity						40.662 sqm		
	Total Deducted Quantity						0.000 sqm		
	Net Total Quantity						40.662 sqm		
	Say 40.662 sqm @ Rs 732.52 / sqm						Rs 29785.73		
28	5.9.19 Centering and shuttering including strutting, etc. and removal of form for:Weather shade, Chajjas, corbels etc., including edges								
	floor slab - pump house (out side)	1	3.142*22.60		0.450		31.955		
	inside	1	21.6*3.142		0.200		13.574		
	floor slab - pump house control rooms	2	7.100+4.4+4.4		0.150		4.770		
	slab for walk way - Entry slab	1	4.500+2.03+2.03		0.200		1.712		
	cantilever walk way slab alround	1	14.000		0.100		1.401		
	Do	1	32.700		0.100		3.271		
	sunshades bottom	2	7.850	0.750			11.775		

	side	2	7.850	0.050			0.785		
	sunshades bottom	4	4.400	0.750			13.201		
	side	4	4.400	0.050			0.881		
	sunshades bottom	2	13.250	1.500			39.750		
	side	2	13.250	0.050			1.326		
	sunshades bottom	1	31.250	1.500			46.875		
	side	1	31.250	0.050			1.563		
	deduction for floor slab of control room(outside)	3	7.230	.45-.15			-6.507		
	Total Quantity						172.839 sqm		
	Total Deducted Quantity						-6.507 sqm		
	Net Total Quantity						166.332 sqm		
	Say 166.332 sqm @ Rs 902.55 / sqm						Rs 150122.95		
29	5.9.16.1 Centering and shuttering including strutting, etc. and removal of form for:Edges of slabs and breaks in floors and wallsUnder 20 cm wide								
	control room edges	2*2	7.100		0.150		4.260		
	do	2*2	5.080		0.150		3.048		
	entry slab	1	4.500		0.150		0.675		
	do	2	2.030		0.150		0.609		
	slab for walkway	1	14.000		0.150		2.100		
	do	2	1.000		0.150		0.300		
	pump house roof slab	1	22.90*3.1 42		0.120		8.635		
	Total Quantity						19.627 metre		
	Total Deducted Quantity						0.000 metre		
	Net Total Quantity						19.627 metre		
	Say 19.627 metre @ Rs 203.93 / metre						Rs 4002.53		
30	5.9.16.2 Centering and shuttering including strutting, etc. and removal of form for:Edges of slabs and breaks in floors and wallsAbove 20 cm wide								
	Edges floor slab of pump house	1	70.38- (2*6.55)		0.250		14.320		
	edges of manhole	12*4	0.800		0.250		9.601		

							Total Quantity	23.921 sqm
							Total Deducted Quantity	0.000 sqm
							Net Total Quantity	23.921 sqm
							Say 23.921 sqm @ Rs 867.91 / sqm	Rs 20761.28
31	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							
	LS	1	100.000	5.000	1.000			500.000
							Total Quantity	500.000 cum
							Total Deducted Quantity	0.000 cum
							Net Total Quantity	500.000 cum
							Say 500.000 cum @ Rs 525.82 / cum	Rs 262910.00
32	2.22.3 Open timbering over areas including strutting, shoring etc. complete (Measurements to be taken of the face area timbered):Depth exceeding 3 m but not exceeding 4.5 m							
	shoring to upper level, stage 1	1	23.000		4.500			103.500
	-do- lower level, stage 2	1	23.000		1.500			34.500
							Total Quantity	138.000 sqm
							Total Deducted Quantity	0.000 sqm
							Net Total Quantity	138.000 sqm
							Say 138.000 sqm @ Rs 71.46 / sqm	Rs 9861.48
33	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							
	for anchor blocks	10	3.000	3.000	3.000			270.000
							Total Quantity	270.000 cum
							Total Deducted Quantity	0.000 cum
							Net Total Quantity	270.000 cum
							Say 270.000 cum @ Rs 9085.14 / cum	Rs 2452987.80
34	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)							

	PCC below bottom plugging of inner well	1	3.142*18.60*18.60/4		0.150		40.763		
	PCC below infiltration gallery	2	7.100	4.400	0.150		9.372		
	PCC below entry slab bed block	1	4.500	0.800	0.150		0.540		
	Total Quantity						50.675 cum		
	Total Deducted Quantity						0.000 cum		
	Net Total Quantity						50.675 cum		
	Say 50.675 cum @ Rs 7211.15 / cum						Rs 365425.03		
35	4.2.2 Providing and laying cement concrete in retaining walls, return walls, walls (any thickness) including attached pilasters, columns, piers, abutments, pillars, posts, struts, buttresses, string or lacing courses, parapets, coping, bed blocks, anchor blocks, plain window sills, fillets, sunken floor, etc. up to floor five level, excluding the cost of centering, shuttering and finishing:1:11/2:3 (1 cement : 11/2 coarse sand : 3 graded stone aggregate 20 mm nominal size)								
	CC for bottom plugging	1	3.142*18.3*18.3/4		0.750		197.293		
	Total Quantity						197.293 cum		
	Total Deducted Quantity						0.000 cum		
	Net Total Quantity						197.293 cum		
	Say 197.293 cum @ Rs 10566.12 / cum						Rs 2084621.51		
36	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)								
	well bottom	1	19.000*19/4		0.150	3.14	42.508		
	Total Quantity						42.508 cum		
	Total Deducted Quantity						0.000 cum		
	Net Total Quantity						42.508 cum		
	Say 42.508 cum @ Rs 8557.76 / cum						Rs 363773.26		
37	50.6.1.5 Solid block masonry using pre cast solid blocks (Factory made) of size 30x20x20cm or nearest available size confirming to IS 2185 Part I of 1979 for super structure up to floor two level thickness 20cm and above in: CM 1:6 (1 cement : 6 coarse sand) etc complete								
	wall of control rooms	2	7.100	0.200	3.600		10.224		

		4	5.080	0.200	3.600		14.631		
	pump house wall	1	3.142*22.40	0.200	5.200		73.197		
	deduction for columns of pump house wall	16	4.300	0.300	0.200		-4.127		
		16	0.700	0.300	0.200		-0.672		
	deduction for columns of control room walls	16	3.300	0.300	0.200		-3.167		
	deduction for lintels	2	7.100	0.200	0.200		-0.568		
		4	5.080	0.200	0.200		-0.812		
	deduction for gantry beam of pump house wall	1	3.142*22.40	0.200	0.700		-9.853		
	deduction for control room openings of pump house wall	2	7.170	0.200	3.300		-9.464		
	deduction for doors of control room	4	1.000	0.200	2.400		-1.920		
	deduction for windows of control room	4*2	1.200	0.200	1.500		-2.880		
	deduction for windows of pump house wall	12	1.200	0.200	1.500		-4.320		
	deduction for ventilators of pump house wall	12	1.200	0.200	0.450		-1.296		
	deduction for rolling shutter opening of pump house wall	1	4.500	0.200	3.300		-2.969		
		Total Quantity					98.052 cum		
		Total Deducted Quantity					-42.048 cum		
		Net Total Quantity					56.004 cum		
		Say 56.004 cum @ Rs 6644.12 / cum					Rs 372097.30		
38	50.6.3.2 Solid block masonry using pre cast solid blocks (Factory made) of size 40x20x10 cm or nearest available size confirming to IS 2185 part I of 1979 for super structure up to floor two level for 10 cm thick wall in : CM 1:6 (1 cement : 6 coarse sand) including cost of scaffolding complete								
	pump house parapet wall	1	22.500	0.100	0.750		1.688		

	control room parapet wall	1*2	14.910	0.100	0.600		1.790	
	Total Quantity						3.478 cum	
	Total Deducted Quantity						0.000 cum	
	Net Total Quantity						3.478 cum	
	Say 3.478 cum @ Rs 7823.61 / cum						Rs 27210.52	
39	<p>21.1.1.2 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 portion Powder coated aluminium (minimum thickness of powder coating 50 micron)</p>							
	Control room -window verticals	8*2			1.500	1.5	36.000	
	Control room -window horizontals	8*2	1.200			1.5	28.800	
	pump house -window verticals	12*2			1.500	1.5	54.000	
	pump house -window horizontals	12*2	1.200			1.5	43.200	
	pump house -ventillator horizontals	12*2	1.200			1.5	43.200	
	pump house -ventillator verticals	12*2			0.450	1.5	16.201	
	control room -door verticals	4*2			2.400	1.5	28.800	
	control room -door horizontals	4*2	1.000			1.5	12.000	
	Total Quantity						262.201 kg	
	Total Deducted Quantity						0.000 kg	
	Net Total Quantity						262.201 kg	
	Say 262.201 kg @ Rs 537.07 / kg						Rs 140820.29	
40	<p>21.1.2.2 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</p>							

	required (Fittings shall be paid for separately) Powder coated aluminium (minimum thickness of powder coating 50 micron)							
	Control room -window verticals	8*2*2			1.500	1.5	72.000	
	Control room -window horizontals	8*2*2	0.600			1.5	28.800	
	pump house -window verticals	12*2*2			1.500	1.5	108.000	
	pump house -window horizontals	12*2*2	0.600			1.5	43.200	
	pump house -ventillator horizontals	12*2*2	0.600			1.5	43.200	
	pump house -ventillator verticals	12*2*2			0.450	1.5	32.401	
	control room -door verticals	4*2			2.400	1.5	28.800	
	control room -door horizontals	4*2	1.000			1.5	12.000	
	Total Quantity						368.401 kg	
	Total Deducted Quantity						0.000 kg	
	Net Total Quantity						368.401 kg	
	Say 368.401 kg @ Rs 643.10 / kg						Rs 236918.68	
41	21.3.2 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 5.50 mm thickness							
	Control room -window	8	1.200		1.500		14.400	
	pump house -window	12	1.200		1.500		21.600	
	pump house -ventillator	12	1.200		0.450		6.480	
	control room -door verticals	4	1.000		2.400		9.600	
	Total Quantity						52.080 sqm	
	Total Deducted Quantity						0.000 sqm	
	Net Total Quantity						52.080 sqm	
	Say 52.080 sqm @ Rs 1526.00 / sqm						Rs 79474.08	

42	21.13 Providing and fixing 100 mm brass locks (best make of approved quality) for aluminium doors including necessary cutting and making good etc. complete							
	Door	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 539.78 / No						Rs 2159.12	
43	21.16.3 Providing and fixing aluminium round shape handle of outer dia 100 mm with SS screws etc. complete as per direction of Engineer-in-Charge.Polyester powder coated minimum thickness 50 micron aluminium							
	Door	4					4.000	
	Total Quantity						4.000 Nos	
	Total Deducted Quantity						0.000 Nos	
	Net Total Quantity						4.000 Nos	
	Say 4.000 Nos @ Rs 104.74 / Nos						Rs 418.96	
44	9.82 Providing and fixing bright finished brass hanging type floor door stopper with necessary screws, etc. complete.							
	Door	4					4.000	
	Total Quantity						4.000 Nos	
	Total Deducted Quantity						0.000 Nos	
	Net Total Quantity						4.000 Nos	
	Say 4.000 Nos @ Rs 125.62 / Nos						Rs 502.48	
45	13.3.1 20 mm cement plaster of mix:1:4 (1 cement : 4 fine sand)							
	wall of control rooms (outer)	2	17.2550		3.600		124.236	
	wall of control rooms (inner)	2	16.2550		3.600		117.036	
	p u m p h o u s e w a l l (i n n e r)	1	68.8009		3.800		261.444	
	p u m p h o u s e w a l l (o u t e r)	1	70.371		5.500		387.041	
	column sides	16*2		0.300	3.800		36.480	
	column side top	16*2		0.100	1.000		3.200	

	pump house wall (above gantry beam inner)	1	68.8009		1.000		68.801		
	gantry beam(bottom)	1	68.8009	0.300			20.641		
	gantry beam(top)	1	68.8009	0.400			27.521		
	gantry beam(side)	1	66.910	0.720			48.176		
	roof ceiling	1	22*22/4			3.14	379.940		
	roof projection	1	22.900	0.150		3.14	10.786		
	pump house parapet (inside)	1	22.700	0.750		3.14	53.459		
	pump house parapet (outside)	1	22.900	0.750		3.14	53.930		
	pump house parapet (top)	1	22.900	0.100		3.14	7.191		
	control room parapet(outside)	2	17.855		0.750		26.783		
	control room parapet(inside)	2	17.455		0.750		26.183		
	do top	2	17.855	0.100			3.571		
	inner central column	4	0.600		5.500	3.14	41.448		
	deduction for windows of control room	4*2	1.200		1.500		-14.399		
	deduction for windows of pump house wall	12	1.200		1.500		-21.599		
	deduction for ventilators of pump house wall	12	1.200		0.450		-6.480		
	deduction for rolling shutter opening of pump house wall	1	4.500		3.300		-14.850		
	Total Quantity						1697.867 sqm		
	Total Deducted Quantity						-57.328 sqm		
	Net Total Quantity						1640.539 sqm		
	Say 1640.539 sqm @ Rs 429.96 / sqm						Rs 705366.15		
46	13.42 Distempering with 1st quality acrylic distemper (ready mixed) of approved manufacturer, of required shade and colour complete, as per manufacturer's specification.								

wall of control rooms (outer)	2	17.2550		3.600		124.236	
wall of control rooms (inner)	2	16.2550		3.600		117.036	
pump house wall (inner)	1	68.8009		3.800		261.444	
pump house wall (outer)	1	70.371		5.500		387.041	
column sides	16*2		0.300	3.800		36.480	
column side top	16*2		0.100	1.000		3.200	
pump house wall (above gantry beam inner)	1	68.8009		1.000		68.801	
gantry beam(bottom)	1	68.8009	0.300			20.641	
gantry beam(top)	1	68.8009	0.400			27.521	
gantry beam(side)	1	66.910	0.720			48.176	
roof ceiling	1	22*22/4			3.14	379.940	
roof projection	1	22.900	0.150		3.14	10.786	
pump house parapet (inside)	1	22.700	0.750		3.14	53.459	
pump house parapet (outside)	1	22.900	0.750		3.14	53.930	
pump house parapet (top)	1	22.900	0.100		3.14	7.191	
control room parapet(outside)	2	17.855		0.750		26.783	
control room parapet(inside)	2	17.455		0.750		26.183	
do top	2	17.855	0.100			3.571	
inner central column	4	0.600		5.500	3.14	41.448	
deduction for windows of control room	4*2	1.200		1.500		-14.399	
deduction for windows of pump house wall	12	1.200		1.500		-21.599	
deduction for ventilators of pump house wall	12	1.200		0.450		-6.480	

	deduction for rolling shutter opening of pump house wall	1	4.500		3.300		-14.850	
	Total Quantity						1697.867 sqm	
	Total Deducted Quantity						-57.328 sqm	
	Net Total Quantity						1640.539 sqm	
	Say 1640.539 sqm @ Rs 102.57 / sqm						Rs 168270.09	
47	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							
	wall of control rooms (outer)	2	17.2550		3.600		124.236	
	wall of control rooms (inner)	2	16.2550		3.600		117.036	
	pump house wall (inner)	1	68.8009		3.800		261.444	
	pump house wall (outer)	1	70.371		5.500		387.041	
	column sides	16*2		0.300	3.800		36.480	
	column side top	16*2		0.100	1.000		3.200	
	pump house wall (above gantry beam inner)	1	68.8009		1.000		68.801	
	gantry beam(bottom)	1	68.8009	0.300			20.641	
	gantry beam(top)	1	68.8009	0.400			27.521	
	gantry beam(side)	1	66.910	0.720			48.176	
	roof ceiling	1	22*22/4			3.14	379.940	
	roof projection	1	22.900	0.150		3.14	10.786	
	pump house parapet (inside)	1	22.700	0.750		3.14	53.459	
	pump house parapet (outside)	1	22.900	0.750		3.14	53.930	
	pump house parapet (top)	1	22.900	0.100		3.14	7.191	
	control room parapet(outside)	2	17.855		0.750		26.783	

	control room parapet(inside)	2	17.455		0.750		26.183		
	do top	2	17.855	0.100			3.571		
	inner central column	4	0.600		5.500	3.14	41.448		
	deduction for windows of control room	4*2	1.200		1.500		-14.399		
	deduction for windows of pump house wall	12	1.200		1.500		-21.599		
	deduction for ventilators of pump house wall	12	1.200		0.450		-6.480		
	deduction for rolling shutter opening of pump house wall	1	4.500		3.300		-14.850		
	Total Quantity						1697.867 sqm		
	Total Deducted Quantity						-57.328 sqm		
	Net Total Quantity						1640.539 sqm		
	Say 1640.539 sqm @ Rs 151.39 / sqm							Rs 248361.20	
48	10.26.3 Providing and fixing hand rail of approved size by welding etc. to steel ladder railing, balcony railing, staircase railing and similar works, including applying priming coat of approved steel primer.G.I. pipes								
	50 mm GI tube hand rail	9	4.130+(0.75*9)			5.03	492.538		
	do	1	3.800			5.03	19.114		
	vertical post 50mm GI tube	9*2			0.900	5.03	81.486		
	Total Quantity						593.138 kg		
	Total Deducted Quantity						0.000 kg		
	Net Total Quantity						593.138 kg		
	Say 593.138 kg @ Rs 186.03 / kg							Rs 110341.46	
49	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								

	Rolling shutter	1	4.500	3.300			14.850	
	Total Quantity						14.850 sqm	
	Total Deducted Quantity						0.000 sqm	
	Net Total Quantity						14.850 sqm	
	Say 14.850 sqm @ Rs 3300.13 / sqm						Rs 49006.93	
Sl No	Description	No	L	B	D	CF	Quantity	Remark
2Providing of 1829mm Dia Raw Water Pumping Main (Cost Index:35.59 %)								
No Specifications added under this Estimate								
Sl No	Description	No	L	B	D	CF	Quantity	Remark
3Cost of materials (Cost Index:35.59 %)								
1	od309879/2021_2022 Supplying, conveying and stacking at site, factory made 1829 mm (OD) MS pipe with socket at one end of 16 mm thick MS plate fabricated as per IS - 3589/2001 with Fe 410 grade steel and confirming to IS 3589/2001 and other allied codes, spirally welded mild steel pipe suitable for sleeve & welded joints for outer dia 1626 mm (shell OD), pipes including internally lined with plant applied cement mortar lining 1:2, (lining thickness of 10mm as per table 8 of IS3589-2001) and including internally lined with plant applied food grade liquid epoxy coating of minimum dry film thickness (DFT). Of 406 microns as per Annex-B , clause -1.2 of IS 3589-2001. And the pipes shall be externally coated with Polyethylene sheathing 4 mm minimum thick with IS specification on the pipe and as per the direction of dept. officers							
	1626mmDia (OD) 16mm Thick MS pipe	1	680.000				680.000	
	Total Quantity						680.000 metre	
	Total Deducted Quantity						0.000 metre	
	Net Total Quantity						680.000 metre	
	Say 680.000 metre @ Rs 62473.60 / metre						Rs 42482048.00	
2	od393160/2021_2022 Providing specials required for 1829mm 16mm thick MS pipe line							
		1	680.000				680.000	
	Total Quantity						680.000 L.S	
	Total Deducted Quantity						0.000 L.S	
	Net Total Quantity						680.000 L.S	
	Say 680.000 L.S @ Rs 3123.68 / L.S						Rs 2124102.40	
3	od393162/2021_2022 Supplying 1800 mm CI Sluice valve							
		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 1074387.50 / No	Rs 1074387.50	
4	od393163/2021_2022 Supplying Non return valve Suitable for fixing with flanged end of 1829 mm MS pipes								
		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 609787.50 / No	Rs 1219575.00	
SI No	Description	No	L	B	D	CF	Quantity	Remark	
4RWPM - Working charges (Cost Index:35.59 %)									
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								
		1	650.000	$(2.50+3.50)/2$	1.500	0.2	585.000		
							Kerala Water Authority Total Quantity	585.000 cum	
							Total Deducted Quantity	0.000 cum	
							Net Total Quantity	585.000 cum	
							Say 585.000 cum @ Rs 296.94 / cum	Rs 173709.90	
2	2.9.1 Excavation work 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 soils as directed, within a lead of 50 m.Ordinary rock								
		1	650.000	$(2.50+3.50)/2$	1.500	0.8	2340.000		
							Total Quantity	2340.000 cum	
							Total Deducted Quantity	0.000 cum	
							Net Total Quantity	2340.000 cum	
							Say 2340.000 cum @ Rs 527.51 / cum	Rs 1234373.40	
3	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)							
	2nd lift	1	650.000	$(2.5+3.5)/2$	1.500	0.6	1755.000	
	Total Quantity						1755.000 cum	
	Total Deducted Quantity						0.000 cum	
	Net Total Quantity						1755.000 cum	
	Say 1755.000 cum @ Rs 997.54 / cum						Rs 1750682.70	
4	100.2.4 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(Requiring Blasting) New Data derived from DAR							
	2nd lift	1	650.000	$(2.5+3.5)/2$	1.500	0.3	877.500	
	Total Quantity						877.500 cum	
	Total Deducted Quantity						0.000 cum	
	Net Total Quantity						877.500 cum	
	Say 877.500 cum @ Rs 1190.14 / cum						Rs 1044347.85	
5	100.1.14 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 : 1.5m to 3.0m. Hard Rock(Blasting Prohibited) (Ref. Item No. 2.14 Of DSR)							
	2nd lift	1	650.000	$(2.5+3.5)/2$	1.500	0.1	292.500	
	Total Quantity						292.500 cum	
	Total Deducted Quantity						0.000 cum	
	Net Total Quantity						292.500 cum	

	Say 292.500 cum @ Rs 1747.08 / cum						Rs 511020.90	
6	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)							
		2	600.000				1200.000	
	Total Quantity						1200.000 metre	
	Total Deducted Quantity						0.000 metre	
	Net Total Quantity						1200.000 metre	
	Say 1200.000 metre @ Rs 96.33 / metre						Rs 115596.00	
7	od393065/2021_2022 Conveying and laying 1829mm MS pipe in trenches to line and levels including specials as per standard specifications							
		1	1680.000				1680.000	
	Total Quantity						1680.000 metre	
	Total Deducted Quantity						0.000 metre	
	Net Total Quantity						1680.000 metre	
	Say 1680.000 metre @ Rs 2394.49 / metre						Rs 4022743.20	
8	od392840/2021_2022 Grinding cut and weld edges of company made 1829 mm dia. 16mm thick MS pipes and specials during fabrication/joining work at site according to site conditions including all labor and hire charges of tools etc. complete:							
		400					400.000	
	Total Quantity						400.000 No	
	Total Deducted Quantity						0.000 No	
	Net Total Quantity						400.000 No	
	Say 400.000 No @ Rs 3856.99 / No						Rs 1542796.00	
9	od392841/2021_2022 Welding 1829.00 mm MS pipes for making bends and other specials by gas/electric welding machine including cost of gas and welding rods ,all labour and hire charges of tools etc. complete: For pipes fabricated with 10mm thick MS plates.							
		180					180.000	
	Total Quantity						180.000 No	
	Total Deducted Quantity						0.000 No	
	Net Total Quantity						180.000 No	
	Say 180.000 No @ Rs 13713.83 / No						Rs 2468489.40	

10	od392842/2021_2022 Cutting 1829 mm MS pipes for making bends and other specials by gas cutting including cost of gas, all labour and hire charges of tools etc. complete: For pipes fabricated with 16mm thick MS plates.							
		50					50.000	
	Total Quantity						50.000 No	
	Total Deducted Quantity						0.000 No	
	Net Total Quantity						50.000 No	
	Say 50.000 No @ Rs 1792.00 / No						Rs 89600.00	
11	od393131/2021_2022 Fabricating MS flanges of diameter(ID) 1829 mm using 20 mm thick MS plate including cost and conveyance charges of MS plate, all fabrication charges, charges of painting the steel work with two or more coat deluxe multi surface paint to give an even shade over an under coat of primer etc. complete: For 1829mm dia pipe 16m thick MS plates.(data derived from 100.37.19.2)							
		100					100.000	
	Total Quantity						100.000 No	
	Total Deducted Quantity						0.000 No	
	Net Total Quantity						100.000 No	
	Say 100.000 No @ Rs 50169.35 / No						Rs 5016935.00	
12	od393150/2021_2022 Provide internal lining of the pipe with cement mortar 1:2,12mm thick of 80% sand and 20% jelly of size 6mm and external lining with Cement Mortar 1:3 ,30mm thick after fixing the wire mesh of size 50x50x3mm on the pipe by spot welding, providing a gap of 10 mm between the mesh and the plate using spacers including hire charges of machinery , transportation and erection charges of machinery, curing tank, workshop, demolishing etc complete for 1829mm MS Pipes							
		150	1.500				225.000	
	Total Quantity						225.000 metre	
	Total Deducted Quantity						0.000 metre	
	Net Total Quantity						225.000 metre	
	Say 225.000 metre @ Rs 8249.88 / metre						Rs 1856223.00	
13	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)							
	RCC for anchor block	6	3.000	3.000	3.000		162.000	
	RCC for Valve chambers ... floor	3	3.000	3.000	0.200		5.400	

	side wall	3	2.7*4	2.800	0.300		27.216		
	cover slab	3	3.000	3.000	0.250		6.750		
	For Duct ... floor	2	12.000	3.600	0.300		25.920		
	side wall	2*2	12.000	2.750	0.300		39.600		
	cover slab	2	12.000	3.600	0.250		21.600		
		6	1.829*1.8 29*3.142/ 4		3.000		-47.298		
	Total Quantity						288.486 cum		
	Total Deducted Quantity						-47.298 cum		
	Net Total Quantity						241.188 cum		
	Say 241.188 cum @ Rs 10954.04 / cum							Rs 2641983.00	
14	5.9.1 Centering and shuttering including strutting, etc. and removal of form for:Foundations, footings, bases of columns, etc for mass concrete								
		6*4	3.000		3.000		216.000		
	pipe	6*2	1.829*1.8 29*3.142/ 4				-31.532		
	Total Quantity						216.000 sqm		
	Total Deducted Quantity						-31.532 sqm		
	Net Total Quantity						184.468 sqm		
	Say 184.468 sqm @ Rs 335.31 / sqm							Rs 61853.97	
15	5.22.6 Steel reinforcement for R.C.C work including straightening, cutting, bending, placing in position and binding all complete upto plinth levelThermo - Mechanically Treated bars of grade Fe-500D or more								
		1	241.188			85.0	20500.980	@85kg/m ³	
	Total Quantity						20500.980 kilogram		
	Total Deducted Quantity						0.000 kilogram		
	Net Total Quantity						20500.980 kilogram		
	Say 20500.980 kilogram @ Rs 98.30 / kilogram							Rs 2015246.33	
16	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								

	for valve chamber	3	3.000	3.000	3.000	0.2	16.200		
	for duct	2	12.000	3.600	3.000	0.2	51.841		
	for anchor block	6	3.000	3.000	3.000	0.7	113.400		
	Total Quantity						181.441 cum		
	Total Deducted Quantity						0.000 cum		
	Net Total Quantity						181.441 cum		
	Say 181.441 cum @ Rs 214.03 / cum						Rs 38833.82		
17	2.7.1 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.Ordinary rock								
	For valve chamber	3	3.000	3.000	3.000	0.8	64.800		
	for duct	2	12.000	3.600	3.000	0.8	207.361		
	for anchor blocks	6	3.000	3.000	3.000	0.3	48.600		
	Total Quantity						320.761 cum		
	Total Deducted Quantity						0.000 cum		
	Net Total Quantity						320.761 cum		
	Say 320.761 cum @ Rs 414.84 / cum						Rs 133064.49		
18	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	50000.000				50000.000		
	Total Quantity						50000.000 Kwh		
	Total Deducted Quantity						0.000 Kwh		
	Net Total Quantity						50000.000 Kwh		
	Say 50000.000 Kwh @ Rs 18.44 / Kwh						Rs 922000.00		
SI No	Description	No	L	B	D	CF	Quantity	Remark	
5PUSH THROUGH CROSSING (Cost Index:35.59 %)									
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								
	for push pit	1	7.000	3.500	1.500		36.750		

	for target pit	1	4.000	3.500	1.500		21.000		
	Total Quantity						57.750 cum		
	Total Deducted Quantity						0.000 cum		
	Net Total Quantity						57.750 cum		
	Say 57.750 cum @ Rs 214.03 / cum							Rs 12360.23	
2	2.7.1 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. Ordinary rock								
	for push pit 2nd lift 1.5-3 m	1	7.000	3.500	1.500		36.750		
	for push pit 3rd lift 3-4.5 m	1	7.000	3.500	1.500		36.750		
	for push pit 4th lift 4.5-5 m	1	7.000	3.500	0.500		12.250		
	for target pit 2nd lift 1.5-3 m	1	4.000	3.500	1.500		21.000		
	for target pit 2nd lift 3-4 m	1	4.000	3.500	1.000		14.000		
	Total Quantity						120.750 cum		
	Total Deducted Quantity						0.000 cum		
	Net Total Quantity						120.750 cum		
	Say 120.750 cum @ Rs 414.84 / cum							Rs 50091.93	
3	2.26.2 Extra for every additional lift 1.5 m or part there of in excavation / banking excavated or stacked materials. Ordinary or hard rock								
	for push pit 2nd lift 1.5-3 m	1	7.000	3.500	1.500		36.750		
	for push pit 3rd lift 3-4.5 m	1	7.000	3.500	1.500	2.0	73.500		
	for push pit 4th lift 4.5-5 m	1	7.000	3.500	0.500	3.0	36.750		
	for target pit 2nd lift 1.5-3 m	1	4.000	3.500	1.500		21.000		
	for target pit 2nd lift 3-4 m	1	4.000	3.500	1.000	2.0	28.000		
	Total Quantity						196.000 cum		

		Total Deducted Quantity				0.000 cum	
		Net Total Quantity				196.000 cum	
		Say 196.000 cum @ Rs 190.78 / cum				Rs 37392.88	
4	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.						
	for push pit	1	7+7+3.5		5.000		87.500
	for target pit	1	4+4+3.5		4.000		46.000
		Total Quantity				133.500 sqm	
		Total Deducted Quantity				0.000 sqm	
		Net Total Quantity				133.500 sqm	
		Say 133.500 sqm @ Rs 749.13 / sqm				Rs 100008.86	
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						
	for push pit	1	2*(7+3.5)				21.000
	for target pit	1	2*(4+3.5)				15.000
		Total Quantity				36.000 metre	
		Total Deducted Quantity				0.000 metre	
		Net Total Quantity				36.000 metre	
		Say 36.000 metre @ Rs 96.33 / metre				Rs 3467.88	
6	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 platform for push pit	1	7.000	3.500	0.200		4.900
		Total Quantity				4.900 cum	
		Total Deducted Quantity				0.000 cum	
		Net Total Quantity				4.900 cum	

	Say 4.900 cum @ Rs 7367.55 / cum							Rs 36101.00
7	<p>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</p>							
		1	1010.000				1010.000	for 45 days,3 hrs/day, 45x3x10x 0.746
	Total Quantity							1010.000 Kwh
	Total Deducted Quantity							0.000 Kwh
	Net Total Quantity							1010.000 Kwh
	Say 1010.000 Kwh @ Rs 18.44 / Kwh							Rs 18624.40
8	<p>od352377/2021_2022 Providing 17.5mm thick 2235mm (OD) factory made MS casing pipe for crossing road near pump junction Aluva (Aluva -Perumbavoor road) by Push through method after conveying the pipe from initial lead and insert through the bored holes below road surface through the alignment of the new pipe line without affecting the passage of traffic in the road by ramming the casing pipe , excavation of push pit and target pit concreting paid seperately, ,hire and labour for suitable capacity crane for handling the pipe , placing the pipe in the pushing pit , pushing the pipes by using hydraulic jack by one by one and welding the pipes in line and levels,cleaning inside the pipe after completion of the work by water jetting , compressed air, or the combination of both and manual labour etc. complete including conveyance of MS Pipe, hire and labour for all machinery and equipment, cost of fuel, lighting,watching,fencing, pay and allowance of all technical and non-technical hands involved in the work etc.complete as per the direction of departmental officers.
</p>							
	crosssing Aluva-Perumbavoor road	1	30.000				30.000	
	Total Quantity							30.000 metre
	Total Deducted Quantity							0.000 metre
	Net Total Quantity							30.000 metre
	Say 30.000 metre @ Rs 58214.32 / metre							Rs 1746429.60
9	<p>od352381/2021_2022 Supplying 17.5mm thick 2235mm (OD) factory made MS casing pipe for crossing road near pump junction Aluva (Aluva -Perumbavoor road) by Push through method</p>							
	For MS pipe crossing Aluva- Perumbavoor road	1	30.000				30.000	
	Total Quantity							30.000 metre

							Total Deducted Quantity	0.000 metre	
							Net Total Quantity	30.000 metre	
							Say 30.000 metre @ Rs 60393.35 / metre	Rs 1811800.50	
SI No	Description	No	L	B	D	CF	Quantity	Remark	
6RAW WATER PUMP SET (Cost Index:35.59 %)									
1	od351423/2021_2022 Design, Supply, erection, testing and commissioning of Submersible/VT pump set- 2 Nos (1 No as standby)above 100 HP and all allied works,like panel board, starter, cable, capacitor for pf above .95, NRV, sluice valve, earthing , pipe connections, foundations as per direction of departmental officers								
	1500Hp motor pump set with stand by	2				1500.0	3000.000		
							Total Quantity	3000.000 Hp	
							Total Deducted Quantity	0.000 Hp	
							Net Total Quantity	3000.000 Hp	
							Say 3000.000 Hp @ Rs 15047.65 / Hp	Rs 45142950.00	
SI No	Description	No	L	B	D	CF	Quantity	Remark	
7Gantry System (Cost Index:35.59 %)									
1	od393142/2021_2022 Providing gantry system of suitable capacity (5 tonne)								
		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 2500000.00 / L.S	Rs 2500000.00	
SI No	Description	No	L	B	D	CF	Quantity	Remark	
8Road Restoration (Cost Index:35.59 %)									
1	100.59.2 Refilling the trenches with a wet mix of close graded granular materials (Stone aggregate - 25mm nominal size - 17.5%, Stone aggregate - 10mm nominal size - 17.5%, Crushed Stone - 2.36mm to 12.5mm - 25%, Stone chippings / screenings - 4.75mm nominal size - 20%, Stone chippings / screenings - 150 micron nominal size - 20%), mixing properly after adding sufficient quantity of water, refilling in layers not exceeding 150mm, compacting properly at Optimum Moisture Content with Surface Plate Vibrator and disposing the excavated material etc. complete, including traffic control, providing caution boards and as per direction of Engineer-in-charge for road restoration works in pipeline leak sites.								
		1	650.000	4.000			2600.000		
							Total Quantity	2600.000 cum	
							Total Deducted Quantity	0.000 cum	

						Net Total Quantity	2600.000 cum
						Say 2600.000 cum @ Rs 7444.64 / cum	Rs 19356064.00
2	100.59.3	Restoring the road surfaces by providing and laying factory made cold bitumen-aggregate pot-hole repair mix in twolayers of 25mm thick (total 50mm thick), by cleaning the surface with brooms etc. to remove dust/bebris/water etc, placing the premix, compacting properly with hand-rammer etc. complete, including traffic control, providing caution boards and as perdirection of Engineer-in-charge for road restoration works in pipeline leak sites.					
		1	650.000	8.000			5200.000
						Total Quantity	5200.000 sqm
						Total Deducted Quantity	0.000 sqm
						Net Total Quantity	5200.000 sqm
						Say 5200.000 sqm @ Rs 2374.46 / sqm	Rs 12347192.00
						Total	199837803.15
						Centage @	0.0%
						Centage Amount	0.00
						Provision for GST payments (in %) @	18.0%
						Amount reserved for GST payments	35970804.57
						Total & Centage	235808607.72
						Lumpsum for round off	191392.28
						GRAND TOTAL Rs	236000000.00
						Rounded Grand Total Rs	23,60,00,000
						Rupees Twenty Three Crore Sixty Lakh Only	

General Abstract

**State Plan-Augmentation of WSS to Kochi and adjoining areas - Proposed WTP at
Aluva-Aerator and raw water channels**

(Dsor year: 2018)

SI No	Heading Description	Amount
1	Aerator 17.10m Dia	11532008.37
2	Raw water channels-	9876978.83
3	3D miniature model of WTP with all components	501660.00
	Total	21910647.20
	Centage @	0.0%
	Centage Amount	0.00
	Provision for GST payments (in %) @	18.0%
	Amount reserved for GST payments	3943916.50
	Total & Centage	25854563.70
	Lumpsum for round off	45436.30
	GRAND TOTAL Rs	25900000.00
	Rounded Grand Total Rs	2,59,00,000
	Rupees Two Crore Fifty Nine Lakh Only	

Kerala Water Authority
PRICE

Detailed Estimate

State Plan-Augmentation of WSS to Kochi and adjoining areas - Proposed WTP at Aluva-Aerator and raw water channels

(Dsr year: 2018)

SI No	Description	No	L	B	D	CF	Quantity	Remark	
1Aerator 17.10m Dia (Cost Index:35.59 %)									
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								
			First depth up to 1.50 m depth						
	Foundation- Centre shaft	1	4.550	4.550	1.500		31.054		
	Colum footings	12	2.700	2.700	1.200		104.977		
							Total Quantity	136.031 cum	
							Total Deducted Quantity	0.000 cum	
							Net Total Quantity	136.031 cum	
							Say 136.031 cum @ Rs 214.03 / cum	Rs 29114.71	
2	2.7.1 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.Ordinary rock								
			Second depth						
	Central shaft	1	4.550	4.550	1.500		31.054		
	Coloums	12	2.700	2.700	0.300		26.245		
			third depth						
	Central shaft	1	4.550	4.550	1.500		31.054		
			fourth						
		1	2.700	2.700	0.500		3.646		
							Total Quantity	91.999 cum	
							Total Deducted Quantity	0.000 cum	

		Net Total Quantity					91.999 cum	
		Say 91.999 cum @ Rs 414.84 / cum					Rs 38164.87	
3	2.26.2 Extra for every additional lift 1.5 m or part there of in excavation / banking excavated or stacked materials. Ordinary or hard rock							
		Second depth						
	Central shaft	1	4.550	4.550	1.500		31.054	
	Coloums	12	2.700	2.700	0.300		26.245	
		third depth						
	Central shaft	1	4.550	4.550	1.500		31.054	
		fourth						
		1	2.700	2.700	0.500		3.646	
		Total Quantity					91.999 cum	
		Total Deducted Quantity					0.000 cum	
		Net Total Quantity					91.999 cum	
		Say 91.999 cum @ Rs 190.78 / cum					Rs 17551.57	
4	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)							
		Second depth						
	Central shaft	1	4.550	4.550	0.100		2.071	
	Coloum footings	12	2.700	2.700	0.100		8.749	
		Total Quantity					10.820 cum	
		Total Deducted Quantity					0.000 cum	
		Net Total Quantity					10.820 cum	
		Say 10.820 cum @ Rs 7367.55 / cum					Rs 79716.89	
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							

	Foundation- Centre shaft	1	4.250	4.250	0.450		8.129	
	Foundation- Centre shaft - beams	1	$(4.25 \times 4.25) + (3.35 \times 3.35)$	0.500	0.450		6.590	
	Central shaft casing	1	2.6*2.6	3.140	4.810	0.25	25.525	$3.14 \times 2.25^* \times 2.25 / 4 = 3.97$
	Outer coloums footing	12	2.500	2.500	0.450		33.750	
	Columns- Footing sloped	12	$(2.5 \times 2.5) + (1.9 \times 1.9)$	1.000	0.300		35.496	$(0.6 \times 0.6) + (2.5 \times 2.5) / 2 = 2.99$
	Deduction for pipe portion	1	1.65*1.65	3.140	4.500	0.25	-9.617	$3.14 \times 1.63^* \times 1.63 / 4 = 2.08$
							Total Quantity	109.490 cum
							Total Deducted Quantity	-9.617 cum
							Net Total Quantity	99.873 cum
							Say 99.873 cum @ Rs 9886.00 / cum	Rs 987344.48
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>							
	Centre shaft	1	$(2.6 \times 2.6) / 4$	3.140	5.050	3.14	84.147	$3.97 - 2.68 = 1.29$
	Columns- Outer	12	.45*.45	3.140	1.550	0.25	2.957	
	Channel support beams	1	13.300	0.350	0.800	3.14	11.694	
	Channel extension beams	2*2	5.175	0.350	0.800		5.796	
	Bottom collection channel	1	13.300	2.550	0.200	3.14	21.299	
	Slab-1	1	10.525	0.775	0.300	3.14	7.684	

	Slab-2	1	8.975	0.775	0.300	3.14	6.553		
	Slab-3	1	7.425	0.775	0.300	3.14	5.421		
	Slab-4	1	5.875	0.775	0.300	3.14	4.290		
	Slab 5	1	4.325	0.775	0.300	3.14	3.158		
	Slab-6	1	2.775	0.775	0.300		0.646		
	rise 1	1	9.450	0.200	1.500		2.835		
	rise 2	1	8.675	0.200	1.500		2.603		
	rise 3	1	6.350	0.200	1.500		1.905		
	rise 4	1	5.575	0.200	1.500		1.673		
	rise 5	1	402.500	0.200	1.500		120.750		
	Bottom tray side wall outer	1	15.500	0.200	1.500		4.650		
	Bottom tray side wall inner	4	10.950	0.350	1.200		18.396		
	deduction for pipe portion								
		1	(1.65*1.65)/4	3.140	4.950		-10.578		
	Total Quantity						306.457 cum		
	Total Deducted Quantity						-10.578 cum		
	Net Total Quantity						295.879 cum		
	Say 295.879 cum @ Rs 11538.10 / cum						Rs 3413881.49		
7	5.9.1 Centering and shuttering including strutting, etc. and removal of form for:Foundations, footings, bases of columns, etc for mass concrete								
	Foundation- Centre shaft	4	4.550		0.450		8.190		
	Footing-outer	12	2.700		0.450		14.581		
	Coloumn-outer	12	0.950		1.000	3.14	35.796		
	Tie beams outer side	2*2*2	5.175		0.800		33.120		
	Total Quantity						91.687 sqm		
	Total Deducted Quantity						0.000 sqm		
	Net Total Quantity						91.687 sqm		
	Say 91.687 sqm @ Rs 335.31 / sqm						Rs 30743.57		
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.								
	Cetre shaft inside	1	2.000	3.140	9.260		58.153		
	Cetre shaft outside	1	2.600	3.140	9.260		75.599		
	Bottom tray side wall outer	1	15.700	3.140	1.700		83.807		
	do inner	1	15.300	3.140	1.500		72.063		
	Total Quantity						289.622 sqm		
	Total Deducted Quantity						0.000 sqm		
	Net Total Quantity						289.622 sqm		
	Say 289.622 sqm @ Rs 717.20 / sqm						Rs 207716.90		
9	5.9.3 Centering and shuttering including strutting, etc. and removal of form for:Suspended floors, roofs, landings, balconies and access platform								
	Centre shaft	1	2.300	0.200	5.050	3.14	7.295		
	Columns- Outer	12	.45*.45	3.140	1.550	0.25	2.957		
	Channel support beams	1	13.300	0.350	0.800	3.14	11.694		
	Channel extension beams	2*2	5.175	0.350	0.800		5.796		
	Bottom collection channel	1	13.300	2.550		3.14	106.494		
	Slab-1	1	10.525	0.775		3.14	25.613		
	Slab-2	1	8.975	0.775		3.14	21.841		
	Slab-3	1	7.425	0.775		3.14	18.069		
	Slab-4	1	5.875	0.775		3.14	14.297		
	Slab 5	1	4.325	0.775		3.14	10.525		
	Slab-6	1	2.775	0.775		3.14	6.753		
	rise 1 inner	1	9.150		0.300	3.14	8.620		
	do outer	1	9.750		0.300	3.14	9.185		
	rise 2 inner	1	8.375		0.300	3.14	7.890		
	outer	1	8.975		0.300	3.14	8.455		
	rise 3 inner	1	6.050		0.300	3.14	5.700		
	outer	1	6.650		0.300	3.14	6.265		
	rise 4 inner	1	5.275		0.300	3.14	4.970		
	outer	1	5.875		0.300	3.14	5.535		

	rise 5 inner	1	4.825		0.300	3.14	4.546		
	outer	1	5.125		1.500	3.14	24.139		
	Bottom tray side wall outer	1	15.500		1.500	3.14	73.006		
	inner	1	15.300		1.200	3.14	57.651		
	Bottom tray side wall inner	1	10.775		1.200	3.14	40.601		
	outer	1	11.125		1.5000		16.688		
	Total Quantity						504.585 sqm		
	Total Deducted Quantity						0.000 sqm		
	Net Total Quantity						504.585 sqm		
	Say 504.585 sqm @ Rs 815.78 / sqm						Rs 411630.35		
10	5.9.6 Centering and shuttering including strutting, etc. and removal of form for:Columns, Pillars, Piers, Abutments, Posts and Struts								
	Coloum-side	12	0.450		0.950	3.14	16.109		
	Total Quantity						16.109 sqm		
	Total Deducted Quantity						0.000 sqm		
	Net Total Quantity						16.109 sqm		
	Say 16.109 sqm @ Rs 863.64 / sqm						Rs 13912.38		
11	5.9.5 Centering and shuttering including strutting, etc. and removal of form for:Lintels, beams, plinth beams, girders bressumers and cantilevers								
	Ring beam bootom	1	13.300	0.450			5.985		
	do inside side	1	12.850		0.600		7.710		
	do outside	1	13.750		0.600		8.250		
	extension tie beams bottom	2*2	5.175	0.350			7.245		
	do inside side & out sides	2*2*2	5.175		0.600		24.840		
	Total Quantity						54.030 sqm		
	Total Deducted Quantity						0.000 sqm		
	Net Total Quantity						54.030 sqm		
	Say 54.030 sqm @ Rs 649.82 / sqm						Rs 35109.77		
12	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							
	R . C . C Qty - 124.836m ³ @130kg/m ³	1	95.360			130.0	12396.800	
	R . C . C Qty - 283.12m ³ @130kg/m ³	1	227.594			130.0	29587.220	
	Total Quantity						41984.020 kilogram	
	Total Deducted Quantity						0.000 kilogram	
	Net Total Quantity						41984.020 kilogram	
	Say 41984.020 kilogram @ Rs 98.30 / kilogram						Rs 4127029.17	
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)							
	GF-long walls	2*2	15.280	3.200			195.584	
	GF-short walls	4*2	10.350	3.200			264.960	
	GF-partition	2*2	4.730	3.200			60.545	
	FF-long walls	4*2	15.280	3.200			391.168	
	FF-short	3*2	15.040	3.200			288.768	
	FF-partition	2*2	4.730	3.200			60.545	
	Slab-1 top&bottom	2	15.680	10.350			324.576	
	Slab-2 top&bottom	2	15.680	15.680			491.725	
	beams	24*2	4.500	0.350			75.600	
	Shaft	2	7.050	10.450			147.345	
	Doors	5	1.000	0.200	2.100		-2.100	
	Windows	17	1.500	0.200	1.500		-7.650	
	Opnings	4	2.000	0.200	2.100		-3.360	
	Total Quantity						2300.816 sqm	
	Total Deducted Quantity						-13.110 sqm	
	Net Total Quantity						2287.706 sqm	
	Say 2287.706 sqm @ Rs 401.21 / sqm						Rs 917850.52	
14	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.)								
	GF-40 sh	1	12.000			4.05	48.600		
	25 sh	3	12.000			2.5	90.000		
	FF 40 sh	1	15.000			4.05	60.750		
	25sh	3	15.000			2.5	112.500		
	Total Quantity						311.850 kg		
	Total Deducted Quantity						0.000 kg		
	Net Total Quantity						311.850 kg		
	Say 311.850 kg @ Rs 677.34 / kg						Rs 211228.48		
15	13.48.1 Finishing with Deluxe Multi surface paint system for interiors and exteriors using primer as per manufacturers specifications:Two or more coats applied on walls @ 1.25 ltr/10 sqm over and including one coat of special primer applied @ 0.75 ltr /10 sqm								
	Same as Item No.14	1	2287.706				2287.706		
	Total Quantity						2287.706 sqm		
	Total Deducted Quantity						0.000 sqm		
	Net Total Quantity						2287.706 sqm		
	Say 2287.706 sqm @ Rs 167.39 / sqm						Rs 382939.11		
16	od376301/2021_2022 Fabricating, supplying and providing 1626mm MS pipe made out of 16mm thick MS plate with internal and external surface CC coating as per IS3589/2001								
	Raw water pumping main at the bottom of aerator	1	12.000				12.000		
	Total Quantity						12.000 metre		
	Total Deducted Quantity						0.000 metre		
	Net Total Quantity						12.000 metre		
	Say 12.000 metre @ Rs 52339.51 / metre						Rs 628074.12		
SI No	Description	No	L	B	D	CF	Quantity	Remark	
2Raw water channels- (Cost Index:35.59 %)									
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								
	Footing for raw water channel	5	2.700	2.700	1.000		36.450		

						Total Quantity	36.450 cum	
						Total Deducted Quantity	0.000 cum	
						Net Total Quantity	36.450 cum	
						Say 36.450 cum @ Rs 214.03 / cum	Rs 7801.39	
2	2.7.1	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. Ordinary rock						
	Footing for raw water channel	5	2.700	2.700	0.600		21.871	
						Total Quantity	21.871 cum	
						Total Deducted Quantity	0.000 cum	
						Net Total Quantity	21.871 cum	
						Say 21.871 cum @ Rs 414.84 / cum	Rs 9072.97	
3	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 for raw water channel	5	2.700	2.700	0.100		3.646	
						Total Quantity	3.646 cum	
						Total Deducted Quantity	0.000 cum	
						Net Total Quantity	3.646 cum	
						Say 3.646 cum @ Rs 7367.55 / cum	Rs 26862.09	
4	5.33.1	Providing and laying in position machine batched and machine mixed design mix M-25 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 upto plinth level						
	Footing for raw water channel	5	2.500	2.500	0.350		10.938	
	Footing for raw water channel tapered portion	5	$((2.5*2.5)+(2*2))/2$		0.400		10.251	
						Total Quantity	21.189 cum	

		Total Deducted Quantity					0.000 cum	
		Net Total Quantity					21.189 cum	
		Say 21.189 cum @ Rs 9413.54 / cum					Rs 199463.50	
5	5.33.2 Providing and laying in position machine batched and machine mixed design mix M-25 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							
	circular column for raw water channel above GL	5	3.140	$(.6*.6)/4$	5.630		7.956	$(7.55+3.7)/2=5.63$
	pier cap beam at top of circular column	5	3.400	0.930	0.800		12.649	
	Longitudinal beams	2*22	3.800	0.500	0.300		25.080	
	floor slab	22	4.600	3.400	0.2300		79.139	
	side wall	2*22	4.600	0.200	1.500		60.720	
	top slab longitudinal	2*22	4.600	1.100	0.150		33.396	
		Total Quantity					218.940 cum	
		Total Deducted Quantity					0.000 cum	
		Net Total Quantity					218.940 cum	
		Say 218.940 cum @ Rs 11065.64 / cum					Rs 2422711.22	
6	5.9.1 Centering and shuttering including strutting, etc. and removal of form for:Foundations, footings, bases of columns, etc for mass concrete							
		Shuttering works						
	Columns footings pcc	5	10.800		0.100		5.400	
	Footings	5	10.000		0.350		17.500	
	Coloum up to GL	5	1.880		0.750		7.050	$3.14*.6=1.884$
		Total Quantity					29.950 sqm	
		Total Deducted Quantity					0.000 sqm	
		Net Total Quantity					29.950 sqm	
		Say 29.950 sqm @ Rs 335.31 / sqm					Rs 10042.53	

7	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.							
	Shuttering works wall							
	Channel side walls-out side	22*2	4.600	1.500			303.600	
	in side	22*2	4.600	1.270			257.048	
	Beam top of column-side	22	8.400	0.930			171.865	
	Longitudinal beam-side	22*2*2	3.800	0.500			167.200	
	Beam top of column-bottom	22	3.400	3.400			254.320	
	Longitudinal beam-bottom	22*2*2	3.800	0.300			100.320	
	Total Quantity						1254.353 sqm	
	Total Deducted Quantity						0.000 sqm	
	Net Total Quantity						1254.353 sqm	
	Say 1254.353 sqm @ Rs 717.20 / sqm						Rs 899621.97	
8	5.9.6 Centering and shuttering including strutting, etc. and removal of form for:Columns, Pillars, Piers, Abutments, Posts and Struts							
	Shuttering columns							
	Coloums	5	1.884		7.110		66.977	
	Total Quantity						66.977 sqm	
	Total Deducted Quantity						0.000 sqm	
	Net Total Quantity						66.977 sqm	
	Say 66.977 sqm @ Rs 863.64 / sqm						Rs 57844.02	
9	5.9.3 Centering and shuttering including strutting, etc. and removal of form for:Suspended floors, roofs, landings, balconies and access platform							
	shuttering Works above plinth level							
	Bottom slab	22	4.600	3.400			344.080	
	Top slab	22*2	4.600	1.100			222.640	
	Total Quantity						566.720 sqm	
	Total Deducted Quantity						0.000 sqm	

	Net Total Quantity						566.720 sqm	
	Say 566.720 sqm @ Rs 815.78 / sqm						Rs 462318.84	
10	13.7.1 12 mm cement plaster finished with a floating coat of neat cement of mix:1:3 (1 cement : 3 fine sand)							
	Column	5	1.880	6.680			62.792	
	Beam top & bottom of column-bottom	5	3.400	3.400			57.800	
	Beam top of column-sides	5	8.400	0.930			39.060	
	Beam longitudinal	22*2	3.800	1.600			267.520	
	Slab top & bottom	22*2	4.600	4.000			809.600	
	Side walls	22*2	4.600	3.000			607.200	
	Chanel inside	22	4.600	3.000			303.600	
	Total Quantity						2147.572 sqm	
	Total Deducted Quantity						0.000 sqm	
	Net Total Quantity						2147.572 sqm	
	Say 2147.572 sqm @ Rs 401.21 / sqm						Rs 861627.36	
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							
	R . C . C Works - 351.122m3@130kg/m 3	1	21.189			130.0	2754.570	
	Total Quantity						2754.570 kilogram	
	Total Deducted Quantity						0.000 kilogram	
	Net Total Quantity						2754.570 kilogram	
	Say 2754.570 kilogram @ Rs 98.30 / kilogram						Rs 270774.23	
12	5.22A.6 Steel reinforcement for R.C.C work including straightening, cutting, bending, placing in position and binding all complete above plinth level. Thermo - Mechanically Treated bars of grade Fe-500D or more							
		1	218.940			130.0	28462.200	
	Total Quantity						28462.200 kg	
	Total Deducted Quantity						0.000 kg	
	Net Total Quantity						28462.200 kg	
	Say 28462.200 kg @ Rs 98.30 / kg						Rs 2797834.26	
13	13.48.2							

	Finishing with Deluxe Multi surface paint system for interiors and exteriors using primer as per manufacturers specifications:Painting wood work with Deluxe Multi Surface Paint of required shade. Two or more coat applied @ 0.90 ltr/10 sqm over an under coat of primer applied @ 0.75 ltr/10 sqm of approved brand and manufacture								
	Column	5	1.880	6.680			62.792		
	Beam top & bottom of column-bottom	5	3.400	3.400			57.800		
	Beam top of column-sides	5	8.400	0.930			39.060		
	Beam longitudinal	5*2	3.800	1.600			60.800		
	Slab top & bottom	5*2	4.600	4.000			184.000		
	Side walls	5*2	4.600	3.000			138.000		
	Total Quantity						542.452 sqm		
	Total Deducted Quantity						0.000 sqm		
	Net Total Quantity						542.452 sqm		
	Say 542.452 sqm @ Rs 153.28 / sqm						Rs 83147.04		
14	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.)								
	40 mm ss	2	100.000			4.05	810.000		
	25mm ss	3*2	100.000			2.5	1500.000		
	Ladder	3	100.000				300.000		
	Total Quantity						2610.000 kg		
	Total Deducted Quantity						0.000 kg		
	Net Total Quantity						2610.000 kg		
	Say 2610.000 kg @ Rs 677.34 / kg						Rs 1767857.40		
SI No	Description	No	L	B	D	CF	Quantity	Remark	
33D miniature model of WTP with all components (Cost Index:35.59 %)									
1	od373446/2021_2022 3D miniature model of WTP with all components								
	180x150 cm size	1	180.000	150.000			27000.000		
	Total Quantity						27000.000 sqcm		

Total Deducted Quantity	0.000 sqcm
Net Total Quantity	27000.000 sqcm
Say 27000.000 sqcm @ Rs 18.58 / sqcm	Rs 501660.00
Total	21910647.20
Centage @	0.0%
Centage Amount	0.00
Provision for GST payments (in %) @	18.0%
Amount reserved for GST payments	3943916.50
Total & Centage	25854563.70
Lumpsum for round off	45436.30
GRAND TOTAL Rs	25900000.00
	Rounded Grand Total Rs 2,59,00,000
	Rupees Two Crore Fifty Nine Lakh Only


 Kerala Water Authority
PRICE

General Abstract

**STATE PLAN-INTERIM AUGMENTATION OF KOCHI CITY AND ADJOINING
AREAS-PHASE -1-PROPOSED WTP AT ALUVA AND ALLIED WORKS-
CONSTRUCTION OF CHEMICAL STORE & CHLORINE ROOM**

(Dsr year: 2018)

SI No	Heading Description	Amount
1	Chlorine Room	3437213.24
2	CHEMICAL HOUSE	23063446.39
3	Chorinator	2400000.00
	Total	28900659.63
	Centage @	0.0%
	Centage Amount	0.00
	Provision for GST payments (in %) @	18.0%
	Amount reserved for GST payments	5202118.73
	Total & Centage	34102778.37
	Lumpsum for round off	97221.63
	GRAND TOTAL Rs	34200000.00
	Rounded Grand Total Rs 3,42,00,000	
	Rupees Three Crore Forty Two Lakh Only	

Kerala Water Authority
PRICE

Detailed Estimate

**STATE PLAN-INTERIM AUGMENTATION OF KOCHI CITY AND ADJOINING
AREAS-PHASE -1-PROPOSED WTP AT ALUVA AND ALLIED WORKS-
CONSTRUCTION OF CHEMICAL STORE & CHLORINE ROOM**

(Dsor year: 2018)

Sl No	Description	No	L	B	D	CF	Quantity	Remark
1Chlorine Room (Cost Index:35.59 %)								
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							
	Footing	14	2.500	2.300	2.000	0.4	64.401	
							Total Quantity	64.401 cum
							Total Deducted Quantity	0.000 cum
							Net Total Quantity	64.401 cum
							Say 64.401 cum @ Rs 214.03 / cum	Rs 13783.75
2	2.7.1 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.Ordinary rock							
	Footing	14	2.500	2.300	2.000	0.4	64.401	
							Total Quantity	64.401 cum
							Total Deducted Quantity	0.000 cum
							Net Total Quantity	64.401 cum
							Say 64.401 cum @ Rs 414.84 / cum	Rs 26716.11
3	2.26.2 Extra for every additional lift 1.5 m or part there of in excavation / banking excavated or stacked materials.Ordinary or hard rock							
	Footing	14	2.500	2.300	2.000	0.4	64.401	
							Total Quantity	64.401 cum
							Total Deducted Quantity	0.000 cum
							Net Total Quantity	64.401 cum
							Say 64.401 cum @ Rs 190.78 / cum	Rs 12286.42

4	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.							
	Main hall	1	14.650	5.800	0.450		38.237	
	Other rooms	2	2.850	2.200	0.450		5.644	
	Total Quantity						43.881 cum	
	Total Deducted Quantity						0.000 cum	
	Net Total Quantity						43.881 cum	
	Say 43.881 cum @ Rs 258.57 / cum						Rs 11346.31	
5	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)							
	Main hall	1	14.650	5.800	0.100		8.497	
	Other rooms	2	2.850	2.200	0.100		1.255	
	footing	14	2.500	2.300	0.100		8.051	
	plinth beam	10	2.650	0.350	0.100		0.928	
	do	2	5.600	0.350	0.100		0.392	
	do	1	5.200	0.350	0.100		0.182	
	do	3	2.100	0.350	0.100		0.221	
	do	1	14.650	0.350	0.100		0.513	
	Total Quantity						20.039 cum	
	Total Deducted Quantity						0.000 cum	
	Net Total Quantity						20.039 cum	
	Say 20.039 cum @ Rs 7211.15 / cum						Rs 144504.23	
6	5.33.1 Providing and laying in position machine batched and machine mixed design mix M-25 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 upto plinth level							
	Footing	14	2.300	2.200	0.300		21.252	
	do	14	(2.3*2.2)	(1*.8)	0.400	0.5	11.335	

	Column upto plinth beam	14	0.300	0.500	1.200		2.520		
	plinth beam	10	2.650	0.250	0.400		2.651		
	do	2	5.600	0.250	0.400		1.120		
	do	1	5.200	0.250	0.400		0.520		
	do	3	2.100	0.250	0.400		0.631		
	do	1	14.650	0.250	0.400		1.465		
	Total Quantity						41.494 cum		
	Total Deducted Quantity						0.000 cum		
	Net Total Quantity						41.494 cum		
	Say 41.494 cum @ Rs 9413.54 / cum						Rs 390605.43		
7	<p>5.33.2 Providing and laying in position machine batched and machine mixed design mix M-25 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</p>								
	Kerala Water Authority Ground floor								
	Column - ground floor	14	0.500	0.300	5.450		11.445		
	roof beam short	2*5	2.650	0.200	0.180		0.954		
	roof beam long	6	5.600	0.200	0.380		2.554		
	do	1	5.200	0.200	0.3880		0.404		
	long	3	2.100	0.200	0.180		0.227		
	Roof slab	1	17.050	8.000	0.120		16.368		
	long	1	8.200	2.400	0.120		2.362		
	Lintel	2	5.600	0.200	0.150		0.336		
	do	1	5.200	0.200	0.150		0.156		
	do	5*2	2.650	0.200	0.150		0.795		
	do	3	2.100	0.200	0.150		0.189		
	Total Quantity						35.790 cum		
	Total Deducted Quantity						0.000 cum		
	Net Total Quantity						35.790 cum		
	Say 35.790 cum @ Rs 11065.64 / cum						Rs 396039.26		

8	5.3 Reinforced cement concrete work in beams, suspended floors, roofs, having slope up to 15 ⁰ 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).								
	Drop	2	16.950	0.050	0.500		0.848		
	do	2	10.400	0.050	0.500		0.520		
		Total Quantity					1.368 cum		
		Total Deducted Quantity					0.000 cum		
		Net Total Quantity					1.368 cum		
		Say 1.368 cum @ Rs 11492.88 / cum					Rs 15722.26		
9	5.9.1 Centering and shuttering including strutting, etc. and removal of form for: Foundations, footings, bases of columns, etc for mass concrete								
		14	(2.3+2.2)		0.300	2.0	37.800		
		Total Quantity					37.800 sqm		
		Total Deducted Quantity					0.000 sqm		
		Net Total Quantity					37.800 sqm		
		Say 37.800 sqm @ Rs 335.31 / sqm					Rs 12674.72		
10	5.9.6 Centering and shuttering including strutting, etc. and removal of form for: Columns, Pillars, Piers, Abutments, Posts and Struts								
	Columns	14	2.000	(.5+.3)	1.200		26.880		
	do	14	2.000	(.5+.3)	5.450		122.081		
		Total Quantity					148.961 sqm		
		Total Deducted Quantity					0.000 sqm		
		Net Total Quantity					148.961 sqm		
		Say 148.961 sqm @ Rs 863.64 / sqm					Rs 128648.68		
11	5.9.3 Centering and shuttering including strutting, etc. and removal of form for: Suspended floors, roofs, landings, balconies and access platform								
		Ground floor							
	Roof slab	1	14.600	5.600			81.760		
	do	1	2.850	2.100			5.985		
	Projection	2	17.050	1.000			34.100		
	do	21	8.400	1.000			176.400		

	Total Quantity						298.245 sqm	
	Total Deducted Quantity						0.000 sqm	
	Net Total Quantity						298.245 sqm	
	Say 298.245 sqm @ Rs 815.78 / sqm						Rs 243302.31	
12	5.9.5 Centering and shuttering including strutting, etc. and removal of form for:Lintels, beams, plinth beams, girders bressumers and cantilevers							
	Ground floor							
	roof beam short	2*5	2.650	.2+.18+.18			14.840	
	roof beam long	6	5.600	0.200+.38 +.38			32.256	
	do	1	5.200	0.200+.38 +.38			4.993	
	long	3	2.100	.2+.18+.18			3.529	
	Lintel	2*2	5.600		0.150		3.360	
	do	2*2	5.200		0.150		3.120	
	do	5*2	2.650		0.150		3.975	
	do	3	2.100		0.150		0.946	
	plinth beam	10*2	2.650		0.400		21.201	
	do	2*2	5.600		0.400		8.960	
	do	1*2	5.200		0.400		4.160	
	do	3*2	2.100		0.400		5.041	
	do	1*2	14.650		0.400		11.720	
	Total Quantity						118.101 sqm	
	Total Deducted Quantity						0.000 sqm	
	Net Total Quantity						118.101 sqm	
	Say 118.101 sqm @ Rs 649.82 / sqm						Rs 76744.39	
13	5.9.16.1 Centering and shuttering including strutting, etc. and removal of form for:Edges of slabs and breaks in floors and walls Under 20 cm wide							
	Roof slab	2	16.950				33.900	
	do	2	10.400				20.800	
	Total Quantity						54.700 metre	
	Total Deducted Quantity						0.000 metre	
	Net Total Quantity						54.700 metre	

	Say 54.700 metre @ Rs 203.93 / metre						Rs 11154.97	
14	5.9.20 Centering and shuttering including strutting, etc. and removal of form for:Suspended floors, roofs, landings, balconies and access platform with water proof ply 12 mm thick							
	Drop	2	16.950		0.500		16.950	
	do	2	10.400		0.500		10.400	
	Total Quantity						27.350 sqm	
	Total Deducted Quantity						0.000 sqm	
	Net Total Quantity						27.350 sqm	
	Say 27.350 sqm @ Rs 917.27 / sqm						Rs 25087.33	
15	5.22.6 Steel reinforcement for R.C.C work including straightening, cutting, bending, placing in position and binding all complete upto plinth levelThermo - Mechanically Treated bars of grade Fe-500D or more							
	qty same as 7	1	41.494			100.0	4149.400	
	Total Quantity						4149.400 kilogram	
	Total Deducted Quantity						0.000 kilogram	
	Net Total Quantity						4149.400 kilogram	
	Say 4149.400 kilogram @ Rs 98.30 / kilogram						Rs 407886.02	
16	5.22A.6 Steel reinforcement for R.C.C work including straightening, cutting, bending, placing in position and binding all complete above plinth level.Thermo - Mechanically Treated bars of grade Fe-500D or more							
	Qty same as no 8 & 9	1	35.790+1. 368			120.0	4458.960	
	Total Quantity						4458.960 kg	
	Total Deducted Quantity						0.000 kg	
	Net Total Quantity						4458.960 kg	
	Say 4458.960 kg @ Rs 98.30 / kg						Rs 438315.77	
17	50.6.1.5 Solid block masonry using pre cast solid blocks (Factory made) of size 30x20x20cm or nearest available size confirming to IS 2185 Part I of 1979 for super structure up to floor two level thickness 20cm and above in: CM 1:6 (1 cement : 6 coarse sand) etc complete							
	solid block masonry							
	plinth beam	10	2.650	0.200	5.070		26.872	
	do	2	5.600	0.200	5.070		11.357	
	do	1	5.200	0.200	5.070		5.273	
	do	3	2.100	0.200	5.070		6.389	

	do	1	14.650	0.200	5.070		14.856		
	half wall	1	14.650	0.300	1.400		6.153		
	For glazed openings	11	2.650	0.200	1.550		-9.036		
	Shutter	1	2.650	0.200	3.400		-1.802		
	Doors	2	0.900	0.200	2.100		-0.756		
	Total Quantity						70.900 cum		
	Total Deducted Quantity						-11.594 cum		
	Net Total Quantity						59.306 cum		
	Say 59.306 cum @ Rs 6644.12 / cum						Rs 394036.18		
18	13.1.1 12 mm cement plaster of mix:1:4 (1 cement : 4 fine sand)								
	Outside wall plastering	2	15.05+8.4		5.450		255.606		
	Inside plastering main hall	2	14.65+5.6		5.000		202.500		
	do control room	2*2	2.95+2.2		5.000		103.000		
	half wall	1	14.650		2.200		32.231		
	Deductions								
	For shutter opening	1	2.650		3.400		-9.010		
	GW openings	11	2.650		1.550		-45.182		
	Doors	2	0.900		2.100		-3.780		
	Total Quantity						593.337 sqm		
	Total Deducted Quantity						-57.972 sqm		
	Net Total Quantity						535.365 sqm		
	Say 535.365 sqm @ Rs 314.09 / sqm						Rs 168152.79		
19	13.16.1 6 mm cement plaster of mix:1:3 (1 cement : 3 fine sand)								
	ground								
	Ceiling	1	14.650	5.600			82.040		
	Controll room	2	2.850	2.200			12.541		
	Extra roof rojection	2	8.400	1.000			16.800		
	do	2	17.050	1.000			34.100		
	Total Quantity						145.481 sqm		
	Total Deducted Quantity						0.000 sqm		
	Net Total Quantity						145.481 sqm		

	Say 145.481 sqm @ Rs 267.59 / sqm						Rs 38929.26	
20	13.9.1 Cement plaster 1:3 (1 cement : 3 coarse sand) finished with a floating coat of neat cement.12 mm cement plaster							
	Roof slab top	1	17.050	8.000			136.400	
	do	1	8.200	2.400			19.680	
	Edges	2	(17.05+10.40)	0.150			8.236	
	Total Quantity						164.316 sqm	
	Total Deducted Quantity						0.000 sqm	
	Net Total Quantity						164.316 sqm	
	Say 164.316 sqm @ Rs 412.13 / sqm						Rs 67719.55	
21	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							
	Kerala Water Authority Rolling shutter							
		1	2.650	3.400			9.010	
	Total Quantity						9.010 sqm	
	Total Deducted Quantity						0.000 sqm	
	Net Total Quantity						9.010 sqm	
	Say 9.010 sqm @ Rs 3300.13 / sqm						Rs 29734.17	
22	10.7 Providing and fixing ball bearing for rolling shutters.							
		3					3.000	
	Total Quantity						3.000 Nos	
	Total Deducted Quantity						0.000 Nos	
	Net Total Quantity						3.000 Nos	
	Say 3.000 Nos @ Rs 494.23 / Nos						Rs 1482.69	
23	10.8.1 Extra for providing mechanical device chain and crank operation for operating rolling shuttersExceeding 10.00 sqm and upto 16.80 sqm in the area							
		1	2.650	3.400			9.010	

							Total Quantity	9.010 sqm
							Total Deducted Quantity	0.000 sqm
							Net Total Quantity	9.010 sqm
							Say 9.010 sqm @ Rs 1302.48 / sqm	Rs 11735.34
24	10.11.1	<p>Providing and fixing factory made ISI marked steel glazed doors, windows and ventilators, side/top/centre hung, with beading and all members such as F7D, F4B, K11B and K 12 B etc. complete of standard rolled steel sections, joints mitred and flash butt welded and sash bars tenoned and riveted, including providing and fixing of hinges, pivots, including priming coat of approved steel primer, but excluding the cost of other fittings, complete all as per approved design, (sectional weight of only steel members shall be measured for payment). Fixing with 15x3 mm lugs 10 cm long embedded in cement concrete block 15x10x10 cm of C.C. 1:3:6 (1 Cement : 3 coarse sand: 6 graded stone aggregate 20 mm nominal size)</p>						
		11	2*(2.65+1.55)	1.000	1.000	1.8	166.321	Kg
							Total Quantity	166.321 kg
							Total Deducted Quantity	0.000 kg
							Net Total Quantity	166.321 kg
							Say 166.321 kg @ Rs 196.00 / kg	Rs 32598.92
25	10.14.1.1	<p>Providing and fixing pressed steel door frames conforming to IS: 4351, manufactured from commercial mild steel sheet 1.60 mm thickness, including hinges, jamb, lock jamb, bead and if required angle threshold of mild steel angle of section 50x25 mm, or base ties of 1.60 mm pressed, mild steel welded or rigidly fixed together by mechanical means, including M.S. pressed butt hinges 2.5 mm thick with mortar guards, lock strike-plate and shock absorbers as specified and applying a coat of approved steel primer after pre-treatment of the surface as directed by Engineer-in-charge: Profile B Fixing with adjustable lugs with split end tail to each jamb</p>						
		2	(2.1+2.1+9)				10.201	
							Total Quantity	10.201 metre
							Total Deducted Quantity	0.000 metre
							Net Total Quantity	10.201 metre
							Say 10.201 metre @ Rs 491.51 / metre	Rs 5013.89
26	10.5.2	<p>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 flats 30x6 mm for diagonal braces and central cross piece</p>						
		2	0.850		2.050		3.485	
							Total Quantity	3.485 sqm

		Total Deducted Quantity					0.000 sqm	
		Net Total Quantity					3.485 sqm	
		Say 3.485 sqm @ Rs 5035.74 / sqm					Rs 17549.55	
27	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.						
		Providig gang rails-MB 250						
		4	5.600			37.3	835.520	
		Total Quantity					835.520 kg	
		Total Deducted Quantity					0.000 kg	
		Net Total Quantity					835.520 kg	
		Say 835.520 kg @ Rs 119.79 / kg					Rs 100086.94	
28	21.1.1.2	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 portionPowder coated aluminium (minimum thickness of powder coating 50 micron)						
		4	2*(2.65+1.75)			0.5	17.600	
		2	2-(1.5+1.75)			0.5	-1.250	
		Total Quantity					16.350 kg	
		Total Deducted Quantity					0.000 kg	
		Net Total Quantity					16.350 kg	
		Say 16.350 kg @ Rs 537.07 / kg					Rs 8781.09	
29	21.3.2	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 5.50 mm thickness						
		FIXED WINDOWS						
		4	2.650		1.750		18.550	
		2	1.500		1.750		5.250	

		Total Quantity						23.800 sqm
		Total Deducted Quantity						0.000 sqm
		Net Total Quantity						23.800 sqm
		Say 23.800 sqm @ Rs 1526.00 / sqm						Rs 36318.80
30	13.43.1	Applying one coat of water thinnable cement primer of approved brand and manufacture on wall surface:Water thinnable cement primer						
	Qty same as above (19+20))	1	682.846				682.846	
		Total Quantity						682.846 sqm
		Total Deducted Quantity						0.000 sqm
		Net Total Quantity						682.846 sqm
		Say 682.846 sqm @ Rs 70.64 / sqm						Rs 48236.24
31	13.48.1	Finishing with Deluxe Multi surface paint system for interiors and exteriors using primer as per manufacturers specifications:Two or more coats applied on walls @ 1.25 ltr/10 sqm over and including one coat of special primer applied @ 0.75 ltr /10 sqm						
	Qty same as above	1	682.846				682.846	
		Total Quantity						682.846 sqm
		Total Deducted Quantity						0.000 sqm
		Net Total Quantity						682.846 sqm
		Say 682.846 sqm @ Rs 167.39 / sqm						Rs 114301.59
32	13.50.3	Applying priming coat:With ready mixed red oxide zinc chromate primer of approved brand and manufacture on steel galvanised iron /steel works						
	For Rolling shutter	1	2.250	2.650	3.400		20.273	
	Doors	2	2.2500	0.900	2.100		8.505	
		Total Quantity						28.778 sqm
		Total Deducted Quantity						0.000 sqm
		Net Total Quantity						28.778 sqm
		Say 28.778 sqm @ Rs 59.66 / sqm						Rs 1716.90
33	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 .						
	For Rolling shutter	1	2.250	2.650	3.400		20.273	

	Doors	2	2.2500	0.900	2.100		8.505	
	Total Quantity						28.778 sqm	
	Total Deducted Quantity						0.000 sqm	
	Net Total Quantity						28.778 sqm	
	Say 28.778 sqm @ Rs 208.54 / sqm						Rs 6001.36	
Sl No	Description	No	L	B	D	CF	Quantity	Remark
2CHEMICAL HOUSE (Cost Index:35.59 %)								
1	<p>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</p>							
	Footing Block 1	24	3.000	3.000	2.650	0.4	228.960	
	Combined	8	3.500	3.000	2.650	0.4	89.040	
	do porch	4	2.000	2.000	2.650	0.4	16.960	
	Block 2	4	3.000	3.000	2.650	0.4	38.160	
	do combined	2	7.520	3.000	2.650	0.4	47.828	
	block 3	16	2.000	2.000	2.650	0.4	67.840	
	Total Quantity						488.788 cum	
	Total Deducted Quantity						0.000 cum	
	Net Total Quantity						488.788 cum	
	Say 488.788 cum @ Rs 214.03 / cum						Rs 104615.30	
2	<p>2.7.1 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.Ordinary rock</p>							
	Footing Block 1	24	3.000	3.000	2.650	0.6	343.440	
	Combined	8	3.500	3.000	2.650	0.6	133.560	
	do porch	4	2.000	2.000	2.650	0.6	25.440	
	Block 2	4	3.000	3.000	2.650	0.6	57.240	
	do combined	2	7.520	3.000	2.650	0.6	71.741	
	block 3	16	2.000	2.000	2.650	0.6	101.760	
	Total Quantity						733.181 cum	
	Total Deducted Quantity						0.000 cum	
	Net Total Quantity						733.181 cum	

	Say 733.181 cum @ Rs 414.84 / cum						Rs 304152.81
3	2.26.2 Extra for every additional lift 1.5 m or part there of in excavation / banking excavated or stacked materials. Ordinary or hard rock						
	Footing Block 1	24	3.000	3.000	2.650	0.6	343.440
	Combined	8	3.500	3.000	2.650	0.6	133.560
	do porch	4	2.000	2.000	2.650	0.6	25.440
	Block 2	4	3.000	3.000	2.650	0.6	57.240
	do combined	2	7.520	3.000	2.650	0.6	71.741
	block 3	16	2.000	2.000	2.650	0.6	101.760
	Total Quantity						733.181 cum
	Total Deducted Quantity						0.000 cum
	Net Total Quantity						733.181 cum
	Say 733.181 cum @ Rs 190.78 / cum						Rs 139876.27
4	4.1.6 Providing and laying in position cement concrete of specified grade excluding the cost of centering and shuttering - All work up to plinth level:1:3:6 (1 cement : 3 coarse sand : 6 graded stone aggregate 40 mm nominal size)						
	For grade beams	13*3	4.070	0.450	0.100		7.143
	do	8*3	3.350	0.450	0.100		3.619
	do	6*4	3.710	0.450	0.100		4.007
	Porch	2	6.350	0.450	0.100		0.572
	Footing Block 1	24	3.000	3.000	0.100		21.600
	Combined	8	3.500	3.000	0.100		8.400
	do porch	4	2.000	2.000	0.100		1.600
	Block 2	4	3.000	3.000	0.100		3.600
	do combined	2	7.520	3.000	0.100		4.512
	block 3	16	2.000	2.000	0.100		6.400
	Total Quantity						61.453 cum
	Total Deducted Quantity						0.000 cum
	Net Total Quantity						61.453 cum
	Say 61.453 cum @ Rs 7211.15 / cum						Rs 443146.80
5	5.33.1 Providing and laying in position machine batched and machine mixed design mix M-25 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 upto plinth level						
	Footing Block 1	24	3.000	3.000	0.300		64.800
	do	26	(3*3)+(1.15*1.15)		0.450	0.5	60.387
	Combined	8	3.500	3.000	0.300		25.200
	do	8	(3.5*3)+(1.65*1.15)		0.450	0.5	22.316
	do porch	4	2.000	2.000	0.300		4.800
	do	4	(2*2)+(1.05*1.05)		0.350	0.5	3.572
	Block 2	4	3.000	3.000	0.300		10.800
	do	4	(3*3)+(1.15*1.15)		0.450	0.5	9.291
	do combined	2	7.520	3.000	0.300		13.536
	do	2	(7.52-3)+(7*1.15)	5.670	0.450	0.5	32.073
	block 3	16	2.000	2.000	0.300		19.200
	do	16	(2*2)+(1.05*1.05)		0.350	0.5	14.287
	For grade beams	13*3	4.070	0.350	0.600		33.334
	do	8*3	3.350	0.350	0.600		16.884
	do	6*4	3.710	0.350	0.600		18.699
	Porch	2	6.350	0.350	0.600		2.667
	ALUM TANKS						
	FLOOR SLAB	2	8.520	2.350	0.200		8.009
	SIDE WALL	2	8.520	0.200	1.500		5.112
	DO	4	3.710	0.200	1.500		4.452
	CROSS WALLS	4	2.150	0.200	1.500		2.580
	DO	4	1.900	0.200	1.500		2.281
	Total Quantity						374.280 cum
	Total Deducted Quantity						0.000 cum

	Net Total Quantity						374.280 cum	
	Say 374.280 cum @ Rs 9413.54 / cum						Rs 3523299.75	
6	5.33.2 Providing and laying in position machine batched and machine mixed design mix M-25 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							
	Columns for porch	8	0.450	0.450	4.080		6.610	
	Storage area for ground and first floors	2*32	0.450	0.450	4.080		52.877	
	Alumn mixing area upto GF	14	0.450	0.450	5.730		16.245	
	do upto FF	12	0.450	0.450	4.380		10.644	
	do upto SF	2	0.450	0.450	7.500		3.038	
	do upto GF rear side	14	0.450	0.450	4.080		11.567	
	Beams porch CDEF & C1D1E1F1	3*2*.35	4.070	0.350	0.570		1.706	
	B E A M S C C1DD1EE1FF1	4	6.350	0.350	0.570		5.068	
	B E A M S A1B1C1F1G1H1 TO A6B6C6F6G6H6	4*2	4.300	0.350	0.570		6.863	
	BEAMS C8D8F8F8 TO C9D9E9F9	2*4	3.710	0.350	0.570		5.922	
	BEAMS C7D7E7F7 TO C9D9E9F9	3*3	4.070	0.350	0.570		7.308	
	BEAMS C9D9E9F9 TO C13D13E13F13	4*3	4.070	0.350	0.450		7.693	
	DO	4*4	3.710	0.350	0.450		9.350	
	tie beams	4	3.710	0.350	0.600		3.117	
	do	3*3	4.070	0.350	0.600		7.693	
	Porch slab	1	15.200	7.300	0.150		16.644	
	GF floor slab	1	35.330	14.200	0.180		90.304	

	Bblock 2 floor slab	1	14.400	12.680	0.180		32.867	
	Block 3 roof slab	1	14.400	9.270	0.150		20.024	
		1	4.070	0.350	0.750		1.069	
	STAIR BEAM	1	4.070	0.350	0.750		1.069	
	FF							
	Beams store & silo C 2 D 2 E 2 F 2 to C 9 D 9 E 9 F 9	3*7	4.070	0.350	0.570		17.052	
	B E A M S A1B1C1F1G1H1 TO A6B6C6F6G6H6	4*2*2	4.300	0.350	0.570		13.726	
	BEAMS C7D7E7F7 TO C9D9E9F9	2*6	3.710	0.350	0.570		8.882	
	BEAMS C7D7E7F7 TO C9D9E9F9	8*3	3.350	0.350	0.570		16.040	
	BEAMS D10E10	1	4.070	0.350	0.450		0.642	
	B E A M S D 9 E 9 & D 1 0 E 1 0	2	3.710	0.350	0.450		1.169	
	Roof slab	1	34.590	13.450	0.150		69.786	
	do OPERAING SLAB	1	8.270	4.870	0.200		8.055	
	STAIR BEAM	3	4.070	0.350	0.750		3.206	
	SF							
	Roof Beams silo	4*2	3.710	0.350	0.450		4.675	
	do	3*3	4.070	0.350	0.450		5.770	
	stair area	2	3.710	0.350	0.450		1.169	
	do	1	4.070	0.350	0.450		0.642	
	Floor slab	1	14.400	9.000	0.150		19.440	
	stair roof	1	5.400	4.200	0.150		3.403	
	LINTELS							
	STORE	8	4.300	0.200	0.150		1.032	
	DO	6	3.800	0.200	0.150		0.684	
	Total Quantity						493.051 cum	
	Total Deducted Quantity						0.000 cum	
	Net Total Quantity						493.051 cum	
	Say 493.051 cum @ Rs 11065.64 / cum						Rs 5455924.87	

7	5.3 Reinforced cement concrete work in beams, suspended floors, roofs, having slope up to 15 ⁰ 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).							
	DROP SLAB							
	GF	1	95.780	0.060	0.570		3.276	
	FF	1	81.870	0.080	0.570		3.734	
	STAIR							
	GF STAIR 1- WAIST SLAB	1	1.000	1.200	0.180		0.216	
	DO RISER	39	1.200	0.280	0.150	0.5	0.983	
	LANDING	3	1.200	1.200	0.180		0.778	
	GF STAIR 2- WAIST SLAB	1	1.000	1.200	0.180		0.216	
	DO RAISER	28	1.200	0.280	0.150	0.5	0.706	
	LANDING	1	3.070	1.200	0.180		0.664	
	FF STAIR - WAIST SLAB	4	2.600	1.200	0.180		2.247	
	RISER	30	1.200	0.280	0.150	0.5	0.756	
	LANDING	1	4.070	1.200	0.180		0.880	
						Total Quantity	14.456 cum	
						Total Deducted Quantity	0.000 cum	
						Net Total Quantity	14.456 cum	
						Say 14.456 cum @ Rs 11492.88 / cum	Rs 166141.07	
8	5.9.1 Centering and shuttering including strutting, etc. and removal of form for: Foundations, footings, bases of columns, etc for mass concrete							
	GROUND FLOOR							
	F O O T I N G 3 0 0 X 3 0 0 X 7 5 0	4*28	3.000		0.300		100.800	
	COMBINED	4*2	(3.5+3)*2		0.300		31.200	
	F O O T I N G 2 0 0 X 2 0 0 X 6 5 0	4*20	2.000		0.300		48.000	
	COMBINED	2	(7.52+3)*2		0.300		12.624	
						Total Quantity	192.624 sqm	

	Total Deducted Quantity						0.000 sqm	
	Net Total Quantity						192.624 sqm	
	Say 192.624 sqm @ Rs 335.31 / sqm						Rs 64588.75	
9	5.9.6 Centering and shuttering including strutting, etc. and removal of form for:Columns, Pillars, Piers, Abutments, Posts and Struts							
	COLUMNS GF							
	PORCH	4*2	4*0.450		6.080		87.552	
	STORE	4*8	4*.45		6.080		350.208	
	MIXING AREA	7*4	4*.45		6.670		336.168	
	FF							
	STORE	8*4	4*.45		4.080		235.008	
	ALUM AREA	4*3	4*.45		5.670		122.472	
	STAIR AREA	2	4*.45		5.670		20.412	
	SF COLUMNS							
	SILO PORTION	4*3	4*.45		2.970		64.152	
	STAIR AREA	2	4*.45		2.970		10.692	
	Total Quantity						1226.664 sqm	
	Total Deducted Quantity						0.000 sqm	
	Net Total Quantity						1226.664 sqm	
	Say 1226.664 sqm @ Rs 863.64 / sqm						Rs 1059396.10	
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.							
	ALUM AND CHLORINE TANKS							
	SIDE WALLS OUTER	2	8.590		1.700		29.206	
	DO	4	3.710		1.700		25.228	
	DO	4	2.100		1.700		14.280	
	INSIDE	8	8.060		1.500		96.720	
	Total Quantity						165.434 sqm	
	Total Deducted Quantity						0.000 sqm	
	Net Total Quantity						165.434 sqm	
	Say 165.434 sqm @ Rs 717.20 / sqm						Rs 118649.26	
11	5.9.3							

	Centering and shuttering including strutting, etc. and removal of form for:Suspended floors, roofs, landings, balconies and access platform							
	PORCH SLAB	3	6.450	4.170			80.690	
	DO	2	7.300	0.750			10.950	
	DO	1	15.500	0.750			11.625	
	DO	2	9.550	0.750			14.326	
	DO	2	12.420	0.750			18.630	
	DO	2	9.500	0.750			14.250	
	STORE	20	3.720	3.450			256.680	
	SILO	2	4.170	3.360			28.023	
	REAR	11	3.810	4.170			174.765	
	PROJECTION REAR	2	25.050	0.200			10.021	
	DO	1	14.400	0.200			2.881	
	DROP SLAB SIDE	2	95.780		0.570		109.190	
	D R O P S L A B B O T T O M	1	95.780		0.570		54.595	
	FF							
	PROJECTIONS	2	9.550	0.750			14.326	
	DO	2	12.420	0.750			18.630	
	DO	2	9.500	0.750			14.250	
	STORE ROOF	20	3.720	3.450			256.680	
	DROP SLAB SIDE	2	81.870		0.570		93.332	
	D R O P S L A B B O T T O M	1	81.870		0.570		46.666	
	SF							
	SILO	7	4.170	3.360			98.079	
	PROJECTION REAR	2	13.120	0.200			5.248	
	DO	1	14.400	0.200			2.881	
	Total Quantity						1336.718 sqm	
	Total Deducted Quantity						0.000 sqm	
	Net Total Quantity						1336.718 sqm	
	Say 1336.718 sqm @ Rs 815.78 / sqm						Rs 1090467.81	
12	5.9.5 Centering and shuttering including strutting, etc. and removal of form for:Lintels, beams, plinth beams,							

	girders bressumers and cantilevers							
	BEAMS & LINTELS-GF							
	PORCH	4	6.350	1.550			39.370	
	DO	2*3	4.070	1.550			37.851	
	STORE	8	3.350	1.520			40.737	
	STAIR	1	3.350	1.550			5.193	
	BEAMS	4*4	4.300	1.520			104.576	
	DO	11*3	4.070	1.520			204.152	
	DO	6*4	3.710	1.520			135.341	
	BEAM STAIR CASE SIDE	1	.75+.63	4.070			5.617	
	DO SIDE	1	0.350	4.070			1.425	
	LINTELS							
		8*2	4.300		0.150		10.320	
		2*2*3	3.550		0.150		6.390	
	S F BEAMS & LINTELS-GF							
	STORE ROOF BEAMS	8	3.350	1.550			41.540	
	BEAMS	4*4	4.300	1.520			104.576	
	DO	7*3	4.070	1.520			129.915	
	DO	4*2	3.710	1.520			45.114	
	DO	2	3.710	1.520			11.279	
	STAIR BEAM SIDE	3	.75+.63	4.070			16.850	
	DO BOTTOM	3	0.350	4.070			4.274	
	DROP SLAB SIDE	2	81.870		0.570		93.332	
	DROP SLAB BOTTOM	1	81.870		0.570		46.666	
	Total Quantity						1084.518 sqm	
	Total Deducted Quantity						0.000 sqm	
	Net Total Quantity						1084.518 sqm	
	Say 1084.518 sqm @ Rs 649.82 / sqm						Rs 704741.49	
13	5.9.7 Centering and shuttering including strutting, etc. and removal of form for:Stairs, (excluding landings) except spiral - staircases)							

ground floor									
	waist slab bottom flight 1,2,3,4	1	3.95+1.65 +2.27+2.8 6+2.92	1.200			16.380		
	sides	2	2.92+1.65 +2.27+2.8 6+2.92		0.310		7.825		
	landing 1 slab bottom stair	1	0.710	1.440			1.023		
	landing 2 bottom	1	0.770	1.440			1.109		
	do landing 3	1	0.820	0.930			0.763		
	do landing 4	1	0.910	0.930			0.847		
	riser side	39	1.200		0.150		7.020		
	stair 2 - waist slab - bottom	1	3.56+1.03 +3.26+.44	1.200			9.948		
	side	2	3.56+1.03 +3.26+.44		0.150		2.487		
	do landing bottom	2	0.760	1.200			1.824		
	riser	27	1.200		0.150		4.860		
Kerala Water Authority first floor									
	waist slab flight 1,2,3,4	1	2.62+2.56 +2.66+3.2 5	1.200			13.308		
	sides	1	2.62+2.56 +2.66+3.2 5	0.310			3.438		
	landing 1,3	2	0.820	1.460			2.395		
	side	1	1.800		0.180		0.324		
	landing 2	1	0.580	0.940			0.546		
	riser side	30	1.200		0.150		5.400		
	Total Quantity						79.497 sqm		
	Total Deducted Quantity						0.000 sqm		
	Net Total Quantity						79.497 sqm		
	Say 79.497 sqm @ Rs 732.52 / sqm						Rs 58233.14		
14	5.9.16.1 Centering and shuttering including strutting, etc. and removal of form for:Edges of slabs and breaks in floors and wallsUnder 20 cm wide								

	GF							
	Block 1 and porch	1	95.780					-95.780
	FF							
	Block 1	1	81.870					81.870
	Total Quantity							81.870 metre
	Total Deducted Quantity							-95.780 metre
	Net Total Quantity							-13.910 metre
	Say -13.910 metre @ Rs 203.93 / metre							Rs -2836.67
15	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							
	Steel reinforcement for R.C.C							
		1	374.280			120.0	44913.600	
	Total Quantity							44913.600 kilogram
	Total Deducted Quantity							0.000 kilogram
	Net Total Quantity							44913.600 kilogram
	Say 44913.600 kilogram @ Rs 98.30 / kilogram							Rs 4415006.88
16	5.22A.6 Steel reinforcement for R.C.C work including straightening, cutting, bending, placing in position and binding all complete above plinth level. Thermo - Mechanically Treated bars of grade Fe-500D or more							
		1	490.713				490.713	
	Total Quantity							490.713 kg
	Total Deducted Quantity							0.000 kg
	Net Total Quantity							490.713 kg
	Say 490.713 kg @ Rs 98.30 / kg							Rs 48237.09
17	50.6.1.5 Solid block masonry using pre cast solid blocks (Factory made) of size 30x20x20cm or nearest available size confirming to IS 2185 Part I of 1979 for super structure up to floor two level thickness 20cm and above in: CM 1:6 (1 cement : 6 coarse sand) etc complete							
	FF							
	store	8	4.300	0.200	3.300			22.704
	do	6	3.350	0.200	3.300			13.266
	rear block	4*2	3.710	0.200	3.300			19.589
	do	3	4.070	0.200	3.300			8.059
	do	3	4.070	0.200	3.300			8.059

	do alum tank	2*2	3.710	0.200	1.800		5.343		
	for openings								
	Windows	14	1.000	0.200	1.500		-4.200		
	ventilator	22	0.600	0.200	0.500		-1.319		
	Parappett								
	GF roof	1	95.780	0.200	0.800		15.325		
	FF	1	96.000	0.200	0.800		15.361		
	SF over silo roof	1	54.000	0.200	0.800		8.640		
	Total Quantity						116.346 cum		
	Total Deducted Quantity						-5.519 cum		
	Net Total Quantity						110.827 cum		
	Say 110.827 cum @ Rs 6644.12 / cum						Rs 736347.89		
18	13.1.1 12 mm cement plaster of mix:1:4 (1 cement : 4 fine sand)								
	GF								
	OUTER WALL B1	2	31.330		4.550		285.103		
	INNER WALL B1	2	33.630		4.300		289.218		
	OUTER WALL B2	1	49.310		4.450		219.430		
	INNER WALL B2	1	50.670		4.200		212.815		
	OUTER WALL B3	2	9.030		5.850		105.651		
	INNER WALL B3	2	9.240		5.850		108.108		
	ALUM TANK	8	5.980		1.500		71.760		
	COLUMN B1	12*4	0.450		4.200		90.720		
	C O L U M N B 1 C O M B I N E D	4	.45+.45+.45 5		4.050		21.870		
	COLUMN B2	8*4	0.450		5.670		81.648		
	COLUMN B3	4*4	0.450		4.050		29.160		
	BEAM BOTTOM B1 LONGITUDE	8	4.300		0.350		12.040		
	BEAM SIDE B1 LONGITUDE	8*2	4.300		0.750		51.600		
	BEAM BOTTOM B1 LONGITUDE	18	3.350		0.750		45.225		
	BEAM SIDE B1 LONGITUDE	18*2	3.350		0.350		42.210		

	BEAM BOTTOM B1 TRANSVERSE	18	3.350		0.350		21.105	
	BEAM SIDE B1 TRANSVERSE	18*2	3.350		0.750		90.450	
	BEAM BOTTOM B2 LONGITUDE	6	4.070		0.350		8.547	
	BEAM SIDE B2 LOGITUDE	6*2	4.070		0.750		36.630	
	BEAM BOTTOM B2 TRANSVERSE	4	3.710		0.350		5.194	
	BEAM SIDE B2 TRANSVERSE	4*2	3.710		0.750		22.260	
	BEAM BOTTOM B3	10	4.070		0.350		14.246	
	BEAM SIDE B3	10*2	4.070		0.750		61.051	
	BEAM BOTTOM B3 TANSVERSE	6	3.710		0.350		7.791	
	BEAM SIDE B3 TANSVERSE	6*2	3.710		0.750		33.390	
	BEAM B3	4	1.730		0.350		2.422	
	DO SIDE B3	4*2	1.730		0.750		10.380	
	STAIR 1 WAIST SLAB BOTTOM	1	3.95+1.65 +2.27+2.8 8+2.92	1.200			16.404	
	SIDE RECTANGLE	2	3.95+1.65 +2.27+2.8 8+2.92		0.180		4.922	
	SIDE TRIANGLE	39*2	0.280		0.150	0.5	1.639	
	RISER	139	1.200		0.150		25.020	
	STAIR 2 WAIST SLAB BOTTOM	1	3.58+1.03 +3.26+4.44	1.200			9.972	
	SIDE RECTANGLE	2	3.58+1.03 +3.26+4.44		0.180		2.992	
	SIDE TRIANGLE	27		0.280	0.150	0.5	0.568	
	RISER	27		1.200	0.150		4.860	
	DROP SLAB SIDE	2	95.780	0.570			109.190	
	D R O P S L A B B O T T O M	1	95.780	0.050			4.790	

	LANDING 1 STAIR 1	1	.71+1.2	1.200			2.292	
	DO LANDING 2	1	.77+1.2	1.200			2.364	
	LANDING 3	1	.82+1.2	1.200			2.424	
	LANDING 4	1	.91+1.2	1.200			2.532	
	STAIR 2 LANDING 1,3	2	.82+1.2	1.200			4.848	
	DO LANDING 2	1	.58+1.2	1.200			2.136	
	PARAPET SIDE OUTER	1	69.550	0.800			55.640	
	DO INNER	1	68.850	0.800			55.080	
	TOP	1	68.950	0.800			55.161	
						FF		
	OUTSIDE WALL	1	9.5+11.85 +9.93	4.700			147.017	
	INSIDE WALL UP TO BEAM BOTTOM	1	34.230	3.600			123.228	
	COLUMN BLOCK 1	18*4	0.350		3.600		90.720	
	COLUMN COMBINED BLOCK 1	4*2	.35+.95		3.600		37.440	
	COLUMN	3*2	0.350		3.600		7.561	
	COLUMN BLOCK 3	14*4	0.350		4.380		85.848	
	BEAM 4.3 BOTTOM B1	16	4.300		0.350		24.080	
	BEAM 4.3 SIDE B1	16*2	4.300		0.750		103.200	
	BEAM BOTTOM B1	12	4.070		0.350		17.094	
	BEAM SIDE B1	18	4.070		0.750		54.946	
	BEAM BOTTOM B3	9	4.070		0.350		12.821	
	BEAM SIDE B3	15	4.070		0.750		45.788	
	DO BEAM BOTTOM B3	10	3.710		0.350		12.985	
	BEAM SIDE B3	10*2	3.710		0.750		55.650	
	STAIR WAIST SLAB BOTTOM	4	2.600		1.200		12.480	
	STAIR WAIST SLAB SIDE	4*2	2.600		0.180		3.744	

	DO	30*2	0.300		0.150	0.5	1.350	
	RAISER	30	1.200		0.150		5.400	
	DROP SLAB SIDE	2	81.870		0.570		93.332	
	D R O P S L A B B O T T O M	1	81.870	0.050			4.094	
	LANDING 1,3	2	.82+1.2	1.200			4.848	
	LANDING 2	1	1.58+1.2	1.200			3.337	
	PARAPET OUTER	1	82.070	0.800			65.656	
	DO INNER	1	81.270	0.800			65.017	
	DO TOP	1	81.670	0.800			65.336	
	SF							
	COLUMN	12*4	0.450		3.000		64.801	
	BEAM BOTTOM TRANSVERSE	10	3.710	0.350			12.985	
	BEAM SIDE TRANSVERSE	10*2	3.710		0.750		55.650	
	BEAM BOTTOM LONGITUDE	10	4.070	0.350			14.246	
	BEAM SIDE LONGITUDE	10*2	4.070		0.750		61.051	
	PARAPET OUTER	1	56.160		0.800		44.928	
	DO INNER	1	54.060		0.800		43.249	
	DO TOP	1	55.060		0.800		44.048	
	GF							
	WINDOW	7	1.000		1.500		-10.500	
	VENTILATION	22					-22.000	
	FF							
	WINDOW	7	1.000		1.500		-10.500	
	Total Quantity						3826.788 sqm	
	Total Deducted Quantity						-43.000 sqm	
	Net Total Quantity						3783.788 sqm	
	Say 3783.788 sqm @ Rs 314.09 / sqm						Rs 1188449.97	
19	13.7.1	12 mm cement plaster finished with a floating coat of neat cement of mix:1:3 (1 cement : 3 fine sand)						
	GF							

	ROOF TOP	1	14.400	12.680			182.592		
	DO	1	7.300	15.200			110.960		
	roof projection	1	92.480	0.600			55.488		
	FF								
	ROOF TOP	1	82.070	14.000			1148.980		
	DO	2	4.520	4.220			38.149		
	ROOF PROJECTION	1	78.870		0.800		63.096		
	SF								
	TOP ROOF	1	14.400	13.300			191.520		
	Total Quantity						1790.785 sqm		
	Total Deducted Quantity						0.000 sqm		
	Net Total Quantity						1790.785 sqm		
	Say 1790.785 sqm @ Rs 401.21 / sqm						Rs 718480.85		
20	13.16.1 6 mm cement plaster of mix:1:3 (1 cement : 3 fine sand)								
	GF								
	CIELING B1	12	3.400	4.350			177.480		
	CIELING B1	9	3.400	4.120			126.072		
	CIELING B2	9	3.770	4.120			139.792		
	CIELING B3	9	3.400	4.350			133.110		
	FF								
	CIELING B1	11	4.350	3.400			162.690		
	DO	9	4.120	3.400			126.072		
	CIELING B2	6	4.710	3.810			107.671		
	SF								
	CIELING	7	4.120	3.760			108.439		
	Total Quantity						1081.326 sqm		
	Total Deducted Quantity						0.000 sqm		
	Net Total Quantity						1081.326 sqm		
	Say 1081.326 sqm @ Rs 267.59 / sqm						Rs 289352.02		
21	13.9.1 Cement plaster 1:3 (1 cement : 3 coarse sand) finished with a floating coat of neat cement.12 mm cement plaster								
	FOR ALUM TANKS								

	iNSIDE	8	2*(1.88+2.15)		1.500		96.720	
	Total Quantity						96.720 sqm	
	Total Deducted Quantity						0.000 sqm	
	Net Total Quantity						96.720 sqm	
	Say 96.720 sqm @ Rs 412.13 / sqm						Rs 39861.21	
22	<p>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</p>							
		3	4.060		3.450		42.021	
	Total Quantity						42.021 sqm	
	Total Deducted Quantity						0.000 sqm	
	Net Total Quantity						42.021 sqm	
	Say 42.021 sqm @ Rs 3300.13 / sqm						Rs 138674.76	
23	<p>10.7 Providing and fixing ball bearing for rolling shutters.</p>							
		3*3					9.000	
	Total Quantity						9.000 Nos	
	Total Deducted Quantity						0.000 Nos	
	Net Total Quantity						9.000 Nos	
	Say 9.000 Nos @ Rs 494.23 / Nos						Rs 4448.07	
24	<p>10.8.1 Extra for providing mechanical device chain and crank operation for operating rolling shuttersExceeding 10.00 sqm and upto 16.80 sqm in the area</p>							
		3	4.060		3.450		42.021	
	Total Quantity						42.021 sqm	
	Total Deducted Quantity						0.000 sqm	
	Net Total Quantity						42.021 sqm	
	Say 42.021 sqm @ Rs 1302.48 / sqm						Rs 54731.51	
25	<p>21.1.1.2 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 :</p>							

	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 portion Powder coated aluminium (minimum thickness of powder coating 50 micron)							
	ALUMINIUM SECTIONS FOR FRAMES							
	FOR WINDOWS 32 X 25 / 0.8	14	2*(1.5+1)			0.47	32.900	
	VENTILATORS 32 X 25 / 0.8	29	2*(.6+.5)			0.47	29.986	
	Total Quantity						62.886 kg	
	Total Deducted Quantity						0.000 kg	
	Net Total Quantity						62.886 kg	
	Say 62.886 kg @ Rs 537.07 / kg						Rs 33774.18	
26	21.3.2 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 5.50 mm thickness							
	Kerala Water Authority WINDOW & VENTILATOR SHUTTERS							
	WINDOWS	14	1.000		1.500		21.000	
	VENTILATORS	29	0.600		0.500		8.700	
	Total Quantity						29.700 sqm	
	Total Deducted Quantity						0.000 sqm	
	Net Total Quantity						29.700 sqm	
	Say 29.700 sqm @ Rs 1526.00 / sqm						Rs 45322.20	
27	10.1 Structural steel work in single section, fixed with or without connecting plate, including cutting, hoisting, fixing in position and applying a priming coat of approved steel primer all complete.							
	For alum mixing cone							
	ISMB FOR SILO	8	37.300				298.400	
	Total Quantity						298.400 kilogram	
	Total Deducted Quantity						0.000 kilogram	
	Net Total Quantity						298.400 kilogram	
	Say 298.400 kilogram @ Rs 101.29 / kilogram						Rs 30224.94	

28	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							
	SECTIONS 50X25X2	4*2	1.200			2.15	20.640	
	DO	4*4	0.600			2.15	20.640	
	CHEQURED	4	1.200	0.500	0.010	7850.0	188.400	
	Total Quantity						229.680 kg	
	Total Deducted Quantity						0.000 kg	
	Net Total Quantity						229.680 kg	
	Say 229.680 kg @ Rs 110.23 / kg						Rs 25317.63	
29	od376069/2021_2022 Providing and fixing Silos make by 12 mm thick S S. sheet cutting bending and jointing the sheets into form a cone							
	Silos							
		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 170132.27 / No						Rs 680529.08	
30	od376086/2021_2022 Providing and fixing cylindrical vessle for stirring mechanism inside the silo using10 mm thick S S. sheet cutting bending and jointing the sheets into forma funnel							
		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 22046.51 / No						Rs 88186.04	
31	10.26.3 Providing and fixing hand rail of approved size by welding etc. to steel ladder railing, balcony railing, staircase railing and similar works, including applying priming coat of approves steel primer.G.I. pipes							
	LADDER RECTANGULAR SECTIONS 50X2.5X2							
	STEPS	2*26	0.800			2.15	89.440	
	DO	2*2	5.100			2.15	43.860	
	HAND RAILS	2*3	5.200			2.15	67.080	

	VERTICALS	2*2*26	0.800			2.15	178.880		
	Total Quantity						379.260 kg		
	Total Deducted Quantity						0.000 kg		
	Net Total Quantity						379.260 kg		
	Say 379.260 kg @ Rs 186.03 / kg						Rs 70553.74		
32	<p>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.)</p>								
	HAND RAIL 50mm dia								
	GF STAIR 1	2	7.010			2.54	35.611		
	LANDING	1	13.440			2.54	34.138		
	GF STAIR 2	1	13.440			2.54	34.138		
	LANDING	1	16.820			2.54	42.723		
	FF STAIR	1	8.750			2.54	22.225		
	DO LANDING	2	8.420			2.54	42.774		
	DO LANDING	1	3.600			2.54	9.144		
	BALUSTRADE 40mm								
	GF STAIR 1	39			1.180	3.23	148.645		
	DO STAIR 2	28			1.180	3.23	106.720		
	FF STAIR 1	30			1.180	3.23	114.342		
	Total Quantity						590.460 kg		
	Total Deducted Quantity						0.000 kg		
	Net Total Quantity						590.460 kg		
	Say 590.460 kg @ Rs 677.34 / kg						Rs 399942.18		
33	<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>								
	GF								
	OUTER WALL B1	2	31.330		4.550		285.103		
	INNER WALL B1	2	33.630		4.300		289.218		

	OUTER WALL B2	1	49.310		4.450		219.430	
	INNER WALL B2	1	50.670		4.200		212.815	
	OUTER WALL B3	2	9.030		5.850		105.651	
	INNER WALL B3	2	9.240		5.850		108.108	
	ALUM TANK	8	5.980		1.500		71.760	
	COLUMN B1	12*4	0.450		4.200		90.720	
	C O L U M N B 1 C O M B I N E D	4	.45+.45+.4 5		4.050		21.870	
	COLUMN B2	8*4	0.450		5.670		81.648	
	COLUMN B3	4*4	0.450		4.050		29.160	
	BEAM BOTTOM B1 LONGITUDE	8	4.300		0.350		12.040	
	BEAM SIDE B1 LONGITUDE	8*2	4.300		0.750		51.600	
	BEAM BOTTOM B1 LONGITUDE	18	3.350		0.750		45.225	
	BEAM SIDE B1 LONGITUDE	18*2	3.350		0.350		42.210	
	BEAM BOTTOM B1 TRANSVERSE	18	3.350		0.350		21.105	
	BEAM SIDE B1 TRANSVERSE	18*2	3.350		0.750		90.450	
	BEAM BOTTOM B2 LONGITUDE	6	4.070		0.350		8.547	
	BEAM SIDE B2 LOGITUDE	6*2	4.070		0.750		36.630	
	BEAM BOTTOM B2 TRANSVERSE	4	3.710		0.350		5.194	
	BEAM SIDE B2 TRANSVERSE	4*2	3.710		0.750		22.260	
	BEAM BOTTOM B3	10	4.070		0.350		14.246	
	BEAM SIDE B3	10*2	4.070		0.750		61.051	
	BEAM BOTTOM B3 TANSVERSE	6	3.710		0.350		7.791	
	BEAM SIDE B3 TANSVERSE	6*2	3.710		0.750		33.390	
	BEAM B3	4	1.730		0.350		2.422	

	DO SIDE B3	4*2	1.730		0.750		10.380	
	STAIR 1 WAIST SLAB BOTTOM	1	3.95+1.65 +2.27+2.8 8+2.92	1.200			16.404	
	SIDE RECTANGLE	2	3.95+1.65 +2.27+2.8 8+2.92		0.180		4.922	
	SIDE TRIANGLE	39*2	0.280		0.150	0.5	1.639	
	RISER	139	1.200		0.150		25.020	
	STAIR 2 WAIST SLAB BOTTOM	1	3.58+1.03 +3.26+.44	1.200			9.972	
	SIDE RECTANGLE	2	3.58+1.03 +3.26+.44		0.180		2.992	
	SIDE TRIANGLE	27		0.280	0.150	0.5	0.568	
	RISER	27		1.200	0.150		4.860	
	DROP SLAB SIDE	2	95.780	0.570			109.190	
	D R O P S L A B B O T T O M	1	95.780	0.050			4.790	
	LANDING 1 STAIR 1	1	.71+1.2	1.200			2.292	
	DO LANDING 2	1	.77+1.2	1.200			2.364	
	LANDING 3	1	.82+1.2	1.200			2.424	
	LANDING 4	1	.91+1.2	1.200			2.532	
	STAIR 2 LANDING 1,3	2	.82+1.2	1.200			4.848	
	DO LANDING 2	1	.58+1.2	1.200			2.136	
	PARAPET SIDE OUTER	1	69.550	0.500			34.775	
	DO INNER	1	68.850	0.500			34.425	
	TOP	1	68.950	0.500			34.475	
	GF							
	CIELING B1	12	3.400	4.350			177.480	
	CIELING B1	9	3.400	4.120			126.072	
	CIELING B2	9	3.770	4.120			139.792	
	CIELING B3	9	3.400	4.350			133.110	
	FF							

	CIELING B1	11	4.350	3.400		162.690	
	DO	9	4.120	3.400		126.072	
	CIELING B2	6	4.710	3.810		107.671	
	SF						
	CIELING	7	4.120	3.760		108.439	
	Total Quantity					3361.978 sqm	
	Total Deducted Quantity					0.000 sqm	
	Net Total Quantity					3361.978 sqm	
	Say 3361.978 sqm @ Rs 70.64 / sqm					Rs 237490.13	
34	13.48.1 Finishing with Deluxe Multi surface paint system for interiors and exteriors using primer as per manufacturers specifications:Two or more coats applied on walls @ 1.25 ltr/10 sqm over and including one coat of special primer applied @ 0.75 ltr /10 sqm						
	GF						
	OUTER WALL B1	2	31.330	4.550		285.103	
	INNER WALL B1	2	33.630	4.300		289.218	
	OUTER WALL B2	1	49.310	4.450		219.430	
	INNER WALL B2	1	50.670	4.200		212.815	
	OUTER WALL B3	2	9.030	5.850		105.651	
	INNER WALL B3	2	9.240	5.850		108.108	
	ALUM TANK	8	5.980	1.500		71.760	
	COLUMN B1	12*4	0.450	4.200		90.720	
	C O L U M N B 1 C O M B I N E D	4	.45+.45+.45	4.050		21.870	
	COLUMN B2	8*4	0.450	5.670		81.648	
	COLUMN B3	4*4	0.450	4.050		29.160	
	BEAM BOTTOM B1 LONGITUDE	8	4.300	0.350		12.040	
	BEAM SIDE B1 LONGITUDE	8*2	4.300	0.750		51.600	
	BEAM BOTTOM B1 LONGITUDE	18	3.350	0.750		45.225	
	BEAM SIDE B1 LONGITUDE	18*2	3.350	0.350		42.210	

	BEAM BOTTOM B1 TRANSVERSE	18	3.350		0.350		21.105	
	BEAM SIDE B1 TRANSVERSE	18*2	3.350		0.750		90.450	
	BEAM BOTTOM B2 LONGITUDE	6	4.070		0.350		8.547	
	BEAM SIDE B2 LOGITUDE	6*2	4.070		0.750		36.630	
	BEAM BOTTOM B2 TRANSVERSE	4	3.710		0.350		5.194	
	BEAM SIDE B2 TRANSVERSE	4*2	3.710		0.750		22.260	
	BEAM BOTTOM B3	10	4.070		0.350		14.246	
	BEAM SIDE B3	10*2	4.070		0.750		61.051	
	BEAM BOTTOM B3 TANSVERSE	6	3.710		0.350		7.791	
	BEAM SIDE B3 TANSVERSE	6*2	3.710		0.750		33.390	
	BEAM B3	4	1.730		0.350		2.422	
	DO SIDE B3	4*2	1.730		0.750		10.380	
	STAIR 1 WAIST SLAB BOTTOM	1	3.95+1.65 +2.27+2.8 8+2.92	1.200			16.404	
	SIDE RECTANGLE	2	3.95+1.65 +2.27+2.8 8+2.92		0.180		4.922	
	SIDE TRIANGLE	39*2	0.280		0.150	0.5	1.639	
	RISER	139	1.200		0.150		25.020	
	STAIR 2 WAIST SLAB BOTTOM	1	3.58+1.03 +3.26+4.44	1.200			9.972	
	SIDE RECTANGLE	2	3.58+1.03 +3.26+4.44		0.180		2.992	
	SIDE TRIANGLE	27		0.280	0.150	0.5	0.568	
	RISER	27		1.200	0.150		4.860	
	DROP SLAB SIDE	2	95.780	0.570			109.190	
	D R O P S L A B B O T T O M	1	95.780	0.050			4.790	

	LANDING 1 STAIR 1	1	.71+1.2	1.200			2.292	
	DO LANDING 2	1	.77+1.2	1.200			2.364	
	LANDING 3	1	.82+1.2	1.200			2.424	
	LANDING 4	1	.91+1.2	1.200			2.532	
	STAIR 2 LANDING 1,3	2	.82+1.2	1.200			4.848	
	DO LANDING 2	1	.58+1.2	1.200			2.136	
	PARAPET SIDE OUTER	1	69.550	0.500			34.775	
	DO INNER	1	68.850	0.500			34.425	
	TOP	1	68.950	0.500			34.475	
	GF							
	CIELING B1	12	3.400	4.350			177.480	
	CIELING B1	9	3.400	4.120			126.072	
	CIELING B2	9	3.770	4.120			139.792	
	CIELING B3	9	3.400	4.350			133.110	
	FF							
	CIELING B1	11	4.350	3.400			162.690	
	DO	9	4.120	3.400			126.072	
	CIELING B2	6	4.710	3.810			107.671	
	SF							
	CIELING	7	4.120	3.760			108.439	
	Total Quantity						3361.978 sqm	
	Total Deducted Quantity						0.000 sqm	
	Net Total Quantity						3361.978 sqm	
	Say 3361.978 sqm @ Rs 167.39 / sqm						Rs 562761.50	
35	13.50.3 Applying priming coat:With ready mixed red oxide zinc chromate primer of approved brand and manufacture on steel galvanised iron /steel works							
		3	4.060		3.450	2.25	94.548	
	Total Quantity						94.548 sqm	
	Total Deducted Quantity						0.000 sqm	
	Net Total Quantity						94.548 sqm	
	Say 94.548 sqm @ Rs 59.66 / sqm						Rs 5640.73	

36	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 .	3	4.060		3.450	2.25	94.548	
							Total Quantity	94.548 sqm
							Total Deducted Quantity	0.000 sqm
							Net Total Quantity	94.548 sqm
							Say 94.548 sqm @ Rs 208.54 / sqm	Rs 19717.04
SI No	Description	No	L	B	D	CF	Quantity	Remark
3Chorinator (Cost Index:35.59 %)								
1	od379653/2021_2022 Supply , erection , testing & commissioning of floor mounted Cabinet vacuum type gas chlorinator , capacity 0 to 30 kg /Hr . The system should consist of primary chlorine gas filter , auto vacuum regulator assembly , flow meter ,control valve assembly , chlorine pressure gauge with isolated assembly , chlorine vacuum gauge , with isolated assembly, water , pressure gauge are made by WIKA , stainless steel – 316, 4 “ dial , 0 to 16 kg / cm2 , duly oil filled ejector assembly with drain valve assembly. The above parts are mounted with fiber glass cabinet 1 no. The chlorine solution outlet should be connected with sump, liquid trap assembly fitted with chlorine stop valve – 2 nos , header line ¾ : carbon steel , seamless pipe schedule 80 with 3 nos chlorine stop valve , both side elbow connection 1 set, copper coil connecting pipe 1 mm thick, PVC coated , chlorine tonner clamps 2 nos, brass adapter for header line 3 nos , etc. complete. Kerala Water Authority							
							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 1200000.00 / No	Rs 2400000.00
							Total	28900659.63
							Centage @	0.0%
							Centage Amount	0.00
							Provision for GST payments (in %) @	18.0%
							Amount reserved for GST payments	5202118.73
							Total & Centage	34102778.37
							Lumpsum for round off	97221.63
							GRAND TOTAL Rs	34200000.00
							Rounded Grand Total Rs	3,42,00,000
							Rupees Three Crore Forty Two Lakh Only	

General Abstract

state plan -interim augmentation of kochi city and adjoining areas- phase 1 -
Proposed WTP at Aluva - construction of flocculator and clarifier units.

(Dsr year: 2018)

SI No	Heading Description	Amount
1	Horizontal flow baffled flocculator cum Carifier & channels	183176535.16
2	Sludge pit 6m Dia	2093169.27
	Total	185269704.43
	Centage @	0.0%
	Centage Amount	0.00
	Provision for GST payments (in %) @	18.0%
	Amount reserved for GST payments	33348546.80
	Total & Centage	218618251.23
	Lumpsum for round off	81748.77
	GRAND TOTAL Rs	218700000.00
	Rounded Grand Total Rs 21,87,00,000	
	Rupees Twenty One Crore Eighty Seven Lakh Only	

Kerala Water Authority
PRICE

Detailed Estimate

state plan -interim augmentation of kochi city and adjoining areas- phase 1 -
Proposed WTP at Aluva - construction of flocculator and clarifier units.

(Dsr year: 2018)

Sl No	Description	No	L	B	D	CF	Quantity	Remark
1Horizontal flow baffled flocculator cum Carifier & channels (Cost Index:35.59 %)								
1	2.31 Clearing jungle including uprooting of rank vegetation, grass, brush wood, trees and saplings of girth up to 30 cm measured at a height of 1 m above ground level and removal of rubbish up to a distance of 50 m outside the periphery of the area cleared							
	Area for flocculator cum clarifier	1	60.000	60.000			3600.000	
							Total Quantity	3600.000 sqm
							Total Deducted Quantity	0.000 sqm
							Net Total Quantity	3600.000 sqm
							Say 3600.000 sqm @ Rs 14.78 / sqm	Rs 53208.00
2	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							
	Clarifier	1				0.0	0.000	
	center portions	6	16.700	16.700	1.100	0.3	552.203	
		6	14.770	14.770	1.350	0.25	441.760	
		6	13.410	13.410	1.400	0.2	302.112	
		6	10.440	10.440	1.650	0.2	215.808	
		6	9.690	9.690	0.550	0.2	61.972	
	ground raft beams	3*2*6	9.370	0.650	0.550	0.2	24.119	
	for inlet pipe of 800mm dia	6	21.000	1.200	1.800	0.35	95.256	
	sludge pipe outlet	6*2	21.000	0.600	1.300	0.35	68.796	
	Raft slab	2	38.100	8.000	1.100	0.3	201.168	

		2	11.600	6.650	1.100	0.3	50.913		
		2	34.300	2.350	1.100	0.3	53.200		
		2*3	38.100	0.650	0.550	0.2	16.345		
		2*2	11.600	0.650	0.550	0.2	3.318		
		2*1	34.300	0.650	0.550	0.2	4.905		
		2*10	8.000	0.650	0.550	0.2	11.441		
		2*3	6.650	0.650	0.550	0.2	2.853		
		2*10	2.350	0.650	0.550	0.2	3.361		
	Total Quantity						2109.530 cum		
	Total Deducted Quantity						0.000 cum		
	Net Total Quantity						2109.530 cum		
	Say 2109.530 cum @ Rs 214.03 / cum						Rs 451502.71		
3	<p>2.7.1 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. Ordinary rock</p>								
	Clarifier	1				0.0	0.000		
	center portions	6	16.700	16.700	1.100	0.7	1288.472		
		6	14.770	14.770	1.350	0.75	1325.279		
		6	13.410	13.410	1.400	0.8	1208.445		
		6	10.440	10.440	1.650	0.8	863.230		
		6	9.690	9.690	0.550	0.8	247.886		
	ground raft beams	3*2*6	9.370	0.650	0.550	0.8	96.474		
	for inlet pipe of 800mm dia	6	21.000	1.200	1.800	0.65	176.904		
	sludge pipe outlet	6*2	21.000	0.600	1.300	0.35	68.796		
	Flocculator	1				0.0	0.000		
	Raft slab	2	38.100	8.000	1.100	0.7	469.392		
		2	11.600	6.650	1.100	0.7	118.796		
		2	34.300	2.350	1.100	0.7	124.132		
		2*3	38.100	0.650	0.550	0.8	65.380		
		2*2	11.600	0.650	0.550	0.8	13.271		
		2*1	34.300	0.650	0.550	0.8	19.620		
		2*10	8.000	0.650	0.550	0.8	45.761		

		2*3	6.650	0.650	0.550	0.8	11.412	
		2*10	2.350	0.650	0.550	0.8	13.443	
	Total Quantity						6156.693 cum	
	Total Deducted Quantity						0.000 cum	
	Net Total Quantity						6156.693 cum	
	Say 6156.693 cum @ Rs 414.84 / cum						Rs 2554042.52	
4	2.26.2 Extra for every additional lift 1.5 m or part there of in excavation / banking excavated or stacked materials. Ordinary or hard rock							
		6*1	14.770	14.770	1.500		1963.377	
		6*2	13.410	13.410	1.500		3236.906	
		6*3	10.440	10.440	1.500		2942.828	
	ground raft beams	3*2*6*3	9.370	0.650	1.500		986.661	
	for inlet pipe of 800mm dia	6*3	21.000	1.200	1.500		680.400	
	sludge pipe outlet	6*2*3	21.000	0.600	1.500		680.400	
		2*3	11.600	6.650	1.100		509.125	
		2*3	34.300	2.350	1.100		531.993	
	Kerala Water Authority Total Quantity						11531.690 cum	
	Total Deducted Quantity						0.000 cum	
	Net Total Quantity						11531.690 cum	
	Say 11531.690 cum @ Rs 190.78 / cum						Rs 2200015.82	
5	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.							
	Clarifier	1				0.0	0.000	
	center portions	6	16.700	16.700	0.500		836.670	
		6	14.770	14.770	0.500		654.459	
		6	13.410	13.410	0.500		539.485	
		6	10.440	10.440	0.500		326.981	
	ground raft beams	3*2*6	9.370	0.650	0.700		153.481	
	for inlet pipe of 800mm dia	6	21.000	1.200	1.500		226.800	
	sludge pipe outlet	6*2	21.000	0.600	1.000		151.200	

		2	11.600	6.650	1.100		169.709		
		2	34.300	2.350	1.100		177.331		
		Total Quantity					3236.116 cum		
		Total Deducted Quantity					0.000 cum		
		Net Total Quantity					3236.116 cum		
		Say 3236.116 cum @ Rs 258.57 / cum					Rs 836762.51		
6	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)								
	Pcc below raft beams under bottom slab of clarifier	6*3*3	9.370	0.650	0.150		49.334		
	Pcc below bottom slab of clarifier	6*4	3.910	3.910	0.150		55.038		
	Pcc below raft beams under hopper slab of clarifier	6	12.530*4	0.960	0.150		43.304		
	Do	6	15.680	1.200	0.150		16.935		
		2	15.680	2.820	0.150		13.266		
		4	15.680	1.900	0.150		17.876		
	Flocculator	2	38.000	8.400	0.150		95.760		
		2	12.890	6.600	0.150		25.523		
		1	50.500	3.630	0.150		27.498		
	PCC below hopper slab	6*4	10.550	2.660	0.150		101.027		
		6*4	14.120	1.910	0.150		97.090		
	pcc for clarifier hopper grid beam	6*4*3	4.830	0.650	0.150		33.907		
		Total Quantity					576.558 cum		
		Total Deducted Quantity					0.000 cum		
		Net Total Quantity					576.558 cum		
		Say 576.558 cum @ Rs 7211.15 / cum					Rs 4157646.22		
7	5.33.1 Providing and laying in position machine batched and machine mixed design mix M-25 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 upto plinth level						
Floor beam of clarifier	6*3*2	8.720	0.450	0.550		77.696	
Floor slab	6	9.170	9.170	0.450		227.041	
hopper slab middle beam	6	12.530*4	0.75/2	1.300		146.601	
hopper corner beam	6*4	5.200	0.450	0.550		30.889	
hopper slab	6*4	(15+8.65)/2	6.350	0.450		810.959	
ground level beam	6	5*15.58	0.750	0.900		315.495	
vertical wall	6	15.45*4	0.450	4.220		704.150	
haunch	6	16.2*4	.3/2	0.900		52.488	
Top beam at flocculator side	2	46.800	0.750	1.900		133.380	
walk way slab-clarifier-flocculator all around	1	184.000	1.000	0.120		22.080	
wings of clarifier	4	46.350	1.000	0.120		22.248	
	2	45.650	1.000	0.120		10.956	
channel cross	2	2.000	1.000	0.120		0.480	
Flocculator raft beam	2*3	48.050	0.450	0.450		58.381	
Flocculator raft slab	2*1	48.050	6.750	0.450		291.904	
Flocculator cross beam	2*13	6.600	0.450	0.450		34.749	
Flocculator pedestal	2*26	0.450	0.450	1.100		11.584	
Flocculator floor beam	2*2	48.050	0.450	0.500		43.245	
Flocculator floor slab	2	48.050	6.100	0.350		205.174	
Flocculator outer wall	2	57.700	0.350	4.220		170.446	
Flocculator cross wall	4	5.500	0.350	4.220		32.494	
Baffle wall	6*3	4.000	0.350	0.350		8.820	
Connection beams for baffle wall	6*3	1.500	0.350	0.600		5.670	
Flocculator haunch	2	56.500	0.3/2	0.900		15.255	
Raft for channel columns	1	34.300	2.450	0.450		37.816	

	columns for channels	36	0.200	0.350	4.550		11.466		
	Channel floor slab	1	120.000	1.700	0.200		40.801		
	Channel side wall	1	120.000	0.200	1.300		31.201		
	Clarified collecting water channel-bottom slab	1	46.800	2.500	0.350		40.950		
	Duct floor below flocculator water channel	1	46.800	1.900	0.150		13.338		
	Internal components of flocculator- Inlet box wall	6	2.2*4	0.200	1.500		15.841		
	Internal components of flocculator- Inlet box cover	6*4	2.20/2	1.400	0.200		7.393		
	Clarifier channel side wall come beam	6*14	15.000	0.200	2.000		504.000		
	clarifier channel-bottom slab	16*8	15.000	0.500	0.200		192.000		
	RCC with mesh	6*4	(8.65+2.40)/2	3.125	0.150		62.157		
	clarifier hopper grid beam	6*4*3	4.830	0.450	0.550		86.071		
	Deduction for wall thickness at walkway	6	15.45*4	0.450	0.120		-20.023		
		2	57.700	0.350	0.120		-4.846		
		4	5.680	0.350	0.120		-0.954		
		Total Quantity						4475.219 cum	
		Total Deducted Quantity						-25.823 cum	
		Net Total Quantity						4449.396 cum	
		Say 4449.396 cum @ Rs 9413.54 / cum						Rs 41884567.22	
8	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 same as item 10 above	1	4449.396				4449.396		
		Total Quantity						4449.396 cum	

		Total Deducted Quantity					0.000 cum	
		Net Total Quantity					4449.396 cum	
		Say 4449.396 cum @ Rs 82.10 / cum					Rs 365295.41	
9	5.9.1 Centering and shuttering including strutting, etc. and removal of form for:Foundations, footings, bases of columns, etc for mass concrete							
	foundation side alround	2	30.900	0.300			18.540	
		2	18.400	0.300			11.040	
	pedestal	2*26*4	0.450		1.100		102.961	
	Clarifier-Bottom slab	6	9.170		0.450		24.759	
	Flocculator floor slab	2	48.050		0.350		33.635	
	Clarified collecting water channel bottom slab	1	46.800		0.350		16.380	
	Raft for channel columns	2	34.300		0.450		30.870	
		Total Quantity					238.185 sqm	
		Total Deducted Quantity					0.000 sqm	
		Net Total Quantity					238.185 sqm	
		Say 238.185 sqm @ Rs 335.31 / sqm					Rs 79865.81	
10	5.9.2 Centering and shuttering including strutting, etc. and removal of form for:Walls (any thickness) including attached pilasters, butteresses, plinth and string courses etc.							
	Hopper slab	6*4	(8.65+15)/ 2		6.350		1802.130	
	vertical wall	6*2	15.45*4		4.220		3129.552	
	Flocculator outer wall	2*2	57.700		4.220		973.976	
	Flocculator cross wall	2*2	5.500		4.220		92.840	
	Baffle wall	6*3*2	4.000		3.500		504.000	
	channel side wall	2	120.000		1.300		312.000	
	flocculator- inlet box wall	6*2	2.20*4		1.500		158.400	
	clarifier channel side wall cum beam	6*14	15.000		2.000		2520.000	
		6*14	15.000	0.200			252.000	

	Total Quantity						9744.898 sqm	
	Total Deducted Quantity						0.000 sqm	
	Net Total Quantity						9744.898 sqm	
	Say 9744.898 sqm @ Rs 717.20 / sqm						Rs 6989040.85	
11	5.9.5 Centering and shuttering including strutting, etc. and removal of form for:Lintels, beams, plinth beams, girders bressumers and cantilevers							
	Clarifier floor beams	6*3*2*2	8.720		0.550		345.313	
	Ground level beam	6*2	4*15.58		0.900		673.056	
	Flocculator raft beam	2*3*2	48.050		0.450		259.470	
	Flocculator cross beam	2*13*2	6.600		0.450		154.440	
		2*13	6.600	0.450			77.220	
	Flocculator floor beam	2*2*2	48.050		0.500		192.200	
		2*2	48.050	0.450			86.490	
	connection beams for baffle wall	6*3*2	1.500		0.600		32.400	
		6*3	1.500	0.350			9.450	
	clarifier channel side wall come beam	6*14	15.000		2.000		2520.000	
		6*14	15.000		1.800		2268.000	
	beam bottom	14	15.000	0.200			42.000	
	top and bottom of clarifier channel	16*6	15.000	0.500			720.000	
	Total Quantity						7380.039 sqm	
	Total Deducted Quantity						0.000 sqm	
	Net Total Quantity						7380.039 sqm	
	Say 7380.039 sqm @ Rs 649.82 / sqm						Rs 4795696.94	
12	5.9.6 Centering and shuttering including strutting, etc. and removal of form for:Columns, Pillars, Piers, Abutments, Posts and Struts							
	channel columns	36	$(.20+.40)*$ 2		4.550		196.561	
	Total Quantity						196.561 sqm	
	Total Deducted Quantity						0.000 sqm	
	Net Total Quantity						196.561 sqm	

	Say 196.561 sqm @ Rs 863.64 / sqm						Rs 169757.94	
13	5.9.3 Centering and shuttering including strutting, etc. and removal of form for:Suspended floors, roofs, landings, balconies and access platform							
	walkway slab clarifier-flocculator	1	184.000	1.000			184.000	
	flocculator floor slab	2	48.050	6.100			586.210	
	channel floor slab	1	120.000	1.700			204.000	
	channel cross	2	2.000	1.000			4.000	
	wings of clarifier	4	46.350	1.000			185.400	
		2	45.650	1.000			91.300	
	inlet box cover	6*4	2.200	1.400		0.5	36.960	
	clarifier channel bottom slab	6*8	15.000	0.150			108.000	
	Deduction for wall thickness at walkway	6	15.45*4	0.450			-166.859	
		2	57.700	0.350			-40.390	
		4	5.680	0.350			-7.951	
	Kerala Water Authority Total Quantity						1399.870 sqm	
	Total Deducted Quantity						-215.200 sqm	
	Net Total Quantity						1184.670 sqm	
	Say 1184.670 sqm @ Rs 815.78 / sqm						Rs 966430.09	
14	5.9.16.1 Centering and shuttering including strutting, etc. and removal of form for:Edges of slabs and breaks in floors and wallsUnder 20 cm wide							
	walkway slab clarifier-flocculator	1	184.000		0.120		22.080	
	channel floor slab	1	120.000		0.200		24.000	
	channel cross	2	2.000		0.120		0.480	
	wings of clarifier	4	46.350		0.120		22.248	
		2	45.650		0.120		10.956	
	Total Quantity						79.764 metre	
	Total Deducted Quantity						0.000 metre	
	Net Total Quantity						79.764 metre	
	Say 79.764 metre @ Rs 203.93 / metre						Rs 16266.27	

15	13.7.1 12 mm cement plaster finished with a floating coat of neat cement of mix:1:3 (1 cement : 3 fine sand)							
	Hopper- bottom	6	8.650	8.650			448.936	
	Hopper-inside	6*4	$(8.65+15)/2$	6.350			1802.130	
	inlet box - outside	6*4	2.400	1.500			86.400	
		6*4	2.40/2	1.400			40.320	
	Flocculator wall - inside	12*2	3.460		4.220		350.429	
		6*2	7.270		4.220		368.153	
	baffle wall	9*2	8.350		3.500		526.050	
		6*2	5.500		3.500		231.000	
		2	5.500	0.350			3.850	
	Baffle wall top	9*2	3.990	0.350			25.137	
	baffle wall connection beam	9*2*2	1.500	0.350			18.900	
		9*2*2	1.500	0.600			32.400	
	flocculator floor	12*2	5.500	3.460			456.720	
	channel column	36	0.350		3.500		44.100	
		36	0.200		3.500		25.201	
	channel floor slab- top and bottom	2	120.000	1.500			360.000	
	channel side wall- inner	1	124.930	1.500			187.395	
	outer	1	126.530	1.700			215.101	
	top	1	125.730	0.200			25.146	
	flocculator wall outside	2	46.800		4.100		383.760	
	clarifier side wall	2	45.900		4.100		376.380	
		4	45.900		4.000		734.400	
		2	46.000		5.000		460.000	
		2	33.400		5.000		334.000	
		4	15.000		4.000		240.000	
	flocculator ceiling	2	45.900	5.500			504.900	
	flocculator roof top	2	46.80+0.60	6.900			654.120	

	clarified water channel bottom	2	45.900	2.500			229.500		
	clarifier roof ceiling	1	33.400	45.900			1533.060		
	clarifier roof top	1	33.40+.60	45.90+.60			1581.000		
	passage under clarified water channel	2	1.900	45.900			174.420		
	Inlet box	6	2.400	2.400			-34.560		
	pipe deduction for inlet box	6*5*4	3.142*.30*.30	1/4			-8.483		
	column deduction	36	0.200	0.350			-2.519		
	Total Quantity						12452.908 sqm		
	Total Deducted Quantity						-45.562 sqm		
	Net Total Quantity						12407.346 sqm		
	Say 12407.346 sqm @ Rs 401.21 / sqm						Rs 4977951.29		
16	13.18 Neat cement punning								
	Hopper- bottom	6	8.650	8.650			448.936		
	Hopper-inside	6*4	(8.65+15)/2	6.350			1802.130		
	inlet box - outside	6*4	2.400	1.500			86.400		
		6*4	2.40/2	1.400			40.320		
	Flocculator wall inside	12*2	3.460		4.220		350.429		
		6*2	7.270		4.220		368.153		
	baffle wall	9*2	8.350		3.500		526.050		
		6*2	5.500		3.500		231.000		
		2	5.500	0.350			3.850		
	Baffle wall top	9*2	3.990	0.350			25.137		
	baffle wall connection beam	9*2*2	1.500	0.350			18.900		
		9*2*2	1.500	0.600			32.400		
	flocculator floor	12*2	5.500	3.460			456.720		
	channel floor slab- top and bottom	1	120.000	1.500			180.000		

	channel side wall- inner	1	124.930	1.500			187.395	
	clarifier side wall	2	45.900		4.000		367.200	
		4	45.900		4.000		734.400	
		2	46.000		5.000		460.000	
		2	33.400		5.000		334.000	
		4	15.000		4.000		240.000	
	clarified water channel bottom	1	45.900	2.500			114.750	
	clarifier roof top	1	33.40+.60	45.90+.60			1581.000	
	clarifier channel	6*14	15.000		2.000		2520.000	
		6*14	15.000		1.800		2268.000	
	beam bottom	14	15.000	0.200			42.000	
	clarifier channel top and bottom	16*6	15.000	0.500			720.000	
	Inlet box	6	2.400	2.400			-34.560	
	pipe deduction for inlet box	6*5*4	3.142*.30* .30	1/4			-8.483	
	Kerala Water Authority Total Quantity						14139.170 sqm	
	Total Deducted Quantity						-43.043 sqm	
	Net Total Quantity						14096.127 sqm	
	Say 14096.127 sqm @ Rs 73.83 / sqm						Rs 1040717.06	
17	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							
	R.C.C Qty-	1	4449.396			100.0	444939.60 0	
	Total Quantity						444939.600 kilogram	
	Total Deducted Quantity						0.000 kilogram	
	Net Total Quantity						444939.600 kilogram	
	Say 444939.600 kilogram @ Rs 98.30 / kilogram						Rs 43737562.68	
18	13.46.1 Finishing walls with Acrylic Smooth exterior paint of required shade: New work (Two or more coat applied @ 1.67 ltr/10 sqm over and including priming coat of exterior primer applied @ 2.20 kg/10 sqm)							
	channel column	36	0.350		3.500		44.100	

		36	0.200		3.500		25.201	
	channel floor slab-bottom	1	120.000	1.500			180.000	
	channel side wall-outer	1	126.530	1.700			215.101	
	top	1	125.730	0.200			25.146	
	flocculator wall outside	2	46.800		4.100		383.760	
	flocculator ceiling	2	45.900	5.500			504.900	
	flocculator roof top	2	46.80+.60	6.900			654.120	
	clarified water channel bottom	1	45.900	2.500			114.750	
	clarifier roof ceiling	1	33.400	45.900			1533.060	
	clarifier roof top	1	33.40+.60	45.90+.60			1581.000	
	passage under clarified water channel	2	1.900	45.900			174.420	
	column deduction	36	0.200	0.350			-2.519	
						Total Quantity	5435.558 sqm	
						Total Deducted Quantity	-2.519 sqm	
						Net Total Quantity	5433.039 sqm	
						Say 5433.039 sqm @ Rs 193.89 / sqm	Rs 1053411.93	
19	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)							
	Hopper- bottom	6	8.650	8.650			448.936	
	Hopper-inside	6*4	$(8.65+15)/2$	6.350			1802.130	
	inlet box - outside	6*4	2.400	1.500			86.400	
		6*4	2.40/2	1.400			40.320	
	Flocculator wall - inside	12*2	3.460		4.220		350.429	
		6*2	7.270		4.220		368.153	
	baffle wall	9*2	8.350		3.500		526.050	
		6*2	5.500		3.500		231.000	
		2	5.500	0.350			3.850	
	Baffle wall top	9*2	3.990	0.350			25.137	

	baffle wall connection beam	9*2*2	1.500	0.350			18.900	
		9*2*2	1.500	0.600			32.400	
	flocculator floor	12*2	5.500	3.460			456.720	
	channel floor slab- top and bottom	1	120.000	1.500			180.000	
	channel side wall- inner	1	124.930	1.500			187.395	
	clarifier side wall	2	45.900		4.000		367.200	
		4	45.900		4.000		734.400	
		2	46.000		5.000		460.000	
		2	33.400		5.000		334.000	
		4	15.000		4.000		240.000	
	clarified water channel bottom	1	45.900	2.500			114.750	
	clarifier roof top	1	33.40+.60	45.90+.60			1581.000	
	clarifier channel	6*14	15.000		2.000		2520.000	
		6*14	15.000		1.800		2268.000	
	beam bottom	14	15.000	0.200			42.000	
	clarifier channel top and bottom	16*6	15.000	0.500			720.000	
	Inlet box	6	2.400	2.400			-34.560	
	pipe deduction for inlet box	6*5*4	3.142*.30*.30	1/4			-8.483	
	column deduction	36	0.200	0.350			-2.519	
						Total Quantity	14139.170 sqm	
						Total Deducted Quantity	-45.562 sqm	
						Net Total Quantity	14093.608 sqm	
						Say 14093.608 sqm @ Rs 107.39 / sqm	Rs 1513512.56	
20	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.)							

	hand rail	6*2	46.800				561.600		
		4*2	46.000				368.000		
	Total Quantity						929.600 kg		
	Total Deducted Quantity						0.000 kg		
	Net Total Quantity						929.600 kg		
	Say 929.600 kg @ Rs 677.34 / kg						Rs 629655.26		
21	od378273/2021_2022 Providing and fixing 316 stainless steel plates and support structures for water treatment, Inclined Chanel support including fabrication, welding etc.. complete suitable for use in the water and waste treatment plants to improve the quantity and quality of water production. With all required accessories (effective size of plate length- 1.8m,width-1.2m,thickness-2mm) as per the direction of Engineer in-charge.								
	For 6 Nos.units	6*7	90.000				3780.000		
	Total Quantity						3780.000 No		
	Total Deducted Quantity						0.000 No		
	Net Total Quantity						3780.000 No		
	Say 3780.000 No @ Rs 13043.64 / No						Rs 49304959.20		
22	od378385/2021_2022 Providing 800mm dia 8mm thick company made MS pipe with cement mortar lining to inside and out side surface including required specials for inlet arrangements from flocculator unit to clarifier unit including cutting, fabricating, welding, graining, lining, conveying, loading & unloading, placing, laying in line and levels jointing etc..complete								
	800mm Dia MS pipe for inlets	6	25.000				150.000		
	Total Quantity						150.000 metre		
	Total Deducted Quantity						0.000 metre		
	Net Total Quantity						150.000 metre		
	Say 150.000 metre @ Rs 40451.52 / metre						Rs 6067728.00		
23	od378420/2021_2022 Providing 800mm CI D/F Sluice valve including supplying, conveying, loading, unloading, fitting in position including necessary specials etc.. complete for inlet pipes								
	800mm Dia CI sluice valve for inlet	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 230001.27 / No						Rs 1380007.62		

24	od378476/2021_2022 Providing 300mm class 10kg/cm2 pvc pipe with specials for making Inlet grid in clarifier unit including cost, conveyance, providing suitable supports etc complete							
	inlet pipe grid	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 281686.98 / No						Rs 1690121.88	
25	100.98.119 Supply of DI K9 Pipe Conforming to IS 8329/2000, 300mm Dia.							
	sludge outlet pipe from bed level	6*2	25.000				300.000	
	sludge outlet pipe from blanket level	6*2	20.000				240.000	
	Total Quantity						540.000 metre	
	Total Deducted Quantity						0.000 metre	
	Net Total Quantity						540.000 metre	
	Say 540.000 metre @ Rs 3537.65 / metre						Rs 1910331.00	
26	100.98.487 Supply of CI Double Flanged Sluice Valve Conforming to IS 14846 - 2000, Sluice Valve with Hand Wheel PN 1.6, Size 300mm.							
	sludge outlet	2*6					12.000	
	Total Quantity						12.000 No	
	Total Deducted Quantity						0.000 No	
	Net Total Quantity						12.000 No	
	Say 12.000 No @ Rs 22275.80 / No						Rs 267309.60	
27	100.98.124 Supply of DI K9 Pipe Conforming to IS 8329/2000, 600mm Dia.							
	600mm DI pipe for sludge collection	1	150.000				150.000	
	Total Quantity						150.000 metre	
	Total Deducted Quantity						0.000 metre	
	Net Total Quantity						150.000 metre	
	Say 150.000 metre @ Rs 9835.35 / metre						Rs 1475302.50	
28	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)							
	sludge collecting pipeline	1	150.000	2.000	1.500	0.5	225.000	
	Total Quantity						225.000 cum	
	Total Deducted Quantity						0.000 cum	
	Net Total Quantity						225.000 cum	
	Say 225.000 cum @ Rs 555.51 / cum						Rs 124989.75	
29	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)							
	sludge collecting pipeline	1	150.000	2.000	1.500	0.5	225.000	
	Total Quantity						225.000 cum	
	Total Deducted Quantity						0.000 cum	
	Net Total Quantity						225.000 cum	
	Say 225.000 cum @ Rs 806.76 / cum						Rs 181521.00	
30	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)							
	sludge collecting pipeline	1	150.000	2.000	1.500		450.000	
	Total Quantity						450.000 cum	
	Total Deducted Quantity						0.000 cum	
	Net Total Quantity						450.000 cum	

	Say 450.000 cum @ Rs 997.54 / cum						Rs 448893.00
31	100.1.7 Excavating trenches of required width for pipes, cables, etc including excavation for sockets, and dressing of sides, ramming of bottoms, depth exceeding 3m in depth but not exceeding 4.5 m, including getting out the excavated soil, and then returning the soil as required, in layers not exceeding 20 cm in depth, including consolidating each deposited layer by ramming, watering, etc. and disposing of surplus excavated soil as directed, within a lead of 50 m : 3.0m to 4.50m. Ordinary Rock. (Ref. Item No. 2.15 of DSR)						
	sludge collecting pipeline	1	150.000	2.000	1.500		450.000
	Total Quantity						450.000 cum
	Total Deducted Quantity						0.000 cum
	Net Total Quantity						450.000 cum
	Say 450.000 cum @ Rs 1188.31 / cum						Rs 534739.50
32	100.1.8 Excavating trenches of required width for pipes, cables, etc including excavation for sockets, and dressing of sides, ramming of bottoms, depth exceeding 4.5 m in depth but not exceeding 6.0 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 : 4.5m to 6.0m. Ordinary Rock. (Ref. Item No. 2.15 of DSR)						
	sludge collecting pipeline	1	150.000	2.000	1.500		450.000
		1	150.000	2.000	1.000		300.000
	Total Quantity						750.000 cum
	Total Deducted Quantity						0.000 cum
	Net Total Quantity						750.000 cum
	Say 750.000 cum @ Rs 1379.09 / cum						Rs 1034317.50
33	100.14.5 Conveying and laying S&S Centrifugally Cast (Spun) / Ductile Iron Pipes conforming to IS: 8329 excluding cost of pipes and specials : 300 mm dia Ductile Iron Class K-9 Pipes Data derived from 18.72.19 in DAR						
		1	540.000				540.000
	Total Quantity						540.000 metre
	Total Deducted Quantity						0.000 metre
	Net Total Quantity						540.000 metre

	Say 540.000 metre @ Rs 205.15 / metre						Rs 110781.00	
34	100.14.10 Conveying and laying S&S Centrifugally Cast (Spun) / Ductile Iron Pipes conforming to IS: 8329 excluding cost of pipes and specials : 600 mm dia Ductile Iron Class K-9 Pipes Data derived from 18.72.24 in DAR							
		1	150.000				150.000	
	Total Quantity						150.000 metre	
	Total Deducted Quantity						0.000 metre	
	Net Total Quantity						150.000 metre	
	Say 150.000 metre @ Rs 584.19 / metre						Rs 87628.50	
35	18.70.5 Providing push - on-joints to Centrifugally (Spun) Cast Iron Pipes or Ductile Iron Pipes including testing of joints and including the cost of rubber gasket:300 mm dia pipe							
		100					100.000	
	Total Quantity						100.000 joint	
	Total Deducted Quantity						0.000 joint	
	Net Total Quantity						100.000 joint	
	Say 100.000 joint @ Rs 412.60 / joint						Rs 41260.00	
36	18.70.10 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:600 mm dia pipes							
		40					40.000	
	Total Quantity						40.000 joint	
	Total Deducted Quantity						0.000 joint	
	Net Total Quantity						40.000 joint	
	Say 40.000 joint @ Rs 1093.40 / joint						Rs 43736.00	
SI No	Description	No	L	B	D	CF	Quantity	Remark
2Sludge pit 6m Dia (Cost Index:35.59 %)								
1	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							
	EW 1st lift	1	6*6/4*3.14 2		1.500	0.35	14.846	
	Total Quantity						14.846 cum	

		Total Deducted Quantity		0.000 cum		
		Net Total Quantity		14.846 cum		
		Say 14.846 cum @ Rs 451.72 / cum		Rs 6706.24		
2	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					
	EW 2nd lift	1	6*6/4*3.14 2	1.500	0.15	6.363
		Total Quantity		6.363 cum		
		Total Deducted Quantity		0.000 cum		
		Net Total Quantity		6.363 cum		
		Say 6.363 cum @ Rs 496.87 / cum		Rs 3161.58		
3	100.3.7.3 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 3.0m to 4.50 m including neat banking. NEW DATA					
	EW 3rd lift	1	6*6/4*3.14 2	1.500	0.1	4.242
		Total Quantity		4.242 cum		
		Total Deducted Quantity		0.000 cum		
		Net Total Quantity		4.242 cum		
		Say 4.242 cum @ Rs 542.09 / cum		Rs 2299.55		
4	100.3.7.4 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 4.50m to 6.0 m including neat banking. NEW DATA					
	EW 4th lift	1	6*6/4*3.14 2	1.500	0.1	4.242
		Total Quantity		4.242 cum		
		Total Deducted Quantity		0.000 cum		
		Net Total Quantity		4.242 cum		
		Say 4.242 cum @ Rs 587.25 / cum		Rs 2491.11		
5	100.3.7.5 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 6.0m to 7.50 m including neat banking. NEW DATA							
	EW 5th lift	1	6*6/4*3.14 2		1.500	0.1	4.242	
	Total Quantity						4.242 cum	
	Total Deducted Quantity						0.000 cum	
	Net Total Quantity						4.242 cum	
	Say 4.242 cum @ Rs 632.39 / cum						Rs 2682.60	
6	100.3.7.6 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 7.5m to 9.0 m including neat banking. NEW DATA							
	EW 6th lift	1	6*6/4*3.14 2		0.500	0.1	1.414	
	Total Quantity						1.414 cum	
	Total Deducted Quantity						0.000 cum	
	Net Total Quantity						1.414 cum	
	Say 1.414 cum @ Rs 677.56 / cum						Rs 958.07	
7	5.5 Reinforced cement concrete work in arches, archribs, domes, vaults, shells, folded plate and roofs having slope more than 15 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)							
	Base	1	6.3*3.142	0.550	0.300		3.267	
	steining	1	6.3*3.142	0.300	7.750		46.023	
	wearing coat at bottom	1	6*6*3.142/ 4		0.100		2.828	
	Floor slab	1	6.9*6.9*3. 142/4		0.200		7.480	
	Floor beam	1	6.000	0.300	0.300		0.540	
	Roof slab	1	6.9*6.9*3. 142/4		0.120		4.488	
	Roof beam	1	6.160	0.300	0.300		0.555	
	sunshade	1	7.2*3.142	0.750	0.080		1.358	
	Lintel	1	6.3*3.142	0.200	0.200		0.792	

									Total Quantity	67.331 cum
									Total Deducted Quantity	0.000 cum
									Net Total Quantity	67.331 cum
									Say 67.331 cum @ Rs 12111.10 / cum	Rs 815452.47
8	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).									
	same as qty 7	1	67.331						67.331	
									Total Quantity	67.331 cum
									Total Deducted Quantity	0.000 cum
									Net Total Quantity	67.331 cum
									Say 67.331 cum @ Rs 82.10 / cum	Rs 5527.88
9	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)									
	Bottom plugging	1	6*6*3.142/ 4		0.300				8.484	
									Kerala Water Authority Total Quantity	8.484 cum
									Total Deducted Quantity	0.000 cum
									Net Total Quantity	8.484 cum
									Say 8.484 cum @ Rs 7990.86 / cum	Rs 67794.46
10	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)									
	PCC	1	6.3*3.142	0.750	0.150				2.227	
	bottom	1	6*6*3.142/ 4		0.150				4.242	
									Total Quantity	6.469 cum
									Total Deducted Quantity	0.000 cum
									Net Total Quantity	6.469 cum
									Say 6.469 cum @ Rs 7211.15 / cum	Rs 46648.93
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									

	for well steing	1	67.331			100.0	6733.100		
	Total Quantity						6733.100 kilogram		
	Total Deducted Quantity						0.000 kilogram		
	Net Total Quantity						6733.100 kilogram		
	Say 6733.100 kilogram @ Rs 98.30 / kilogram						Rs 661863.73		
12	5.9.12 Centering and shuttering including strutting, etc. and removal of form for:Well steining								
	base of steining ... outer face	1	6.85*3.14 2			0.300	6.457		
	inner face	1	5.75*3.14 2			0.300	5.420		
	steining out side	1	6.6*3.142			7.750	160.714		
	inside	1	6*3.142			7.750	146.103		
	Total Quantity						318.694 sqm		
	Total Deducted Quantity						0.000 sqm		
	Net Total Quantity						318.694 sqm		
	Say 318.694 sqm @ Rs 249.69 / sqm						Rs 79574.70		
13	5.9.3 Centering and shuttering including strutting etc. and removal of form for:Suspended floors, roofs, landings, balconies and access platform								
	Floor slab	1	(6*6*3.142)4				28.278		
	Roof slab	1	(6.16*6.16 *3.142)/4				29.807		
		1	6.9*3.142	0.150			3.252		
	Floor slab beam bottom	1	6.000	0.300			-1.799		
	Roof slab beam bottom	1	6.160	0.300			-1.847		
	Total Quantity						61.337 sqm		
	Total Deducted Quantity						-3.646 sqm		
	Net Total Quantity						57.691 sqm		
	Say 57.691 sqm @ Rs 815.78 / sqm						Rs 47063.16		
14	5.9.19 Centering and shuttering including strutting, etc. and removal of form for:Weather shade, Chajjas, corbels etc., including edges								

	sunshade	1	7.2*3.142	0.750			16.967	
	Total Quantity						16.967 sqm	
	Total Deducted Quantity						0.000 sqm	
	Net Total Quantity						16.967 sqm	
	Say 16.967 sqm @ Rs 902.55 / sqm						Rs 15313.57	
15	5.9.5 Centering and shuttering including strutting, etc. and removal of form for:Lintels, beams, plinth beams, girders bressumers and cantilevers							
	floor beam- side	2	6.000		0.300		3.600	
	floor beam- bottom	1	6.000	0.300			1.800	
	roof beam- side	2	6.160		0.300		3.696	
	roof beam- bottom	1	6.160	0.300			1.848	
	Lintel	2	6.3*3.142		0.200		7.918	
	Total Quantity						18.862 sqm	
	Total Deducted Quantity						0.000 sqm	
	Net Total Quantity						18.862 sqm	
	Say 18.862 sqm @ Rs 649.82 / sqm						Rs 12256.90	
16	5.9.16.1 Centering and shuttering including strutting, etc. and removal of form for:Edges of slabs and breaks in floors and walls Under 20 cm wide							
	Roof slab edge	1	6.90*3.14 2		0.120		2.602	
	Total Quantity						2.602 metre	
	Total Deducted Quantity						0.000 metre	
	Net Total Quantity						2.602 metre	
	Say 2.602 metre @ Rs 203.93 / metre						Rs 530.63	
17	6.3.2 Brick work with common burnt clay machine moulded perforated bricks of class designation 12.5 conforming to IS: 2222 in superstructure above plinth level up to floor five level in cement mortar 1:6 (1 cement : 6 coarse sand):With Modular bricks(from floor 2 level up to floor 5 level)							
	wall	1	6.3*3.142	0.200	3.400		13.461	
	parapet	1	6.78*3.14 2	0.120	0.600		1.534	
	Door	1	0.900	0.200	2.400		-0.432	
	window	4	1.500	0.200	1.200		-1.440	

	Ventilator	4	1.200	0.200	0.450		-0.432		
	Total Quantity						14.995 cum		
	Total Deducted Quantity						-2.304 cum		
	Net Total Quantity						12.691 cum		
	Say 12.691 cum @ Rs 8829.96 / cum						Rs 112061.02		
18	13.1.1 12 mm cement plaster of mix:1:4 (1 cement : 4 fine sand)								
	wall-outside	1	6.6*3.142		3.400		70.507		
	wall-inside	1	6.16*3.14 2		3.600		69.677		
	Floor slab	1	(6.16*6.16 *3.142)				119.226		
	Roof slab ceiling	1	(6.16*6.16 *3.142)/4				29.807		
	Roof slab top	1	(6.66*6.66 *3.142)/4				34.842		
	Roof slab projection- top and bottom	2	6.9*3.142	0.150			6.504		
	Roof slab projection- side	1	6.9*3.142		0.120		2.602		
	Parapet - outside	1	6.90*3.14 2		0.600		13.008		
	Parapet - inside	1	6.60*3.14 2		0.600		12.443		
	Parapet - top	1	6.78*3.14 2	0.120			2.557		
	Sunshade	2	7.2*3.142	0.750			33.934		
	Door	1	0.900		2.400		-2.160		
	window	4	1.500		1.200		-7.199		
	Ventilator	4	1.200		0.450		-2.160		
	Total Quantity						395.107 sqm		
	Total Deducted Quantity						-11.519 sqm		
	Net Total Quantity						383.588 sqm		
	Say 383.588 sqm @ Rs 314.09 / sqm						Rs 120481.15		
19	13.46.1 Finishing walls with Acrylic Smooth exterior paint of required shade:New work (Two or more coat applied								

	@ 1.67 ltr/10 sqm over and including priming coat of exterior primer applied @ 2.20 kg/10 sqm)						
wall-outside	1	6.6*3.142		3.400		70.507	
wall-inside	1	6.16*3.14 2		3.600		69.677	
Roof slab ceiling	1	(6.16*6.16 *3.142)/4				29.807	
Roof slab projection- top and bottom	2	6.9*3.142	0.150			6.504	
Roof slab projection- side	1	6.9*3.142		0.120		2.602	
Parapet - outside	1	6.90*3.14 2		0.600		13.008	
Parapet - inside	1	6.60*3.14 2		0.600		12.443	
Parapet - top	1	6.78*3.14 2	0.120			2.557	
Sunshade	2	7.2*3.142	0.750			33.934	
Door	1	0.900		2.400		-2.160	
window	4	1.500		1.200		-7.199	
Ventilator	4	1.200		0.450		-2.160	
					Total Quantity	241.039 sqm	
					Total Deducted Quantity	-11.519 sqm	
					Net Total Quantity	229.520 sqm	
					Say 229.520 sqm @ Rs 193.89 / sqm	Rs 44501.63	
20	21.3.2 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 5.50 mm thickness						
	Windows	4	1.500		1.200	7.200	
	Ventilators	4	1.200		0.450	2.160	
					Total Quantity	9.360 sqm	
					Total Deducted Quantity	0.000 sqm	
					Net Total Quantity	9.360 sqm	
					Say 9.360 sqm @ Rs 1526.00 / sqm	Rs 14283.36	
21	10.1						

	Structural steel work in single section, fixed with or without connecting plate, including cutting, hoisting, fixing in position and applying a priming coat of approved steel primer all complete.							
	Grills for windows	4				30.0	120.000	
	ventilators	4				20.0	80.000	
	Total Quantity						200.000 kilogram	
	Total Deducted Quantity						0.000 kilogram	
	Net Total Quantity						200.000 kilogram	
	Say 200.000 kilogram @ Rs 101.29 / kilogram						Rs 20258.00	
22	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	0.900		2.400		2.160	
	Total Quantity						2.160 sqm	
	Total Deducted Quantity						0.000 sqm	
	Net Total Quantity						2.160 sqm	
	Say 2.160 sqm @ Rs 5212.28 / sqm						Rs 11258.52	
	Total						185269704.43	
	Kerala Water Authority Centage @						0.0%	
	Centage Amount						0.00	
	Provision for GST payments (in %) @						18.0%	
	Amount reserved for GST payments						33348546.80	
	Total & Centage						218618251.23	
	Lumpsum for round off						81748.77	
	GRAND TOTAL Rs						218700000.00	
	Rounded Grand Total Rs 21,87,00,000							
	Rupees Twenty One Crore Eighty Seven Lakh Only							

General Abstract

**STATE PLAN -AUGMENTATION OF WSS TO KOCHI CITY AND ADJOINING
AREAS-PHASE-1-PROPOSED WTP AT ALUVA- ELECTRICAL, MECHANICAL
AND O&M CHARGES.**

(Dsr year: 2018)

SI No	Heading Description	Amount
1	Supply and Fixing of pipes and fittings	27380316.58
2	Pumps and motors for the Treatment plant	11875674.88
3	Electrial items for 143 MLD WTP	18290261.09
4	Ten year maintenance of the 143 MLD plant and other connected components.(Only the electrical energy charges payable to KSEB during the maintenance period shall be borne by KWA.).	252495099.20
	Total	310041351.75
	Centage @	0.0%
	Centage Amount	0.00
	Provision for GST payments (in %) @	18.0%
	Amount reserved for GST payments	55807443.32
	Total & Centage	365848795.07
	Lumpsum for round off	0.00
	GRAND TOTAL Rs	365848795.07
	Rounded Grand Total Rs 36,58,48,795	
	Rupees Thirty Six Crore Fifty Eight Lakh Forty Eight Thousand Seven Hundred and Ninety Five Only	

Detailed Estimate

**STATE PLAN -AUGMENTATION OF WSS TO KOCHI CITY AND ADJOINING
AREAS-PHASE-1-PROPOSED WTP AT ALUVA- ELECTRICAL, MECHANICAL
AND O&M CHARGES.**

(Dsor year: 2018)

SI No	Description	No	L	B	D	CF	Quantity	Remark
1Supply and Fixing of pipes and fittings (Cost Index:35.59 %)								
1	od368472/2021_2022 Supplying 80mm GI heavy duty pipe with specials							
	from 300mm DI to filter box-Air flow	24	27.000				648.000	
							Total Quantity	648.000 metre
							Total Deducted Quantity	0.000 metre
							Net Total Quantity	648.000 metre
							Say 648.000 metre @ Rs 807.43 / metre	Rs 523214.64
2	od368475/2021_2022 Conveying and fixing G.I. pipes complete with G.I. fittings and clamps, including cutting and making good the walls etc. but excluding cost of pipes and fittings - Internal work - Exposed on Wall. r n 80 mm dia nominal bore r n(heavy duty pipe) Observed Data derived from item no.18.10 of DARr n Details of Cost For 10 m							
	Filter box	24	27.000				648.000	
							Total Quantity	648.000 metre
							Total Deducted Quantity	0.000 metre
							Net Total Quantity	648.000 metre
							Say 648.000 metre @ Rs 635.16 / metre	Rs 411583.68
3	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							
		24	12.000				288.000	
							Total Quantity	288.000 metre
							Total Deducted Quantity	0.000 metre
							Net Total Quantity	288.000 metre

	Say 288.000 metre @ Rs 1803.75 / metre						Rs 519480.00	
4	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							
		24	12.000				288.000	
	Total Quantity						288.000 metre	
	Total Deducted Quantity						0.000 metre	
	Net Total Quantity						288.000 metre	
	Say 288.000 metre @ Rs 2705.90 / metre						Rs 779299.20	
5	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	330.000				330.000	
	Total Quantity						330.000 metre	
	Total Deducted Quantity						0.000 metre	
	Net Total Quantity						330.000 metre	
	Say 330.000 metre @ Rs 3415.04 / metre						Rs 1126963.20	
6	18.73.4 Providing and laying Double Flanged (Screwed / Welded) Centrifugally (Spun) Ductile Iron Pipes of Class K - 9 conforming to IS: 8329 :250 mm dia Ductile Iron Double Flanged							
		1	240.000				240.000	
	Total Quantity						240.000 metre	
	Total Deducted Quantity						0.000 metre	
	Net Total Quantity						240.000 metre	
	Say 240.000 metre @ Rs 4844.43 / metre						Rs 1162663.20	
7	18.73.5 Providing and laying Double Flanged (Screwed / Welded) Centrifugally (Spun) Ductile Iron Pipes of Class K - 9 conforming to IS: 8329 :300 mm dia Ductile Iron Double Flanged							
	Blower inlet to bed top	24	9.000				216.000	
	Total Quantity						216.000 metre	
	Total Deducted Quantity						0.000 metre	
	Net Total Quantity						216.000 metre	
	Say 216.000 metre @ Rs 6223.45 / metre						Rs 1344265.20	
8	18.73.9 Providing and laying Double Flanged (Screwed / Welded) Centrifugally (Spun) Ductile Iron Pipes of Class K - 9 conforming to IS: 8329 :500 mm dia Ductile Iron Double Flanged							

	Inlet wash water tank	24	12.000				288.000	
	Back wash out let	2	120.000				240.000	
	Total Quantity						528.000 metre	
	Total Deducted Quantity						0.000 metre	
	Net Total Quantity						528.000 metre	
	Say 528.000 metre @ Rs 14957.41 / metre						Rs 7897512.48	
9	18.73.11 Providing and laying Double Flanged (Screwed / Welded) Centrifugally (Spun) Ductile Iron Pipes of Class K - 9 conforming to IS: 8329 :700 mm dia Ductile Iron Double flanged							
	Filter bed out let	24	12.000				288.000	
	Total Quantity						288.000 metre	
	Total Deducted Quantity						0.000 metre	
	Net Total Quantity						288.000 metre	
	Say 288.000 metre @ Rs 23463.85 / metre						Rs 6757588.80	
10	18.72.27 Providing and laying S & S Centrifugally Cast (Spun) / Ductile Iron Pipes conforming to IS : 8329:800 mm dia Ductile Iron Class K- 9 pipes							
		24	3.000				72.000	
	Total Quantity						72.000 metre	
	Total Deducted Quantity						0.000 metre	
	Net Total Quantity						72.000 metre	
	Say 72.000 metre @ Rs 18982.19 / metre						Rs 1366717.68	
11	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	15.000				15.000	
	Total Quantity						15.000 quintal	
	Total Deducted Quantity						0.000 quintal	
	Net Total Quantity						15.000 quintal	
	Say 15.000 quintal @ Rs 20121.56 / quintal						Rs 301823.40	
12	18.69.1 Providing and laying D.I Specials of Class K - 12 suitable for mechanical jointing as per IS : 9523 :Upto 600 mm dia							
		25					25.000	
	Total Quantity						25.000 quintal	

							Total Deducted Quantity	0.000 quintal
							Net Total Quantity	25.000 quintal
							Say 25.000 quintal @ Rs 21145.26 / quintal	Rs 528631.50
13	100.19.1 "Providing flanged joints to double flanged CI/DI pipes and specials, including testing of joints : 700mm Diameter Pipe (Ref. Data: 18.30 in DAR 2014)							
		24						24.000
							Total Quantity	24.000 joint
							Total Deducted Quantity	0.000 joint
							Net Total Quantity	24.000 joint
							Say 24.000 joint @ Rs 2363.31 / joint	Rs 56719.44
14	100.19.3 "Providing flanged joints to double flanged CI/DI pipes and specials, including testing of joints : 800mm Diameter Pipe (Ref. Data: 18.30 in DAR 2014)							
		20						20.000
							Total Quantity	20.000 joint
							Total Deducted Quantity	0.000 joint
							Net Total Quantity	20.000 joint
							Say 20.000 joint @ Rs 3035.18 / joint	Rs 60703.60
15	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							
		175						175.000
							Total Quantity	175.000 metre
							Total Deducted Quantity	0.000 metre
							Net Total Quantity	175.000 metre
							Say 175.000 metre @ Rs 122.10 / metre	Rs 21367.50
16	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							
		75						75.000

		Total Quantity					75.000 metre	
		Total Deducted Quantity					0.000 metre	
		Net Total Quantity					75.000 metre	
		Say 75.000 metre @ Rs 163.05 / metre					Rs 12228.75	
17	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						
		24	12.000				288.000	
		Total Quantity					288.000 joint	
		Total Deducted Quantity					0.000 joint	
		Net Total Quantity					288.000 joint	
		Say 288.000 joint @ Rs 258.77 / joint					Rs 74525.76	
18	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						
		24	12.000				288.000	
		Total Quantity					288.000 joint	
		Total Deducted Quantity					0.000 joint	
		Net Total Quantity					288.000 joint	
		Say 288.000 joint @ Rs 315.99 / joint					Rs 91005.12	
19	od368523/2021_2022	Labour for cutting Ductile Iron pipe with steel saw. 150 mm diameter Ductile Iron. pipe						
		1	8.000				8.000	
		Total Quantity					8.000 Each Cut	
		Total Deducted Quantity					0.000 Each Cut	
		Net Total Quantity					8.000 Each Cut	
		Say 8.000 Each Cut @ Rs 322.95 / Each Cut					Rs 2583.60	
20	od368524/2021_2022	Labour for cutting Ductile Iron pipe with steel saw. 200 mm diameter Ductile Iron. pipe						
		1	12.000				12.000	
		Total Quantity					12.000 Each Cut	
		Total Deducted Quantity					0.000 Each Cut	
		Net Total Quantity					12.000 Each Cut	
		Say 12.000 Each Cut @ Rs 430.73 / Each Cut					Rs 5168.76	
21	od368527/2021_2022							

	Labour for cutting Ductile Iron pipe with steel saw. 250 mm diameter Ductile Iron. pipe							
		1	15.000				15.000	
	Total Quantity						15.000 Each Cut	
	Total Deducted Quantity						0.000 Each Cut	
	Net Total Quantity						15.000 Each Cut	
	Say 15.000 Each Cut @ Rs 535.65 / Each Cut						Rs 8034.75	
22	od368529/2021_2022 Labour for cutting Ductile Iron pipe with steel saw. 300 mm diameter Ductile Iron. pipe							
		1	8.000				8.000	
	Total Quantity						8.000 Each Cut	
	Total Deducted Quantity						0.000 Each Cut	
	Net Total Quantity						8.000 Each Cut	
	Say 8.000 Each Cut @ Rs 748.35 / Each Cut						Rs 5986.80	
23	od368530/2021_2022 Labour for cutting Ductile Iron pipe with steel saw. 500 mm diameter Ductile Iron. pipe							
		1	10.000				10.000	
	Total Quantity						10.000 Each Cut	
	Total Deducted Quantity						0.000 Each Cut	
	Net Total Quantity						10.000 Each Cut	
	Say 10.000 Each Cut @ Rs 855.72 / Each Cut						Rs 8557.20	
24	100.22.1 "Labour for cutting C.I. pipe with steel saw:700 mm diameter C.I. pipe" Observed Data derived from item no.18.83.of DAR							
		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 1513.32 / No						Rs 18159.84	
25	100.22.3 "Labour for cutting C.I. pipe with steel saw: 800 mm diameter C.I. pipe" Observed Data derived from item no.18.83.of DAR							
		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 1726.20 / No						Rs 10357.20
26	18.30.1 Providing flanged joints to double flanged C.I./ D.I pipes and specials, including testing of joints:80 mm diameter pipe							
		1	70.000				70.000	
		Total Quantity						70.000 Nos
		Total Deducted Quantity						0.000 Nos
		Net Total Quantity						70.000 Nos
		Say 70.000 Nos @ Rs 199.11 / Nos						Rs 13937.70
27	18.30.2 Providing flanged joints to double flanged C.I./ D.I pipes and specials, including testing of joints:100 mm diameter pipe							
		1	60.000				60.000	
		Total Quantity						60.000 Nos
		Total Deducted Quantity						0.000 Nos
		Net Total Quantity						60.000 Nos
		Say 60.000 Nos @ Rs 311.92 / Nos						Rs 18715.20
28	18.30.4 Providing flanged joints to double flanged C.I./ D.I pipes and specials, including testing of joints:150 mm diameter pipe							
		1	30.000				30.000	
		Total Quantity						30.000 Nos
		Total Deducted Quantity						0.000 Nos
		Net Total Quantity						30.000 Nos
		Say 30.000 Nos @ Rs 385.41 / Nos						Rs 11562.30
29	18.30.5 Providing flanged joints to double flanged C.I./ D.I pipes and specials, including testing of joints:200 mm diameter pipe							
		1	34.000				34.000	
		Total Quantity						34.000 Nos
		Total Deducted Quantity						0.000 Nos
		Net Total Quantity						34.000 Nos
		Say 34.000 Nos @ Rs 418.50 / Nos						Rs 14229.00
30	18.30.6 Providing flanged joints to double flanged C.I./ D.I pipes and specials, including testing of joints:250 mm							

	diameter pipe								
		1	24.000				24.000		
		Total Quantity					24.000 Nos		
		Total Deducted Quantity					0.000 Nos		
		Net Total Quantity					24.000 Nos		
		Say 24.000 Nos @ Rs 570.56 / Nos					Rs 13693.44		
31	18.30.7 Providing flanged joints to double flanged C.I./ D.I pipes and specials, including testing of joints:300 mm diameter pipe								
		24					24.000		
		Total Quantity					24.000 Nos		
		Total Deducted Quantity					0.000 Nos		
		Net Total Quantity					24.000 Nos		
		Say 24.000 Nos @ Rs 578.43 / Nos					Rs 13882.32		
32	18.30.12 Providing flanged joints to double flanged C.I./ D.I pipes and specials, including testing of joints:600 mm diameter pipe								
		20					20.000		
		Total Quantity					20.000 Nos		
		Total Deducted Quantity					0.000 Nos		
		Net Total Quantity					20.000 Nos		
		Say 20.000 Nos @ Rs 1739.89 / Nos					Rs 34797.80		
33	100.98.481 Supply of CI Double Flanged Sluice Valve Conforming to IS 14846 - 2000, Sluice Valve with Hand Wheel PN 1.6, Size 80mm.								
		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 3275.90 / No					Rs 19655.40		
34	100.98.484 Supply of CI Double Flanged Sluice Valve Conforming to IS 14846 - 2000, Sluice Valve with Hand Wheel PN 1.6, Size 150mm.								
		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 6829.10 / No					Rs 40974.60	
35	100.98.485 Supply of CI Double Flanged Sluice Valve Conforming to IS 14846 - 2000, Sluice Valve with Hand Wheel PN 1.6, Size 200mm.							
		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 11938.60 / No					Rs 47754.40	
36	100.98.482 Supply of CI Double Flanged Sluice Valve Conforming to IS 14846 - 2000, Sluice Valve with Hand Wheel PN 1.6, Size 100mm.							
		24				24.000		
		Total Quantity					24.000 No	
		Total Deducted Quantity					0.000 No	
		Net Total Quantity					24.000 No	
		Say 24.000 No @ Rs 4368.05 / No					Rs 104833.20	
37	100.98.486 Supply of CI Double Flanged Sluice Valve Conforming to IS 14846 - 2000, Sluice Valve with Hand Wheel PN 1.6, Size 250mm.							
		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 18564.25 / No					Rs 222771.00	
38	100.98.487 Supply of CI Double Flanged Sluice Valve Conforming to IS 14846 - 2000, Sluice Valve with Hand Wheel PN 1.6, Size 300mm.							
		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 22275.80 / No					Rs 267309.60	

39	100.98.491 Supply of CI Double Flanged Sluice Valve Conforming to IS 14846 - 2000, Sluice Valve with Hand Wheel PN 1.6, Size 500mm.								
			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 78620.20 / No							Rs 314480.80
40	100.98.492 Supply of CI Double Flanged Sluice Valve Conforming to IS 14846 - 2000, Sluice Valve with Hand Wheel PN 1.6, Size 600mm.								
			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 101913.70 / No							Rs 407654.80
41	100.31.2.2 Conveying and fixing C.I. sluice valves (with cap) by providing complete with bolts, nuts, rubber insertions etc. excluding the cost of valve (the tail pieces if required will be paid separately) : 100 mm diameter. Class II" Kerala Water Authority Data derived from item no.18.31.1.2of DAR								
			24						24.000
		Total Quantity							24.000 Nos
		Total Deducted Quantity							0.000 Nos
		Net Total Quantity							24.000 Nos
		Say 24.000 Nos @ Rs 957.74 / Nos							Rs 22985.76
42	100.31.2.6 Conveying and fixing C.I. sluice valves (with cap) by providing complete with bolts, nuts, rubber insertions etc. excluding the cost of valve (the tail pieces if required will be paid separately) : 250 mm diameter. Class II" Data derived from item no.18.31.5.2of DAR								
			12						12.000
		Total Quantity							12.000 Nos
		Total Deducted Quantity							0.000 Nos
		Net Total Quantity							12.000 Nos
		Say 12.000 Nos @ Rs 2504.62 / Nos							Rs 30055.44

43	100.31.2.7 Conveying and fixing C.I. sluice valves (with cap) by providing complete with bolts, nuts, rubber insertions etc. excluding the cost of valve (the tail pieces if required will be paid separately) : 300 mm diameter. Class II" Data derived from item no.18.31.6.2of DAR							
		12						12.000
		Total Quantity						12.000 Nos
		Total Deducted Quantity						0.000 Nos
		Net Total Quantity						12.000 Nos
		Say 12.000 Nos @ Rs 2956.27 / Nos						Rs 35475.24
44	100.31.2.11 Conveying and fixing C.I. sluice valves (with cap) by providing complete with bolts, nuts, rubber insertions etc. excluding the cost of valve (the tail pieces if required will be paid separately) : 500 mm diameter. Class II" Observed Data derived from item no.18.31.of DAR							
		4						4.000
		Total Quantity						4.000 Nos
		Total Deducted Quantity						0.000 Nos
		Net Total Quantity						4.000 Nos
		Say 4.000 Nos @ Rs 7693.72 / Nos						Rs 30774.88
45	100.31.2.12 Conveying and fixing C.I. sluice valves (with cap) by providing complete with bolts, nuts, rubber insertions etc. excluding the cost of valve (the tail pieces if required will be paid separately) : 600 mm diameter. Class II" Observed Data derived from item no.18.31.of DAR							
		4						4.000
		Total Quantity						4.000 Nos
		Total Deducted Quantity						0.000 Nos
		Net Total Quantity						4.000 Nos
		Say 4.000 Nos @ Rs 10163.35 / Nos						Rs 40653.40
46	100.31.2.1 "Conveying and fixing C.I. sluice valves (with cap) by providing complete with bolts, nuts, rubber insertions etc. excluding the cost of valve (the tail pieces if required will be paid separately) : 80 mm diameter. Class II" Observed Data derived from item no.18.31.of DAR							
		6						6.000
		Total Quantity						6.000 Nos

		Total Deducted Quantity					0.000 Nos	
		Net Total Quantity					6.000 Nos	
		Say 6.000 Nos @ Rs 625.34 / Nos					Rs 3752.04	
47	100.31.2.4 Conveying and fixing C.I. sluice valves (with cap) by providing complete with bolts, nuts, rubber insertions etc. excluding the cost of valve (the tail pieces if required will be paid separately) : 150 mm diameter. Class II" Data derived from item no.18.31.3.2of DAR							
		6					6.000	
		Total Quantity					6.000 Nos	
		Total Deducted Quantity					0.000 Nos	
		Net Total Quantity					6.000 Nos	
		Say 6.000 Nos @ Rs 1283.83 / Nos					Rs 7702.98	
48	100.31.2.5 Conveying and fixing C.I. sluice valves (with cap) by providing complete with bolts, nuts, rubber insertions etc. excluding the cost of valve (the tail pieces if required will be paid separately) : 200 mm diameter. Class II" Data derived from item no.18.31.4.2of DAR							
		4					4.000	
		Total Quantity					4.000 Nos	
		Total Deducted Quantity					0.000 Nos	
		Net Total Quantity					4.000 Nos	
		Say 4.000 Nos @ Rs 1729.52 / Nos					Rs 6918.08	
49	100.98.232 Supply of uPVC Pipe, IS 4985: 2000 , 10kg/cm ² , 40mm Dia.							
	Alum lime mixing water line	1	120.000				120.000	
	Pressure line for cleaning	1	120.000				120.000	
		Total Quantity					240.000 metre	
		Total Deducted Quantity					0.000 metre	
		Net Total Quantity					240.000 metre	
		Say 240.000 metre @ Rs 63.20 / metre					Rs 15168.00	
50	100.98.236 Supply of uPVC Pipe, IS 4985: 2000 , 10kg/cm ² , 90mm Dia.							
	Land scaping watering	1	180.000				180.000	

	Total Quantity						180.000 metre	
	Total Deducted Quantity						0.000 metre	
	Net Total Quantity						180.000 metre	
	Say 180.000 metre @ Rs 324.25 / metre						Rs 58365.00	
51	100.98.237 Supply of uPVC Pipe, IS 4985: 2000 , 10kg/cm2, 110mm Dia.							
	Alum lime out	80					80.000	
	alumn lime scour	165					165.000	
	Total Quantity						245.000 metre	
	Total Deducted Quantity						0.000 metre	
	Net Total Quantity						245.000 metre	
	Say 245.000 metre @ Rs 488.80 / metre						Rs 119756.00	
52	100.98.239 Supply of uPVC Pipe, IS 4985: 2000 , 10kg/cm2, 160mm Dia.							
		1	180.000				180.000	
	Total Quantity						180.000 metre	
	Total Deducted Quantity						0.000 metre	
	Net Total Quantity						180.000 metre	
	Say 180.000 metre @ Rs 1025.50 / metre						Rs 184590.00	
53	od368550/2021_2022 Supply, erection, testing and commissioning of 75mm PVC pipe 10kg/cm2 for lateral pipes in the filter bed by drilling holes and laying filter bed as per drawings. As per the direction of departmental officers.							
	75mm PVC pipe 10kg/cm2 for lateral pipes	16	2.000	24.000	6.000		4608.000	
	Total Quantity						4608.000 metre	
	Total Deducted Quantity						0.000 metre	
	Net Total Quantity						4608.000 metre	
	Say 4608.000 metre @ Rs 343.08 / metre						Rs 1580912.64	
54	od368552/2021_2022 Supply and fixing PVC special heavy duty suitable for recomented pipe.(Tee,bends.Tail piece,End cap,coupling Reducer etc as per the direction of departmental officers.)-3% cost of pipe.							
		1	1528000.0 00				1528000.0 00	
	Total Quantity						1528000.000 L.S	

		Total Deducted Quantity					0.000 L.S	
		Net Total Quantity					1528000.000 L.S	
		Say 1528000.000 L.S @ Rs 0.03 / L.S					Rs 45840.00	
55	100.9.4 Laying UPVC pipes of class 2 to class 6 and specials, lowering to the trenches already made, placing in position aligning the pipe line to the lines and levels and jointing the pipes and specials with solvent cement and testing the pipe line with water to the required test pressure (excluding cost of pipes and specials). 40 mm nominal outer dia pipes.							
	Alum lime mixing water line	1	120.000				120.000	
	Pressure line for cleaning	1	120.000				120.000	
		Total Quantity					240.000 metre	
		Total Deducted Quantity					0.000 metre	
		Net Total Quantity					240.000 metre	
		Say 240.000 metre @ Rs 47.59 / metre					Rs 11421.60	
56	100.9.8 Laying UPVC pipes of class 2 to class 6 and specials, lowering to the trenches already made, placing in position aligning the pipe line to the lines and levels and jointing the pipes and specials with solvent cement and testing the pipe line with water to the required test pressure (excluding cost of pipes and specials). 90 mm nominal outer dia pipes."							
	Land scaping watering	1	180.000				180.000	
		Total Quantity					180.000 metre	
		Total Deducted Quantity					0.000 metre	
		Net Total Quantity					180.000 metre	
		Say 180.000 metre @ Rs 87.05 / metre					Rs 15669.00	
57	100.9.9 Laying UPVC pipes of class 2 to class 6 and specials, lowering to the trenches already made, placing in position aligning the pipe line to the lines and levels and jointing the pipes and specials with solvent cement and testing the pipe line with water to the required test pressure (excluding cost of pipes and specials). 110 mm nominal outer dia pipes.							
	Alum lime out	80					80.000	
	alumn lime scour	165					165.000	
		Total Quantity					245.000 metre	
		Total Deducted Quantity					0.000 metre	

		Net Total Quantity					245.000 metre	
		Say 245.000 metre @ Rs 128.27 / metre					Rs 31426.15	
58	100.9.11 Laying UPVC pipes of class 2 to class 6 and specials, lowering to the trenches already made, placing in position aligning the pipe line to the lines and levels and jointing the pipes and specials with solvent cement and testing the pipe line with water to the required test pressure (excluding cost of pipes and specials).160 mm nominal outer dia pipes.							
		1	180.000				180.000	
		Total Quantity					180.000 metre	
		Total Deducted Quantity					0.000 metre	
		Net Total Quantity					180.000 metre	
		Say 180.000 metre @ Rs 202.77 / metre					Rs 36498.60	
59	od368556/2021_2022 Providing Float arrangements to the Inspection chamber.with brass ball float including al accessories .							
		8					8.000	
		Total Quantity					8.000 No	
		Total Deducted Quantity					0.000 No	
		Net Total Quantity					8.000 No	
		Say 8.000.No @ Rs 21197.38 / No					Rs 169579.04	
60	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 consolidatingeach 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)							
	Excavation for different types of pipe	1	350.000	0.800	1.400	0.7	274.400	DI and other pipes with trench width as per specification
		Total Quantity					274.400 cum	
		Total Deducted Quantity					0.000 cum	
		Net Total Quantity					274.400 cum	

Say 274.400 cum @ Rs 555.51 / cum							Rs 152431.94	
61	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)						
	Excavation for different types of pipe	1	350.000	0.800	1.400	0.15	58.800	
Total Quantity							58.800 cum	
Total Deducted Quantity							0.000 cum	
Net Total Quantity							58.800 cum	
Say 58.800 cum @ Rs 806.76 / cum							Rs 47437.49	
62	100.1.13	"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 :" Hard Rock(Blasting Prohibited) (Ref. Item No. 2.13.3 of DSR)						
	Excavation for different types of pipe	1	350.000	0.800	1.400	0.15	58.800	
Total Quantity							58.800 cum	
Total Deducted Quantity							0.000 cum	
Net Total Quantity							58.800 cum	
Say 58.800 cum @ Rs 1556.30 / cum							Rs 91510.44	
SI No	Description	No	L	B	D	CF	Quantity	Remark
2Pumps and motors for the Treatment plant (Cost Index:35.59 %)								
1	od368464/2021_2022	Supply, erection, testing and commissioning of Alum, lime agitator motor with reduction gear of best quality make brand new 5 HP or nearest suitable squirrel cage induction motor with suitable specification for works in manually, electrically and SCADA systems(reduction gear box with suitable ratio) , etc. complete as per the direction of departmental officers.						
	Alum and lime	4+4					8.000	
Total Quantity							8.000 No	
Total Deducted Quantity							0.000 No	

							Net Total Quantity	8.000 No
							Say 8.000 No @ Rs 90597.00 / No	Rs 724776.00
2	od368468/2021_2022 Supply, providing testing and commissioning of Alum and lime solution out let valves-100mm(PN 1.6) or nearest.Valves with suitable specification for works in manually,electrically and SCADA systems with connecting specials							
		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 5459.57 / set	Rs 43676.56
3	od368476/2021_2022 Supply, erection, testing and commissioning of flocculator unit agitator motor with reduction gear of best quality make brand new 2.5 HP or nearest suitable squirrel cage induction motor (reduction gear box with suitable ratio) , etc. complete as per the direction of departmental officers. 							
		8						8.000
							Total Quantity	8.000 No
							Total Deducted Quantity	0.000 No
							Net Total Quantity	8.000 No
							Say 8.000 No @ Rs 83628.00 / No	Rs 669024.00
4	od368479/2021_2022 :Supply, providing testing and commissioning of Flocculator scour valve with suitable operating mechanism 200mm (PN 1.6) or nearest size including gear system and spindles with suitable specification with connecting specials as per the direction of depart mental officers. 							
		6*2						12.000
							Total Quantity	12.000 No
							Total Deducted Quantity	0.000 No
							Net Total Quantity	12.000 No
							Say 12.000 No @ Rs 13523.52 / No	Rs 162282.24
5	od368486/2021_2022 Supply, providing testing and commissioning of lamella scour valve with suitable operating mechanism 250mm (PN 1.6) or nearest size including gear system and spindles with suitable specification with connecting specials as per the direction of departmental officers. 							
		6*2						12.000
							Total Quantity	12.000 No
							Total Deducted Quantity	0.000 No

										Net Total Quantity	12.000 No
										Say 12.000 No @ Rs 20849.82 / No	Rs 250197.84
6	od368488/2021_2022 supply,providing ,.testing and commissioning Suitable type pump with sufficient pressure (pressure type)for washing lamella sheet and bed with hose connecting arrangements. -As per the direction of departmental officers										
		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 63882.50 / No	Rs 383295.00
7	od368489/2021_2022 :Supply, providing testing and commissioning of bypass gate valves at raw water Chanel -750 mmx750mm square type (PN 1.6) or nearest IS specification of IS-3042 including gear system and spindles with suitable specification for works with connecting specials as per the direction of depart mental officers. 										
		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 189324.50 / No	Rs 378649.00
8	od368492/2021_2022 Supply, providing testing and commissioning of Filter bed inlet gate valves -750 mm square type (PN 1.6) or nearest IS specification of IS-3042 including gear system and spindles with suitable specification for works in manually,electrically and SCADA systems with connecting specials as per the direction of depart mental officers.										
		8									8.000
										Total Quantity	8.000 No
										Total Deducted Quantity	0.000 No
										Net Total Quantity	8.000 No
										Say 8.000 No @ Rs 109181.00 / No	Rs 873448.00
9	od368496/2021_2022 Supply, providing testing and commissioning of filter bed out let valves clear water -700mm(PN 1.6) or nearest size .Valves with suitable specification for works in manually,electrically and SCADA systems with connecting specials 										
		24									24.000
										Total Quantity	24.000 No

								Total Deducted Quantity	0.000 No
								Net Total Quantity	24.000 No
								Say 24.000 No @ Rs 156403.08 / No	Rs 3753673.92
10	od368497/2021_2022 Supply, providing testing and commissioning of Filter bed scour valves and back wash inlet to filter bed-500 mm(PN 1.6) or nearest including gear system and spindles with suitable specification for works in manually,electrically and SCADA systems with connecting specials as per the direction of depart mental officers.								
	scour and back wash	24						24.000	
								Total Quantity	24.000 No
								Total Deducted Quantity	0.000 No
								Net Total Quantity	24.000 No
								Say 24.000 No @ Rs 79566.45 / No	Rs 1909594.80
11	od368500/2021_2022 Supply, providing testing and commissioning of NRV-PN-16 for blower unit .300mm size .								
		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 24610.22 / No	Rs 147661.32
12	od368503/2021_2022 Supply, providing testing and commissioning of - Blower line to filter bed -300mm Ductile iron D/F Butterfly Valves with GGG 40 or equivalent grade as per IS 3896 (part 2) 1985 and subsequent revisions double ecentrically disc with renewable soft seal on the disc and body seat face of stainless steel / nickel weld overlay microfinished with powder or liquid epoxy coating with minimum thickness of 250 microns applied on both body and disc inside and outside face to face dimensions as per AWWA C 504 or BS 5155 or IS 13095 for works in manually,electrically and SCADA systems with connecting specials<b								
		24						24.000	
								Total Quantity	24.000 No
								Total Deducted Quantity	0.000 No
								Net Total Quantity	24.000 No
								Say 24.000 No @ Rs 21544.19 / No	Rs 517060.56
13	od368507/2021_2022 :Supply, providing testing and commissioning of blower units for filter bed(27.72m3/minute at 0.4kg/cm2) . works in manually,electrically and SCADA systems with connecting specials as per the direction of depart mental officers.								

		4					4.000	3 stand by	
	Total Quantity						4.000 No		
	Total Deducted Quantity						0.000 No		
	Net Total Quantity						4.000 No		
	Say 4.000 No @ Rs 26133.75 / No						Rs 104535.00		
14	od368511/2021_2022 Supply, providing testing and commissioning of inlet pump for back wash tank(0.013 cumec and total head 13m) suitable for the treatment plant . . works in manually,electrically and SCADA systems with connecting specials as per the direction of depart mental officers.-As per KWA circular latest.								
		2+2					4.000	2 stand by	
	Total Quantity						4.000 No		
	Total Deducted Quantity						0.000 No		
	Net Total Quantity						4.000 No		
	Say 4.000 No @ Rs 102797.92 / No						Rs 411191.68		
15	od368512/2021_2022 :Supply, providing testing and commissioning of sump scour valve with suitable operating mechanism 250mm (PN 1.6) or nearest size including gear system and spindles with suitable specification with connecting specials as per the direction of depart mental officers. 								
		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 20849.82 / No						Rs 62549.46		
16	od368518/2021_2022 Over flow line from sump-Fabricating MS pipes,flanges, bends etc special cutting, jointing ,grinding , welding etc (Including wall casting pipe) of size 1000 mm (ID) using 10 mm thick MS plate including cost and conveyance charges of MS plate, all fabrication charges, charges of painting the steel work with two or more coat deluxe multi surface paint to give an even shade over an under coat of primer etc. complete: For pipes fabricated with 10mm thick MS plates								
		50					50.000		
	Total Quantity						50.000 metre		
	Total Deducted Quantity						0.000 metre		
	Net Total Quantity						50.000 metre		
	Say 50.000 metre @ Rs 29681.19 / metre						Rs 1484059.50		
SI No	Description	No	L	B	D	CF	Quantity	Remark	
3Electrial items for 143 MLD WTP (Cost Index:35.59 %)									

1	od368510/2021_2022 Supply, laying, testing and commissioning of the following size/ suitable size PVC/XLPE insulated, sheathed armoured Aluminium conductor UG cable (12 kv grade) clamped on wall/ceiling with clamps and saddle clips partly laid in cable tray/partly laid in trench, 3 core 300 Sq.mm, XLPE AL Cable. laying Proposed DP structure to RMU, RMU to Transformer incommer panel(HV)	250					250.000	
		Total Quantity					250.000 metre	
		Total Deducted Quantity					0.000 metre	
		Net Total Quantity					250.000 metre	
		Say 250.000 metre @ Rs 2582.01 / metre					Rs 645502.50	
2	od368513/2021_2022 Supply of all materials and providing end termination kit (Out door type) of the following size heat shrinkable 3x 300sq.mm PVC/XLPE armoured Alluminium conducor cable(11kv grade) for receiving power connection from KSEB 11 KV structure 	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 20759.00 / set					Rs 41518.00	
3	od368520/2021_2022 Supply of all materials and providing end termination of the following size/suitable size PVC/XLPE insulated, sheathed armoured Aluminium conductor cable(11kv grade Indoor) for giving power connections to HT Breaker, Transformers, Panel boards etc. complete as per standards.3core 300 Sq.mm.XLPE ALconductor heat shrnkable type XLPE Cable.kit 	4					4.000	
		Total Quantity					4.000 set	
		Total Deducted Quantity					0.000 set	
		Net Total Quantity					4.000 set	
		Say 4.000 set @ Rs 16188.26 / set					Rs 64753.04	
4	od368521/2021_2022 Cabling, Supply, laying, testing and commissioning of the following size/suitable size PVC/XLPE insulated, sheathed armoured Aluminium conductor cable (12 Kv grade) clamped on wall/ceiling with clamps and saddle clips partly laid in cable tray/partly laid in trench, 3 core 150 Sq.mm.11kv, XLPE AL UG Cable/suitable size in between 11 KV transformer control DB to 1000 KVA and 500 KVA transformers	100					100.000	
		Total Quantity					100.000 metre	

		Total Deducted Quantity					0.000 metre	
		Net Total Quantity					100.000 metre	
		Say 100.000 metre @ Rs 1957.13 / metre					Rs 195713.00	
5	od368522/2021_2022 Supply and laying,testing and commissioning of fallowing size/suitable size XLPE insulated PVC sheathed Armoured Alluminium conductor cable(3.3kv grade) clamped on wall/ceiling with clamps partly laid in trench and partly in cable tray,3core,2run 240sq.mm,3.3kv grade XLPE Alluminium UG cable laying from transformer(2500kva) LV side to 3.3kv pannel (incomming side)							
		250					250.000	
		Total Quantity					250.000 metre	
		Total Deducted Quantity					0.000 metre	
		Net Total Quantity					250.000 metre	
		Say 250.000 metre @ Rs 2117.41 / metre					Rs 529352.50	
6	od368525/2021_2022 Supply and laying 110mm HDPE pipe 8 kg/cm2 foe the mechanical protection of cable from starter panel to pump including clamping and connected works as per the direction of dept. officers							
		9	175.000				1575.000	
		Total Quantity					1575.000 metre	
		Total Deducted Quantity					0.000 metre	
		Net Total Quantity					1575.000 metre	
		Say 1575.000 metre @ Rs 479.75 / metre					Rs 755606.25	
7	od368526/2021_2022 SSB1 Fabrication supply,conveyance,installation testing and commissioning of floor/wall mounting dust and vermin proof cubicle type MV panel board confirming of the fallowinf components/devicess and complying to IS 8623 Fabrication of fully partitioned ,dust and vermin proof enclosure for panel assembly as per form 4 of IS 8623 using 2mm CRCA sheet as per approved design and requirement, with front and rear accessfacility,bus bar chambers,hinged doors for all switch gear components ,earthing the door using 4sq.mm braided copper conductor, providing necessary cut-outs for mounting meters,relays,indication lamps,bus bar inter connections etc,detachable covers for busbar chamber and cable alley,power coating the assembly after subjecting to 7 tank process etc as required. CRCA sheet alone be used for the fabrication.Angles/flats/slotted angles etc shall not be used forthe fabrication of panel assembly. The panel shaii be provided with base frame from ISMS 75.Necessary barriers and shrouding with 2mm/3mm SMC Sheets shall be provided.Heavy duty neoprene beeding of aproprate sizes shall be used to make the panel dust and vermin proof,..Flush mounted electronic volt meter with 3line display suitable to show the voltages on 3 phases-1Nos. BUS BAR SYSTEM SITC of main bus bar system and inter connections with electrolytic grade copper strips/rigi conductors confirming to IS 1867 supported on finger type bus bar support of adequate size,spacing between support not exceeding 50 cm and ovr hang not exceeding 5cm including bending to shape,drilling holes,tinning the points of contacts,fixing heat shrinkable PVC sleeves,plated bolts and nuts with plate washers and spring washers,copper sockets for round conductors etc as required. (ii)250A TPN ISOLATOR-1No. 63 A							

	,current limiting TP MCCB with thermal magnetic release having adjustable OL-5No.(iv)100A,35KA,3pole with thermal magnetic release having adjustable OL-1No.(v) The panel shall be fabricated incorporating all the above items,necessary control wiring to be done as per requirement,metallic danger board to be fixed and legend plte made from 1mm Al sheet with inscriptions as required to be fixed on all compartments, conveyed to site and installed as directed at site as required.						
		1					1.000
	Total Quantity						1.000 No
	Total Deducted Quantity						0.000 No
	Net Total Quantity						1.000 No
	Say 1.000 No @ Rs 200000.00 / No						Rs 200000.00
8	od368528/2021_2022 SSB1 Fabrication supply,conveyance,installation testing and commissioning of floor/wall mounting dust and vermin proof cubicle type MV panel board confirming of the fallowing components/devicess and complying to IS 8623 Fabrication of fully partitioned ,dust and vermin proof enclosure for panel assembly as per form 4 of IS 8623 using 2mm CRCA sheet as per approved design and requirement, with front and rear accessfacility,bus bar chambers,hinged doors for all switch gear components ,earthing the door using 4sq.mm braided copper conductor, providing necessary cut-outs for mounting meters,relays,indication lamps,bus bar inter connections etc,detachable covers for busbar chamber and cable alley,power coating the assembly after subjecting to 7 tank process etc as required. CRCA sheet alone be used for the fabrication.Angles/flats/slotted angles etc shall not be used forthe fabrication of panel assembly. The panel shaii be provided with base frame from ISMS 75.Necessary barriers and shrouding with 2mm/3mm SMC Sheets shall be provided.Heavy duty neoprene beeding of aproprate sizes shall be used to make the panel dust and vermin proof,.Flush mounted electronic volt meter with 3line display suitable to show the voltages on 3 phases-1Nos. BUS BAR SYSTEM SITC of main bus bar system and inter connections with electrolytic grade copper strips/rigi conductors confirming to IS 1867 supported on finger type bus bar support of adequate size,spacing between support not exceeding 50 cm and ovr hang not exceeding 5cm including bending to shape,drilling holes,tinning the points of contacts,fixing heat shrinkable PVC sleeves,plated bolts and nuts with plate washers and spring washers,copper sockets for round conductors etc as required. (ii)160A TPN ISOLATOR-1No. 100A ,current limiting TP MCCB with thermal magnetic release having adjustabOL 6No.(iv)63,35KA,3poleMCCB with thermal magnetic release having adjustable OL-1No.(v) The panel shall be fabricated incorporating all the above items,necessary control wiring to be done as per requirement,metallic danger board to be fixed and legend plte made from 1mm Al sheet with inscriptions as required to be fixed on all compartments, conveyed to site and installed as directed at site as required 						
		1	1.000				1.000
	Total Quantity						1.000 No
	Total Deducted Quantity						0.000 No
	Net Total Quantity						1.000 No
	Say 1.000 No @ Rs 140000.00 / No						Rs 140000.00
9	od368532/2021_2022						

	<p>MSB
Fabrication supply,conveyance,installation testing and commissioning of floor/wall mounting dust and vermin proof cubicle type MV panel board confirming of the fallowinf components/devicess and complying to IS 8623
Fabrication of fully partitioned ,dust and vermin proof enclosure for panel assembly as per form 4 of IS 8623 using 2mm CRCA sheet as per approved design and requirement, with front and rear accessfacility,bus bar chambers,hinged doors for all switch gear components ,earthing the door using 4sq.mm braided copper conductor, providing necessary cut-outs for mounting meters,relays,indication lamps,bus bar inter connections etc,detachable covers for busbar chamber and cable alley,power coating the assembly after subjecting to 7 tank process etc as required. CRCA sheet alone be used for the fabrication.Angles/flats/slotted angles etc shall not be used forthe fabrication of panel assembly. The panel shaii be provided with base frame from ISMS 75.Necessary barriers and shrouding with 2mm/3mm SMC Sheets shall be provided.Heavy duty neoprene beeding of aproprate sizes shall be used to make the panel dust and vermin proof.
INCOMER
630A,50KA,4 pole MCCB with 3 OC+1EF-1No.Flush mounted electronic volt meter with 3line display suitable to show the voltages on 3 phases-1Nos.
Flush mounted electronic ammeter with 3line display suitable to show the current on 3 phases with 900/5A CT-1SET
PF meter with required accessories
Low set earth fault relay with all required accessories-1No.
LED type phase indication lamp with protective fuses-1 set
900/5A CT class 1 for APFC relay
BUS BAR SYSTEM
SITC of main bus bar system and inter connections with electrolytic grade copper strips/rigi conductors confirming to IS 1867 supported on finger type bus bar support of adequate size,spacing between support not exceeding 50 cm and ovr hang not exceeding 5cm including bending to shape,drilling holes,tinning the points of contacts,fixing heat shrinkable PVC sleeves,plated bolts and nuts with plate washers and spring washers,copper sockets for round conductors etc as required.
1.630A,35KA 3pole current limiting type MCCB having adjustable OL-1No.(ii)250A35KA,3 pole current limiting type MCCB having adjustable OL-2Nos.(III)200A,35KA,3pole with thermal magnetic release having adjustable OL-1No.(iv)160A,35KA,3pole with thermal magnetic release having adjustable OL-1No.(v)40A,35 KA,3pole,with thermal magnetic release having adjustable OL-1No.
The panel shall be fabricated incorporating all the above items,necessary control wiring to be done as per requirement,metalic danger board to be fixed and legend plte made from 1mm Al sheet with inscriptions as required to be fixed on all compartments, conveyed to site and installed as directed at site as required.</p>							
	1	2.000					2.000	
	Total Quantity						2.000 No	
	Total Deducted Quantity						0.000 No	
	Net Total Quantity						2.000 No	
	Say 2.000 No @ Rs 450000.00 / No						Rs 900000.00	
10	<p>od368535/2021_2022 Supply and laying ,testing and commissioning of fallowing size PVC/XLPE insulated armoured cable with alluminium conductor for working voltage up to and including 1100 volt cnfirming IS 1584 PART I/1988 for PVC IS 7098 PART I/1988 for XLPE
3.5x400 sq.mm 2 run</p>							
	200						200.000	
	Total Quantity						200.000 metre	
	Total Deducted Quantity						0.000 metre	
	Net Total Quantity						200.000 metre	

	Say 200.000 metre @ Rs 3720.73 / metre						Rs 744146.00	
11	od368536/2021_2022 Supplying and making end termination with brass compression gland and aluminium lugs for following size of PVC insulated and PVC sheathed / XLPE aluminium conductor cable of 1.1KV grade as required. 3.5X400 Sq.mm 2 run							
		4					4.000	
	Total Quantity						4.000 set	
	Total Deducted Quantity						0.000 set	
	Net Total Quantity						4.000 set	
	Say 4.000 set @ Rs 1639.28 / set						Rs 6557.12	
12	od368537/2021_2022 Supply of all materials and providing end termination of the following size/suitable size heat shrinkable PVC/XLPE insulated, sheathed armoured Aluminium conductor cable 11kv grade) for giving power connections to HT Breaker, Transformers, Panel boards etc. complete as per standards. 3 core 150Sq.mm.11kv,XLPE AL conductor shrinking type Cable kit (Indoor)							
		4					4.000	
	Total Quantity						4.000 set	
	Total Deducted Quantity						0.000 set	
	Net Total Quantity						4.000 set	
	Say 4.000 set @ Rs 14748.39 / set						Rs 58993.56	
13	od368538/2021_2022 Supply of all materials and providing end termination kit (Indoor type) of following size/suitable size heat shrinkable PVC/XLPE,Sheathed,armoured Alluminium conductor cable(3.3kv grade, 3x240sq.mm size) for giving power connection to 3.3kv pannel from the transformer LV side							
		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 13887.12 / set						Rs 27774.24	
14	od368539/2021_2022 Supply, laying, testing and commissioning of the following size/suitable size PVC/XLPE insulated, sheathed armoured Aluminium conductor cable (1100 volts&3.3/11kv grade) clamped on wall/ceiling with clamps and saddle clips partly laid in cable tray/partly laid in trench, 3.5 core 95Sq.mm. AYFY Cable							
		250					250.000	
	Total Quantity						250.000 metre	
	Total Deducted Quantity						0.000 metre	

						Net Total Quantity	250.000 metre
						Say 250.000 metre @ Rs 485.51 / metre	Rs 121377.50
15	od368540/2021_2022 Supply of all materials and providing end termination of the following size/suitable size PVC/XLPE insulated, sheathed armoured Aluminium conductor cable (1100 volts & 3.3/11kv grade) for giving power connections to HT Breaker, Transformers, Panel boards etc. complete as per standards. 3.5 core 95Sq.mm. AYFY Cable PRICE EST NO:2019/5819 						
			12				12.000
						Total Quantity	12.000 set
						Total Deducted Quantity	0.000 set
						Net Total Quantity	12.000 set
						Say 12.000 set @ Rs 364.71 / set	Rs 4376.52
16	od368541/2021_2022 Supply and laying 150 sqmm 3.5 core PVC/XLPE insulated armoured cable with aluminium conductors for working voltages up to and including 1100 volts conforming IS 1584/part I/1988 for PVC IS 7098 part I for XLPE including required quantities of cable end termination with all accessories						
			250				250.000
						Total Quantity	250.000 metre
						Total Deducted Quantity	0.000 metre
						Net Total Quantity	250.000 metre
						Say 250.000 metre @ Rs 915.16 / metre	Rs 228790.00
17	od368542/2021_2022 Supply and laying 70 sqmm 3.5 core PVC/XLPE insulated armoured cable with aluminium conductors for working voltages up to and including 1100 volts conforming IS 1584/part I/1988 for PVC IS 7098 part I for XLPE including required quantities of cable end termination with all accessories						
			300				300.000
						Total Quantity	300.000 metre
						Total Deducted Quantity	0.000 metre
						Net Total Quantity	300.000 metre
						Say 300.000 metre @ Rs 559.61 / metre	Rs 167883.00
18	od368543/2021_2022 Supy and laying 50 sqmm 3.5 core PVC/XLPE insulated armoured cable with aluminium conductors for working voltages up to and including 1100 volts conforming IS 1584/part I/1988 for PVC IS 7098 part I for XLPE including required quantities of cable end termination with all accessoriespl						
			1	1100.000			1100.000

		Total Quantity					1100.000 metre
		Total Deducted Quantity					0.000 metre
		Net Total Quantity					1100.000 metre
		Say 1100.000 metre @ Rs 451.33 / metre					Rs 496463.00
19	od368544/2021_2022 Supy and laying 25 sqmm 3.5 core PVC/XLPE insulated armoured cable with aluminium conductors for working voltages up to and including 1100 volts conforming IS 1584/part I/1988 for PVC IS 7098 part I for XLPE including required quantities of cable end termination with all accessories	1	1200.000				1200.000
		Total Quantity					1200.000 metre
		Total Deducted Quantity					0.000 metre
		Net Total Quantity					1200.000 metre
		Say 1200.000 metre @ Rs 325.66 / metre					Rs 390792.00
20	od368545/2021_2022 Supy and laying(Laying partly trough ground,cable tray and HDPE pipe) 150 sqmm 3 core PVC/XLPE insulated armoured cable with aluminium conductors for working voltages up to and including 3300volts conforming IS 1584/part I/1988 for PVC IS 7098 part I for XLPE including required quantities of cable end termination with all accessories	3000					3000.000
		Total Quantity					3000.000 metre
		Total Deducted Quantity					0.000 metre
		Net Total Quantity					3000.000 metre
		Say 3000.000 metre @ Rs 1050.00 / metre					Rs 3150000.00
21	od368546/2021_2022 Supplying and installing following size of perforated painted with powder coating M.S. cable trays with perforation not more than 17.5%, in convenient sections, joined with connectors, suspended from the ceiling with M.S. suspenders including bolts & nuts, painting suspenders etc. as required. 600 mm width X 50 mm depth X 2.0 mm thickness	150					150.000
		Total Quantity					150.000 metre
		Total Deducted Quantity					0.000 metre
		Net Total Quantity					150.000 metre
		Say 150.000 metre @ Rs 1310.33 / metre					Rs 196549.50
22	od368547/2021_2022 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						

		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 14021.36 / No						Rs 140213.60	
23	od368548/2021_2022 Earthing with G.I. earth plate 600 mm X 600 mm X 6 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.							
		16					16.000	
	Total Quantity						16.000 No	
	Total Deducted Quantity						0.000 No	
	Net Total Quantity						16.000 No	
	Say 16.000 No @ Rs 9189.65 / No						Rs 147034.40	
24	od368549/2021_2022 Supply, laying and termination of the following sizes of copper strip/wires for earthing of substation, transformers, HTpanel boards,LT panel boards, equipments and inter connection of earth pits etc. 25x6mm copper strips. 							
		50					50.000	
	Total Quantity						50.000 metre	
	Total Deducted Quantity						0.000 metre	
	Net Total Quantity						50.000 metre	
	Say 50.000 metre @ Rs 1225.61 / metre						Rs 61280.50	
25	od368551/2021_2022 Supply, laying and termination of the following sizes of copper strip/wires for earthing of substation, transformers, HTpanel boards,LT panel boards, equipments and inter connection of earth pits etc. 25x3mm copper strips. 							
		75					75.000	
		1					0.000	
	Total Quantity						75.000 metre	
	Total Deducted Quantity						0.000 metre	
	Net Total Quantity						75.000 metre	
	Say 75.000 metre @ Rs 1041.21 / metre						Rs 78090.75	
26	od368553/2021_2022 Supply, laying and termination of the following sizes of copper strip/wires for earthing of substation, transformers, HTpanel boards,LT panel boards, equipments and inter connection of earth pits							

	etc., 25X6mm GI strips							
		200						200.000
		Total Quantity						200.000 metre
		Total Deducted Quantity						0.000 metre
		Net Total Quantity						200.000 metre
		Say 200.000 metre @ Rs 276.41 / metre						Rs 55282.00
27	od368554/2021_2022 Supply, laying and termination of the following sizes of copper strip/wires for earthing of substation, transformers, HTpanel boards,LT panel boards, equipments and inter connection of earth pits etc.32x6mm GI strips.							
		150						150.000
		Total Quantity						150.000 metre
		Total Deducted Quantity						0.000 metre
		Net Total Quantity						150.000 metre
		Say 150.000 metre @ Rs 348.00 / metre						Rs 52200.00
28	od368555/2021_2022 Supply and fixing of 6mm thick checkered plate with required M.S. angle/plate supports over the masonry cable trench at substation and electrical control room. Angle and plate should be painted one coat of primer and two coats of enamel paint as required							
		1						1.000
		Total Quantity						1.000 tonne
		Total Deducted Quantity						0.000 tonne
		Net Total Quantity						1.000 tonne
		Say 1.000 tonne @ Rs 89118.41 / tonne						Rs 89118.41
29	od368557/2021_2022 Supply and fixing of M.S. angle cable tray for clamping the various sizes of cables in trenches, through walls, & trusses etc. as per KEI standards							
		1						1.000
		Total Quantity						1.000 tonne
		Total Deducted Quantity						0.000 tonne
		Net Total Quantity						1.000 tonne
		Say 1.000 tonne @ Rs 73275.55 / tonne						Rs 73275.55
30	od368558/2021_2022 Battery& Battery Charger., Supplying, fixing, testing and commissioning of Lead acid cellbattery 24V, 200AH capacity at 10hrs rate of discharge assembled with plante positive and pasted negative plates with inter cell, inter raw, interior connectors etc. stand and cell insulators, sealed floats, nuts,							

	bolt, washers etc with electrolyte of specific gravity 1.190 and accessories such as voltmeter, Thermometer, Hydrometer, spanners etc with teak wood stand with 3 coats of antiacid paint to accommodate battery						
	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 58075.00 / No						Rs 58075.00
31	od368559/2021_2022 Erection, Testing & commissioning charges-Battery & Battery Charger						
	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 580.75 / set						Rs 580.75
32	od368560/2021_2022 Supplying, fixing, testing and commissioning of automatic twin battery charger with distribution board with all instruments and protective devices etc. complete as per standards.						
	1						1.000
	Total Quantity						1.000 No
	Total Deducted Quantity						0.000 No
	Net Total Quantity						1.000 No
	Say 1.000 No @ Rs 46460.00 / No						Rs 46460.00
33	od368561/2021_2022 Erection, Testing & commissioning charges -Automatic Twin Type Battery charger with DB						
	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 580.75 / set						Rs 580.75
34	od368562/2021_2022 Supply and providing the following safety items approved by Kerala Electrical Inspectorate and relevant standards. 11kv rubber mat=8set 11kv rubber gloves=2 pair 11kv danger board=10Nos 9ltre capacity fire bucket=3Nos First aid box=2Nos shock treatment chart=4set 5kg fire estingusher=12 Nos						
	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 101631.25 / set	Rs 101631.25
35	od368563/2021_2022 Wiring for light point/ fan point/ exhaust fan point/ call bell point with 1.5 sq. mm FRLS PVC insulated copper conductor single core cable in surface I recessed PVC conduit, with piano type switch, phenolic laminated sheet, suitable size MS box and earthing the point with 1.5 sq. mm FRLS PVC insulated copper conductor single core cable etc. as required. Group B								
			484						484.000
								Total Quantity	484.000 No
								Total Deducted Quantity	0.000 No
								Net Total Quantity	484.000 No
								Say 484.000 No @ Rs 1149.80 / No	Rs 556503.20
36	od368564/2021_2022 Wiring for circuit/ submain wiring alongwith earth wire with the following sizes of FRLS PVC insulated copper conductor, single core cable in surface/ recessed medium class PVC conduit as required. 2 X 1.5 sq. mm + 1 X 1.5 sq. mm earth wire								
			282						282.000
								Total Quantity	282.000 metre
								Total Deducted Quantity	0.000 metre
								Net Total Quantity	282.000 metre
								Say 282.000 metre @ Rs 173.55 / metre	Rs 48941.10
37	od368565/2021_2022 Wiring for circuit/ submain wiring alongwith earth wire with the following sizes of FRLS PVC insulated copper conductor, single core cable in surface/ recessed medium class PVC conduit as required. 2 X 2.5 sq. mm + 1 X 2.5 sq. mm earth wire								
			2000						2000.000
								Total Quantity	2000.000 metre
								Total Deducted Quantity	0.000 metre
								Net Total Quantity	2000.000 metre
								Say 2000.000 metre @ Rs 307.01 / metre	Rs 614020.00
38	od368566/2021_2022 Supplying and fixing of following sizes of medium class PVC conduit along with accessories in surface/recess including cutting the wall and making good the same in case of recessed conduit as required. 20mm								
			900						900.000

							Total Quantity	900.000 metre
							Total Deducted Quantity	0.000 metre
							Net Total Quantity	900.000 metre
							Say 900.000 metre @ Rs 154.42 / metre	Rs 138978.00
39	od368567/2021_2022 Wiring for circuit/ submain wiring alongwith earth wire with the following sizes of FRLS PVC insulated copper conductor, single core cable in surface/ recessed medium class PVC conduit as required. 2 X 4 sq. mm + 1 X 4 sq. mm earth wire							
		1190						1190.000
							Total Quantity	1190.000 metre
							Total Deducted Quantity	0.000 metre
							Net Total Quantity	1190.000 metre
							Say 1190.000 metre @ Rs 367.69 / metre	Rs 437551.10
40	od368568/2021_2022 Wiring for circuit/ submain wiring alongwith earth wire with the following sizes of FRLS PVC insulated copper conductor, single core cable in surface/ recessed medium class PVC conduit as required. 4 X 2.5 sq. mm + 2 X 2.5 sq. mm earth wire							
		980						980.000
							Total Quantity	980.000 metre
							Total Deducted Quantity	0.000 metre
							Net Total Quantity	980.000 metre
							Say 980.000 metre @ Rs 315.92 / metre	Rs 309601.60
41	od368569/2021_2022 Wiring for circuit/ submain wiring alongwith earth wire with the following sizes of FRLS PVC insulated copper conductor, single core cable in surface/ recessed medium class PVC conduit as required. 4 X 4 sq. mm + 2 X 4 sq. mm earth wire							
		798						798.000
							Total Quantity	798.000 metre
							Total Deducted Quantity	0.000 metre
							Net Total Quantity	798.000 metre
							Say 798.000 metre @ Rs 417.61 / metre	Rs 333252.78
42	od368570/2021_2022 Wiring for circuit/ submain wiring alongwith earth wire with the following sizes of FRLS PVC insulated copper conductor, single core cable in surface/ recessed medium class PVC conduit as required. 4 X 6 sq. mm + 2 X 6 sq. mm earth wire							
		998						998.000

							Total Quantity	998.000 metre
							Total Deducted Quantity	0.000 metre
							Net Total Quantity	998.000 metre
							Say 998.000 metre @ Rs 534.22 / metre	Rs 533151.56
43	od368571/2021_2022 Supplying and fixing two module stepped type electronic fan regulator on the existing modular plate switch box including connections but excluding modular plate etc. as required.							
		1	30.000					30.000
							Total Quantity	30.000 No
							Total Deducted Quantity	0.000 No
							Net Total Quantity	30.000 No
							Say 30.000 No @ Rs 463.71 / No	Rs 13911.30
44	od368572/2021_2022 Providing and fixing following rating and breaking capacity MCCB with thermodynamic release and terminal spreaders in existing cubicle PANEL / vertical DB including drilling holes in cubicle panel, making connections etc as required 150KA, 16KA							
		1	4.000					4.000
							Total Quantity	4.000 No
							Total Deducted Quantity	0.000 No
							Net Total Quantity	4.000 No
							Say 4.000 No @ Rs 6356.45 / No	Rs 25425.80
45	od368573/2021_2022 Providing and fixing following rating and breaking capacity MCCB with thermodynamic release and terminal spreaders in existing cubicle PANEL / vertical DB including drilling holes in cubicle panel, making connections etc as required 125A, 16KA							
		1	8.000					8.000
							Total Quantity	8.000 No
							Total Deducted Quantity	0.000 No
							Net Total Quantity	8.000 No
							Say 8.000 No @ Rs 5620.20 / No	Rs 44961.60
46	od368574/2021_2022 Providing and fixing following rating and breaking capacity MCCB with thermodynamic release and terminal spreaders in existing cubicle PANEL / vertical DB including drilling holes in cubicle panel, making connections etc as required 100A, 16KA							
		1	18.000					18.000
							Total Quantity	18.000 No

								Total Deducted Quantity	0.000 No
								Net Total Quantity	18.000 No
								Say 18.000 No @ Rs 5052.08 / No	Rs 90937.44
47	od368575/2021_2022 Supply and installation of sheet steel, phosphatised and painted, dust and vermin proof enclosure of MCB DB including copper /brass bus bar, neutral link, earth bus and DIN rail suitable for fixing MCB/ isolator etc. fixed on wall using suitable anchor bolts or fixed in recess including cutting hole on the wall , making good the damages, colour washing etc. as required 12 way (8+36) - three phase double cover (IP 42/43)								
		1	20.000					20.000	
								Total Quantity	20.000 No
								Total Deducted Quantity	0.000 No
								Net Total Quantity	20.000 No
								Say 20.000 No @ Rs 13325.78 / No	Rs 266515.60
48	od368576/2021_2022 90.11.1.12 Supply and installation of sheet steel, phosphatised and painted, dust and vermin proof enclosure of MCB DB including copper /brass bus bar, neutral link, earth bus and DIN rail suitable for fixing MCB/ isolator etc. fixed on wall using suitable anchor bolts or fixed in recess including cutting hole on the wall , making good the damages, colour washing etc. as required 8 way (8+24) - three phase double cover (IP 42/43)								
		1	24.000					24.000	
								Total Quantity	24.000 No
								Total Deducted Quantity	0.000 No
								Net Total Quantity	24.000 No
								Say 24.000 No @ Rs 10500.08 / No	Rs 252001.92
49	od368577/2021_2022 Providing and fixing following capacity TP&N disconnecter fuse switch unit inside the existing panel board with ISI marked HRC fuses including drilling holes in cubicle panel, making connections, etc. as required. 200A TP&N								
		1	2.000					2.000	
								Total Quantity	2.000 No
								Total Deducted Quantity	0.000 No
								Net Total Quantity	2.000 No
								Say 2.000 No @ Rs 12346.82 / No	Rs 24693.64
50	od368578/2021_2022 Providing and fixing following capacity TP&N disconnecter fuse switch unit inside the existing panel board with ISI marked HRC fuses including drilling holes in cubicle panel, making connections, etc. as required. 160A TP &N								

		1	2.000				2.000	
	Total Quantity						2.000 No	
	Total Deducted Quantity						0.000 No	
	Net Total Quantity						2.000 No	
	Say 2.000 No @ Rs 10786.18 / No						Rs 21572.36	
51	od368579/2021_2022 Providing and fixing following capacity TP&N disconnecter fuse switch unit inside the existing panel board with ISI marked HRC fuses including drilling holes in cubicle panel, making connections, etc. as required. 100A TP&N							
		1	10.000				10.000	
	Total Quantity						10.000 No	
	Total Deducted Quantity						0.000 No	
	Net Total Quantity						10.000 No	
	Say 10.000 No @ Rs 8167.94 / No						Rs 81679.40	
52	od368580/2021_2022 Providing and fixing following capacity TP&N disconnecter fuse switch unit inside the existing panel board with ISI marked HRC fuses including drilling holes in cubicle panel, making connections, etc. as required. 125A TP&N							
		1	4.000				4.000	
	Total Quantity						4.000 No	
	Total Deducted Quantity						0.000 No	
	Net Total Quantity						4.000 No	
	Say 4.000 No @ Rs 9079.10 / No						Rs 36316.40	
53	od368581/2021_2022 Providing and fixing following capacity TP&N disconnecter fuse switch unit inside the existing panel board with ISI marked HRC fuses including drilling holes in cubicle panel, making connections, etc. as required 63 A TP&N							
		1	24.000				24.000	
	Total Quantity						24.000 No	
	Total Deducted Quantity						0.000 No	
	Net Total Quantity						24.000 No	
	Say 24.000 No @ Rs 3963.29 / No						Rs 95118.96	
54	od368582/2021_2022 Supply, conveyance and fixing the following types & current rated control gears & switchgears conforming to IS 13947 suitable for 440 V, 50 Hz, AC supply in the existing panel assembly as required. 125A, 35/36 kA (Ics=100%Icu), 3 pole, current limiting type MCCB with microprocessor							

	based release with overload setting of 50 - 100% having adjustable OL & SC						
		1	2.000				2.000
	Total Quantity						2.000 No
	Total Deducted Quantity						0.000 No
	Net Total Quantity						2.000 No
	Say 2.000 No @ Rs 13077.00 / No						Rs 26154.00
55	od368583/2021_2022 Supplying and fixing 5 A to 32 A rating, 240/415 V, 10 kA, "C" curve, miniature circuit breaker suitable for inductive load of following poles in the existing MCB DB complete with connections, testing and commissioning etc. as required. Triple pole						
		1	165.000				165.000
	Total Quantity						165.000 No
	Total Deducted Quantity						0.000 No
	Net Total Quantity						165.000 No
	Say 165.000 No @ Rs 1119.97 / No						Rs 184795.05
56	od368584/2021_2022 Supplying and fixing following rating, four pole, 415 volts, isolator in the existing MCB DB complete with connections, testing and commissioning etc. as required. 40 amps						
		1	16.000				16.000
	Total Quantity						16.000 No
	Total Deducted Quantity						0.000 No
	Net Total Quantity						16.000 No
	Say 16.000 No @ Rs 1128.10 / No						Rs 18049.60
57	od368585/2021_2022 Supplying and fixing following rating, four pole, 415 volts, isolator in the existing MCB DB complete with connections, testing and commissioning etc. as required. 63 amps						
		1	12.000				12.000
	Total Quantity						12.000 No
	Total Deducted Quantity						0.000 No
	Net Total Quantity						12.000 No
	Say 12.000 No @ Rs 1137.60 / No						Rs 13651.20
58	od368586/2021_2022 Supply, conveyance and fixing the following types & current rated control gears & switchgears conforming to IS 13947 suitable for 440 V, 50 Hz, AC supply in the existing panel assembly as required. 16 A-100A, 16 kA (Ics=100%Icu), 3 pole, current limiting type MCCB having thermal setting range of 80 - 100% with thermal magnetic release having adjustable OL						

		1	5.000				5.000	
	Total Quantity						5.000 No	
	Total Deducted Quantity						0.000 No	
	Net Total Quantity						5.000 No	
	Say 5.000 No @ Rs 3763.00 / No						Rs 18815.00	
59	od368587/2021_2022 Wiring for circuit/ submain wiring alongwith earth wire with the following sizes of FRLS PVC insulated copper conductor, single core cable in surface/ recessed medium class PVC conduit a 4 X 10 sq. mm + 2 X 6 sq. mm earth wire required.							
		694					694.000	
	Total Quantity						694.000 metre	
	Total Deducted Quantity						0.000 metre	
	Net Total Quantity						694.000 metre	
	Say 694.000 metre @ Rs 908.45 / metre						Rs 630464.30	
60	od368588/2021_2022 Wiring for circuit/ submain wiring alongwith earth wire with the following sizes of FRLS PVC insulated copper conductor, single core cable in surface/ recessed medium class PVC conduit as required. 4 X 16 sq. mm + 2 X 6 sq. mm earth wire							
		780					780.000	
	Total Quantity						780.000 metre	
	Total Deducted Quantity						0.000 metre	
	Net Total Quantity						780.000 metre	
	Say 780.000 metre @ Rs 1282.68 / metre						Rs 1000490.40	
61	od368589/2021_2022 Supplying and fixing suitable size GI box with modular plate and cover in front on surface or in recess, including providing and fixing 3 pin 5/6 A modular socket outlet and 5/6 A modular switch, connections etc. as required.							
		410					410.000	
	Total Quantity						410.000 No	
	Total Deducted Quantity						0.000 No	
	Net Total Quantity						410.000 No	
	Say 410.000 No @ Rs 477.27 / No						Rs 195680.70	
62	od368590/2021_2022 Supplying and fixing suitable size GI box with modular plate and cover in front on surface or in recess, including providing and fixing 6 pin 5/6 A & 15/16 A modular socket outlet and 15/16 A modular switch, connections etc. as required.							

		62					62.000	
	Total Quantity						62.000 No	
	Total Deducted Quantity						0.000 No	
	Net Total Quantity						62.000 No	
	Say 62.000 No @ Rs 671.17 / No						Rs 41612.54	
63	od368591/2021_2022 Supplying and fixing call bell/ buzzer suitable for single phase, 230 V, complete as required.							
		15					15.000	
	Total Quantity						15.000 No	
	Total Deducted Quantity						0.000 No	
	Net Total Quantity						15.000 No	
	Say 15.000 No @ Rs 108.47 / No						Rs 1627.05	
64	od368592/2021_2022 Installation, testing and commissioning of pre-wired, fluorescent fitting / compact fluorescent fitting of all types, complete with all accessories and tube/lamp etc. directly on ceiling/ wall, including connections with 1.5 sq. mm FRLS PVC insulated, copper conductor, single core cable and earthing etc. as required.							
		362					362.000	
	Total Quantity						362.000 No	
	Total Deducted Quantity						0.000 No	
	Net Total Quantity						362.000 No	
	Say 362.000 No @ Rs 199.31 / No						Rs 72150.22	
65	od368593/2021_2022 Installation, testing and commissioning of ceiling fan, including wiring the down rods of standard length (upto 30 cm) with 1.5 sq. mm FRLS PVC insulated, copper conductor, single core etc. as required.							
		1	30.000				30.000	
	Total Quantity						30.000 No	
	Total Deducted Quantity						0.000 No	
	Net Total Quantity						30.000 No	
	Say 30.000 No @ Rs 203.38 / No						Rs 6101.40	
66	od368594/2021_2022 Installation of exhaust fan in the existing opening, including making good the damage, connection, testing, commissioning etc. as required. 510 mm sweep							
		30					30.000	
	Total Quantity						30.000 No	

							Total Deducted Quantity	0.000 No
							Net Total Quantity	30.000 No
							Say 30.000 No @ Rs 622.35 / No	Rs 18670.50
67	od368595/2021_2022 Supplying and drawing of UTP 4 pair CAT 6 LAN Cable in the existing surface/ recessed Steel/ PVC conduit as required. 3 run of cable							
		980						980.000
							Total Quantity	980.000 No
							Total Deducted Quantity	0.000 No
							Net Total Quantity	980.000 No
							Say 980.000 No @ Rs 135.59 / No	Rs 132878.20
68	od368596/2021_2022 Providing and fixing following rating and breaking capacity and pole MCCB with thermomagnetic release and terminal spreaders in existing cubicle panel board including drilling holes in cubicle panel, making connections, etc. as required. 100 A, 30kA, FPMCCB							
		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 10002.47 / No	Rs 30007.41
69	od368597/2021_2022 Supplying and fixing following way, single pole and neutral, sheet steel, MCB distribution board, 240 V, on surface/ recess, complete with tinned copper bus bar, neutral bus bar, earth bar, din bar, interconnections, powder painted including earthing etc. as required. (But without MCB/RCCB/Isolator) 12 way double door =2Nos							
		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 2440.62 / No	Rs 4881.24
70	od368598/2021_2022 Supplying and fixing following way, single pole and neutral, sheet steel, MCB distribution board, 240 V, on surface/ recess, complete with tinned copper bus bar, neutral bus bar, earth bar, din bar, interconnections, powder painted including earthing etc. as required. (But without MCB/RCCB/Isolator) 8 way double door							
		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 2092.15 / No						Rs 4184.30	
71	od368599/2021_2022 Supplying and fixing following way, horizontal type three pole and neutral, sheet steel, MCB distribution board, 415 V, on surface/ recess, complete with tinned copper bus bar, neutral bus bar, earth bar, din bar, interconnections, powder painted including earthing etc. as required. (But without MCB/RCCB/Isolator) 8 way (4 + 24), Double door=3							
		3					3.000	Average of the above spec
	Total Quantity						3.000 No	
	Total Deducted Quantity						0.000 No	
	Net Total Quantity						3.000 No	
	Say 3.000 No @ Rs 5469.70 / No						Rs 16409.10	
72	od368600/2021_2022 Supplying and fixing following way, horizontal type three pole and neutral, sheet steel, MCB distribution board, 415 V, on surface/ recess, complete with tinned copper bus bar, neutral bus bar, earth bar, din bar, interconnections, powder painted including earthing etc. as required. (But without MCB/RCCB/Isolator) 6 way (4 + 18), Double door							
		8					8.000	
	Total Quantity						8.000 No	
	Total Deducted Quantity						0.000 No	
	Net Total Quantity						8.000 No	
	Say 8.000 No @ Rs 4390.40 / No						Rs 35123.20	
73	od368601/2021_2022 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 outlet 4 way 8 way (4 + 24), Double door=2							
		2					2.000	Average of the above spec
	Total Quantity						2.000 No	
	Total Deducted Quantity						0.000 No	

								Total Deducted Quantity	0.000 metre
								Net Total Quantity	150.000 metre
								Say 150.000 metre @ Rs 263.04 / metre	Rs 39456.00
82	od368610/2021_2022 Laying of one number additional PVC insulated and PVC sheathed / XLPE power cable of 1.1 kV grade of following size direct in ground in the same trench in one tier horizontal formation including excavation and refilling the trench etc. as required, but excluding sand cushioning and protective covering. Above 35 sq. mm and upto 95 sq. mm								
		150							150.000
								Total Quantity	150.000 metre
								Total Deducted Quantity	0.000 metre
								Net Total Quantity	150.000 metre
								Say 150.000 metre @ Rs 215.58 / metre	Rs 32337.00
83	od368611/2021_2022 Erection of metallic pole of following length in cement concrete 1:3:6 (1 cement : 3 coarse sand : 6 graded stone aggregate 40 mm nominal size) foundation including excavation and refilling etc. as required. Above 6.5 meter and upto 8.0 meter								
		50							50.000
								Total Quantity	50.000 No
								Total Deducted Quantity	0.000 No
								Net Total Quantity	50.000 No
								Say 50.000 No @ Rs 4582.03 / No	Rs 229101.50
84	od368612/2021_2022 Supplying and embedding following dia G.I. pipe (medium class) in pole collar/ foundation (during casting) for cable entry including bending the pipe to the required shape complete as required. 32 mm dia								
		50							50.000
								Total Quantity	50.000 metre
								Total Deducted Quantity	0.000 metre
								Net Total Quantity	50.000 metre
								Say 50.000 metre @ Rs 335.16 / metre	Rs 16758.00
85	od368613/2021_2022 Supply and providing imported vertical air terminal with 12 needdled nickel coated spike receiver,supporting rod and stand icluding all accessories as required with possitive absorber(45 metre receiving capacity),supply and laying required quantity of 25x3mm GI strip through epoxy resin cast support,down conductor through wall,vertical run/through parapet,supply and installation of test joint box fabricated out of 16 SWG CRCA sheets,supply and laying required quantity of 32x6mm GI strip through ground including earth work excavation back filling and jointing etc 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 58000.00 / No						Rs 58000.00	
86	od368614/2021_2022 Supply and fitting 1200mm sweep ceiling fan with all accessories as required							
		1	30.000				30.000	
	Total Quantity						30.000 No	
	Total Deducted Quantity						0.000 No	
	Net Total Quantity						30.000 No	
	Say 30.000 No @ Rs 1800.00 / No						Rs 54000.00	
87	od368615/2021_2022 Supply and fitting exhaust fan with all accessories as required(Heavy duty)							
		30					30.000	
	Total Quantity						30.000 No	
	Total Deducted Quantity						0.000 No	
	Net Total Quantity						30.000 No	
	Say 30.000 No @ Rs 2300.00 / No						Rs 69000.00	
88	od368616/2021_2022 Supply and fitting 20 W LED Tube fittings with all accessories as required							
		362					362.000	
	Total Quantity						362.000 No	
	Total Deducted Quantity						0.000 No	
	Net Total Quantity						362.000 No	
	Say 362.000 No @ Rs 500.00 / No						Rs 181000.00	
89	od368617/2021_2022 Supply and laying 2x4 sq.mm alluminium UG cable including excavation of trench and back filling pit							
		480					480.000	
	Total Quantity						480.000 metre	
	Total Deducted Quantity						0.000 metre	
	Net Total Quantity						480.000 metre	
	Say 480.000 metre @ Rs 91.00 / metre						Rs 43680.00	
90	od368618/2021_2022							

	Supply and laying 3.5x35sq.mm PVC AI UG cable including excavation of trench and back filling pit						
	280						280.000
	Total Quantity						280.000 metre
	Total Deducted Quantity						0.000 metre
	Net Total Quantity						280.000 metre
	Say 280.000 metre @ Rs 390.00 / metre						Rs 109200.00
91	od368619/2021_2022 Supply conveyance ,installation testing and commissioning of36/40 W LED street/Yard light out put greater than105 lumen/watts 4000-6000K with IP66 protection with LED chip make cree/Lumilled/Nichea with powerfactor greater than 0.95 at full load ,internal surge protection up to 8 kv and alluminium preasure die cast powder coated housing acryliccover complete with THD less than 10% power factor greater than 0.98 R0HS compliant duly wired up for use on 230v AC supply.Driver compartment should be separately accessible for maintanance(LM 79&80 Certificate from NABL acredited third party lab produced mentioning chip manufacturer)						
	50						50.000
	Total Quantity						50.000 No
	Total Deducted Quantity						0.000 No
	Net Total Quantity						50.000 No
	Say 50.000 No @ Rs 4476.00 / No						Rs 223800.00
92	od368620/2021_2022 Supply and laying 4x16sq.mm alluminium UG cable including excavation of trench and back filling pit						
	190						190.000
	Total Quantity						190.000 metre
	Total Deducted Quantity						0.000 metre
	Net Total Quantity						190.000 metre
	Say 190.000 metre @ Rs 240.00 / metre						Rs 45600.00
93	od368621/2021_2022 Supply installation testing and commissioning of 120Kw grid connected solar pannel with all accessories as required Rs.60000/Kw						
	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 300000.00 / No						Rs 300000.00
94	od368622/2021_2022 Preparation of all drawings submitting and getting approval from electrical inspectorate,submitting of						

	completion certificates and arranging inspection ,getting sanction and energisation certificates from electrical inspectorate &KSEB Ltd,obtaining power feasibility etc for commissioning of the whole installation in the premises.All statutory payments will be reimbursed on production of original receipt.							
		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 150000.00 / L.S						Rs 150000.00	
SI No	Description	No	L	B	D	CF	Quantity	Remark
4Ten year maintenance of the 143 MLD plant and other connected components.(Only the electrical energy charges payable to KSEB during the maintenance period shall be borne by KWA.). (Cost Index:35.59 %)								
1	od368471/2021_2022 SCADA operator (1 No. each in 3 shifts/day)degree/Diploma Holder in concerned filed..							
		3	10.000	365.000			10950.000	
	Total Quantity						10950.000 No	
	Total Deducted Quantity						0.000 No	
	Net Total Quantity						10950.000 No	
	Say 10950.000 No @ Rs 929.20 / No						Rs 10174740.00	
2	od368474/2021_2022 Pump operator (2 Nos. in each 3 shifts/day)-Diploma / ITI holder in concerned field .							
		2*3	10.000	365.000			21900.000	
	Total Quantity						21900.000 No	
	Total Deducted Quantity						0.000 No	
	Net Total Quantity						21900.000 No	
	Say 21900.000 No @ Rs 929.20 / No						Rs 20349480.00	
3	od369693/2021_2022 Chemist 1 No. in a day							
		1	10.000	365.000			3650.000	
	Total Quantity						3650.000 No	
	Total Deducted Quantity						0.000 No	
	Net Total Quantity						3650.000 No	
	Say 3650.000 No @ Rs 929.20 / No						Rs 3391580.00	
4	od368478/2021_2022 Gardener (General shift-1 Nos)							
		1	10.000	365.000			3650.000	

		1	10.000	365.000			3650.000	
	Total Quantity						3650.000 No	
	Total Deducted Quantity						0.000 No	
	Net Total Quantity						3650.000 No	
	Say 3650.000 No @ Rs 813.05 / No						Rs 2967632.50	
10	od369697/2021_2022 Overseer for overall supervision 1No. per day							
		1	10.000	365.000			3650.000	
	Total Quantity						3650.000 No	
	Total Deducted Quantity						0.000 No	
	Net Total Quantity						3650.000 No	
	Say 3650.000 No @ Rs 929.20 / No						Rs 3391580.00	
11	od368498/2021_2022 Labour and material (all costs towards labour, spares, consumables, chemicals, repairs and renewals shall be on to the account of the contractor) cost for replacement of any parts and spares in the aerator,floculator, clarifier,f ilter electrical, mechanical , SCADA, aboratory equipment,plumping items,furniture items,landscaping items,valves. hand rails, gate, all components in the 143 MLD WTP .building and connected stretchers during maintenance period ,If any equipment/machinery/tools,All components connected with the 143 MLD WTP etc (If anything found to be defective either due to manufacture or due to unsatisfactory maintenance, the same should be replaced by the contractor at his cost per year							
	First 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 250000.00 / No						Rs 2500000.00	
12	od368502/2021_2022 Supply and delivery of Hydrated lime as per specification at dosage(or as per condition)							
		10	365.000	0.700			2555.000	
	Total Quantity						2555.000 MT	
	Total Deducted Quantity						0.000 MT	
	Net Total Quantity						2555.000 MT	
	Say 2555.000 MT @ Rs 12980.00 / MT						Rs 33163900.00	
13	od368504/2021_2022 Supply and delivery of Alum (or as per condition)							
		10	365.000	1.1300			4124.500	

	Total Quantity							4124.500 MT
	Total Deducted Quantity							0.000 MT
	Net Total Quantity							4124.500 MT
	Say 4124.500 MT @ Rs 22240.00 / MT							Rs 91728880.00
14	od368508/2021_2022 Supply of liquid chlorine filled in Tonner Cylinders (or as per condition)							
	Five year	10	365.000	0.384			1401.600	
	Total Quantity							1401.600 MT
	Total Deducted Quantity							0.000 MT
	Net Total Quantity							1401.600 MT
	Say 1401.600 MT @ Rs 11152.00 / MT							Rs 15630643.20
15	od369715/2021_2022 Chemicals and materials required for lab for a day							
		10	365.000				3650.000	
	Total Quantity							3650.000 No
	Total Deducted Quantity							0.000 No
	Net Total Quantity							3650.000 No
	Say 3650.000 No @ Rs 290.38 / No							Rs 1059887.00
	Total							310041351.75
	Centage @							0.0%
	Centage Amount							0.00
	Provision for GST payments (in %) @							18.0%
	Amount reserved for GST payments							55807443.32
	Total & Centage							365848795.07
	Lumpsum for round off							0.00
	GRAND TOTAL Rs							365848795.07
	Rounded Grand Total Rs 36,58,48,795							
	Rupees Thirty Six Crore Fifty Eight Lakh Forty Eight Thousand Seven Hundred and Ninety Five Only							

General Abstract

Interim Augmentation of Kochi City and adjoining areas- phase-1- Proposed WTP at Aluva-Filter house No.1,2&3,Clear water sump, OHSR, Wash Water tank.

(Dsr year: 2018)

SI No	Heading Description	Amount
1	CLEAR WATER SUMP-32.50LL, FILTER HOUSE, WASH WATER TANK-2.10 LL And OHSR-15LL	349108340.40
2	FILTER SHELL	45319603.92
3	Water supply and sanitary works	633206.02
4	Supply and fixing of lab equipments	1016585.00
Total		396077735.34
Centage @		0.0%
Centage Amount		0.00
Provision for GST payments (in %) @		18.0%
Amount reserved for GST payments		71293992.36
Total & Centage		467371727.70
Lumpsum for round off		28272.30
GRAND TOTAL Rs		467400000.00
Kerala Water Authority		Rounded Grand Total Rs 46,74,00,000
PRICE		Rupees Forty Six Crore Seventy Four Lakh Only

Detailed Estimate

Interim Augmentation of Kochi City and adjoining areas- phase-1- Proposed WTP at Aluva-Filter house No.1,2&3,Clear water sump, OHSR, Wash Water tank.

(Dsr year: 2018)

SI No	Description	No	L	B	D	CF	Quantity	Remark	
1 CLEAR WATER SUMP-32.50LL, FILTER HOUSE, WASH WATER TANK-2.10 LL And OHSR-15LL (Cost Index:35.59 %)									
1	20.2A.1 Boring, providing and installation bored cast-in-situ reinforced cement concrete piles of grade M-25 of specified diameter and length below pile cap, to carry a safe working load not less than specified, excluding the cost of steel reinforcement but including the cost of boring with bentonite solution and temporary casing of appropriate length for setting out and removal of same and the length of the pile to be embedded in the pile cap etc. by Crawler mounted, telescopic boom hydraulic piling Rig all complete, including removal of excavated earth with all its lifts and leads (length of pile for payment shall be measured up to bottom of pile cap). Note: Truck Mounted rotary/TMR/Tube well boring machine shall not be used. 600 mm dia piles								
	PC2 600 mm dia piles	2*28	11.950				669.200		
	PC3 600 mm dia piles	2*24	11.950				573.600		
	Kerala Water Authority Total Quantity						1242.800 metre		
	Total Deducted Quantity						0.000 metre		
	Net Total Quantity						1242.800 metre		
	Say 1242.800 metre @ Rs 4973.92 / metre						Rs 6181587.78		
2	20.2A.2 750 mm dia piles								
	PC1 750mm dia piles	50*2	11.950				1195.000		
	PC4 750 mm dia piles	28	11.950				334.600		
	Total Quantity						1529.600 metre		
	Total Deducted Quantity						0.000 metre		
	Net Total Quantity						1529.600 metre		
	Say 1529.600 metre @ Rs 7201.66 / metre						Rs 11015659.14		
3	20.6.2.1 Vertical load testing of piles in accordance with IS 2911(Part IV) including installation of loading platform and preparation of pile head or construction of test cap and dismantling of test cap after test etc. complete as per specification & the direction of engineer -in-Charge. Single pile above 50 tonne and upto 100 tonne capacity Initial test								

	750 mm	4					4.000	
	600 mm	2					2.000	
	Total Quantity						6.000 per test	
	Total Deducted Quantity						0.000 per test	
	Net Total Quantity						6.000 per test	
	Say 6.000 per test @ Rs 70869.50 / per test						Rs 425217.00	
4	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							
	First lift up to 1.50 m							
	Comp. 1 and 2	2	32.350	28.100	1.500		2727.106	
	Additional filter Units Comp.1 Sump	1	26.850	21.000	1.500		845.776	
	Total Quantity						3572.882 cum	
	Total Deducted Quantity						0.000 cum	
	Net Total Quantity						3572.882 cum	
	Say 3572.882 cum @ Rs 214.03 / cum						Rs 764703.93	
5	2.7.1 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.Ordinary rock							
	Second Lift and Additional filter Units							
	Sump comp 1 and 2	2	32.350	28.100	1.500		2727.106	
	for pile caps- pc-1	50	3.725	1.850	1.500		516.844	
	" PC-2	28	3.200	1.700	0.170		25.895	
	" PC3	24	3.200	1.700	0.170		22.196	
	" PC4	1	1.400	1.400	0.170		0.334	
	Additional Filter units comp 1 Sump	1	26.850	21.000	0.620		349.587	
	Additional Filter units comp 1 Sump x-x	1*2*5	1.950	1.950	0.750		28.519	
	"	1*5*2	3.240	0.900	0.750		21.871	
	"	1*5*2	3.010	0.600	0.750		13.545	
	"	1*5*2	2.780	0.600	0.750		12.510	

	Additional Filter units comp 1 Sump y-y	1*2*2*9	4.230	0.900	0.750		102.790	
	"	1*2*2*9	4.420	0.900	0.750		107.406	
	Juctions							
	Additional Filter Units	1*5*9	0.900	0.900	0.750		-27.337	
	Total Quantity						3928.603 cum	
	Total Deducted Quantity						-27.337 cum	
	Net Total Quantity						3901.266 cum	
	Say 3901.266 cum @ Rs 414.84 / cum						Rs 1618401.19	
6	2.7.3 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.Hard rock (blasting prohibited)							
	Third lift 3.0m to 4.50m							
	Sump bottom	2	32.350	28.100	0.070		127.265	
	PC-1	50	3.725	1.850	0.750		258.422	
	PC-2	28	3.200	1.700	0.750		114.241	
	PC-3	24	3.200	1.700	0.750		97.920	
	PC-4	28	1.400	1.400	0.750		41.160	
	Additional Filter Units Sump bottom	1	26.850	21.000	0.070		39.470	
	Tie beams x-x	2*4	2.850	0.600	0.750		10.260	
	"	2.*4	2.760	0.600	0.750		9.936	
	"	2*4	2.530	0.600	0.750		9.108	
	"	2*10	1.910	0.600	0.750		17.190	
	"	2*10	1.820	0.600	0.750		16.381	
	"	2*10	2.530	0.600	0.750		22.770	
	Y-Y	2*4	4.020	0.600	0.750		14.472	
	"	2*8	4.220	0.600	0.750		30.384	
	"	2*4	.75+.55	0.600	0.750		4.680	
	"	2*8	0.77+0.75	0.600	0.750		10.944	
	"	2*6	2.880	0.600	0.750		15.552	
	"	2*12	2.140	0.600	0.750		23.113	
	Total Quantity						863.268 cum	

		Total Deducted Quantity				0.000 cum	
		Net Total Quantity				863.268 cum	
		Say 863.268 cum @ Rs 1196.17 / cum				Rs 1032615.28	
7	2.26.2 Extra for every additional lift 1.5 m or part there of in excavation / banking excavated or stacked materials. Ordinary or hard rock						
	Qty same as item-5	1	3292.375				3292.375
	Qty same as item -6	1	823.798		2.0		1647.596
		Total Quantity				4939.971 cum	
		Total Deducted Quantity				0.000 cum	
		Net Total Quantity				4939.971 cum	
		Say 4939.971 cum @ Rs 190.78 / cum				Rs 942447.67	
8	2.16.3 Close timbering in trenches including strutting, shoring and packing cavities (wherever required) complete (Measurements to be taken of the face area timbered). Depth exceeding 3 m but not exceeding 4.5 m						
		Shoring					
	Comp. 1 and 2	2	(32.350+2 8.1)		3.820		461.838
	Additional Filter Units	1	(26.15+20. 30)		2.120		98.475
		Total Quantity				560.313 sqm	
		Total Deducted Quantity				0.000 sqm	
		Net Total Quantity				560.313 sqm	
		Say 560.313 sqm @ Rs 196.06 / sqm				Rs 109854.97	
9	100.7.3 Bailing out water with engine and pumpset above 10 HP upto 20 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	42000.000				42000.000
		Total Quantity				42000.000 Kwh	
		Total Deducted Quantity				0.000 Kwh	
		Net Total Quantity				42000.000 Kwh	
		Say 42000.000 Kwh @ Rs 9.22 / Kwh				Rs 387240.00	
10	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)							
	Pile chipping							
	PC1 750mm dia piles	50*2	0.750	0.750	1.000	0.79	44.438	pi/4 =.79
	PC2 600mm dia piles	28*2	0.600	0.600	1.000	0.79	15.927	
	PC3 600mm dia piles	24*2	0.600	0.600	1.000	0.79	13.652	
	PC4 750 mm dia piles	28*1	0.750	0.750	1.000	0.79	12.443	
	Total Quantity						86.460 cum	
	Total Deducted Quantity						0.000 cum	
	Net Total Quantity						86.460 cum	
	Say 86.460 cum @ Rs 2045.12 / cum						Rs 176821.08	
11	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)							
	PCC for pile cap, Tie beam and Raft bottom							
	Full Raft area	2	31.200	27.100	0.100		169.104	
	Additional Filter Units Sump Raft area	1	26.150	20.300	0.150		79.627	
	"	5*9	0.750	0.150	0.150		0.760	
	PCC Deduction for pile area							
	PC1 750mm dia piles	50*2	0.750	0.750	0.100	0.79	-4.443	
	PC2 600mm dia piles	28*2	0.600	0.600	0.100	0.79	-1.592	
	PC3 600mm dia piles	24*2	0.600	0.600	0.100	0.79	-1.365	
	PC4 750 mm dia piles	28	0.750	0.750	0.100	0.79	-1.244	
	Additional filter units							
	Additional Filter units comp 1 Sump	1	26.850	21.000	0.150		84.578	
	Additional Filter units comp 1 Sump x-x	1*2*5	1.950	1.950	0.150		5.704	
	"	1*5*2	3.240	0.900	0.150		4.375	
	"	1*5*2	3.010	0.600	0.150		2.709	
	"	1*5*2	2.780	0.600	0.150		2.502	
	Additional Filter units comp 1 Sump y-y	1*2*2*9	4.230	0.900	0.150		20.558	

	"	1*2*2*9	4.420	0.900	0.150		21.482	
	Juctions							
	Additional Filter Units	1*5*9	0.900	0.900	0.150		-5.467	
	Total Quantity						391.399 cum	
	Total Deducted Quantity						-14.111 cum	
	Net Total Quantity						377.288 cum	
	Say 377.288 cum @ Rs 7367.55 / cum						Rs 2779688.20	
12	5.33.1 Providing and laying in position machine batched and machine mixed design mix M-25 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 upto plinth level							
	Pile cap tie beams and Sump floor							
	PC1	50	3.525	1.650	0.750		218.110	
	PC2	28	3.000	1.500	0.750		94.500	
	PC3	24	3.000	1.500	0.750		81.000	
	PC4	28	1.200	1.200	0.750		30.241	
	Tie beams x-x	2*4	2.850	0.600	0.750		10.260	
	"	2.*4	2.760	0.600	0.750		9.936	
	"	2*4	2.530	0.600	0.750		9.108	
	"	2*10	1.910	0.600	0.750		17.190	
	"	2*10	1.820	0.600	0.750		16.381	
	"	2*10	2.530	0.600	0.750		22.770	
	Y-Y	2*4	4.020	0.600	0.750		14.472	
	"	2*8	4.220	0.600	0.750		30.384	
	"	2*4	.75+.55	0.600	0.750		4.680	
	"	2*8	0.77+0.75	0.600	0.750		10.944	
	"	2*6	2.880	0.600	0.750		15.552	
	"	2*12	2.140	0.600	0.750		23.113	
	FOR satair area	2	1.050	0.600	0.750		0.946	
	"	3	1.800	0.600	0.750		2.430	
	"	2	5.300	0.600	0.750		4.770	

		2	2.760	0.600	0.750		2.484	
	Raft	2	31.200	27.100	0.450		760.968	
R.C.C WORKS UPTO PLINTH LEVEL (FILTER HOUSE FLOOR LEVEL)								
	SUMP WALLS - comp.1 and -2 Long walls	2*2	30.600	0.350	3.300		141.372	
	" SHORT WALL	2*2	26.500	0.350	3.300		122.430	
	Columns C1 75X35cm	2*23	0.750	0.350	3.300		39.848	
	Columns c2 - 75x60 cm	2*35	0.750	0.600	3.300		103.950	
	Column c3 -45x45 cm	2*24	0.450	0.450	3.300		32.076	
	Column c4 40x30 cm	8	0.400	0.300	3.300		3.168	
	SUMP Roof slab comp.1 and.2	2	31.300	26.500	0.350		580.615	
	Beams xx	2*2*5	1.000	0.350	1.000		7.000	
	"	2*2*5	3.140	0.350	1.000		21.980	
	"	2*2*5	3.360	0.350	1.000		23.520	
	Beams yy	2*7*6	4.800	0.350	1.000		141.120	
Kerala Water Authority DEDUCTIONS								
	COLUMNS FROM WALL C1 ,C4	2*22	0.750	0.350	4.450		-51.397	
	" C1 ,C4	2*6	0.350	0.350	4.450		-6.541	
Additional filter units								
	Additional Filter units comp 1 Sump Raft	1	26.850	21.000	0.450		253.733	
	Additional Filter units comp 1 Sump x-x	1*2*5	1.950	1.950	0.750		28.519	
	"	1*5*2	3.240	0.900	0.750		21.871	
	"	1*5*2	3.010	0.600	0.750		13.545	
	"	1*5*2	2.780	0.600	0.750		12.510	
	Additional Filter units comp 1 Sump y-y	1*2*2*9	4.230	0.900	0.750		102.790	
	"	1*2*2*9	4.420	0.900	0.750		107.406	
	Additional Filter units comp 1 Sump Long wall	1*2	26.150	0.350	2.600		47.593	

	Short Wall	1*2	19.450	0.350	2.600		35.399		
	Columns c2 - 75x60 cm	1*21	0.600	0.750	2.600		24.570		
	Columns c3 - 45x45 cm	1*16	0.450	0.450	2.600		8.425		
	columns c4 - 35x75 cm	1*24	0.350	0.750	2.600		16.380		
	Juctions								
	Additional Filter Units	1*5*9	0.900	0.900	0.750		-27.337		
	Columns in sump wall	1*20	0.350	0.750	2.600		-13.649		
	"	1*4	0.350	0.350	2.600		-1.273		
	R.C.C WORKS UPTO PLINTH LEVEL (ADDITIONAL FILTER HOUSE FLOOR LEVEL)								
	SUMP Roof slab comp. 1	1	26.150	20.300	0.350		185.796		
	Beams xx	2*5	1.000	0.350	1.000		3.500		
	"	2*5	3.140	0.350	1.000		10.990		
	"	2*5	3.360	0.350	1.000		11.760		
	"	2*5	3.120	0.350	1.000		10.920		
	Beams yy	2*2*7	4.250	0.350	1.000		41.650		
	"	2*2*7	4.420	0.350	1.000		43.316		
	Total Quantity						3577.991 cum		
	Total Deducted Quantity						-100.197 cum		
	Net Total Quantity						3477.794 cum		
	Say 3477.794 cum @ Rs 9413.54 / cum						Rs 32738352.93		
13	5.33.2 Providing and laying in position machine batched and machine mixed design mix M-25 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								
	RCC WORKS ABOVE PLINTH LEVEL UPTO floor V Level								
	Up to working platform Columns - C1	2*23	0.750	0.350	5.350		64.602		
	" C2	2*35	0.750	0.350	5.350		98.307		

" C4	8	0.400	0.300	5.350		5.136	
FILTER HOUSE beams XX	2*2*5	1.000	0.350	5.350		37.450	
" XX	2*2*5	3.140	0.350	5.350		117.593	
" XX	2*2*5	3.360	0.350	5.350		125.832	
" YY	2*2*7*6	4.800	0.350	5.350		1509.984	
for trough	2*24	8.400	1.800	0.120		87.092	
Up to floor v level-C1	2*23	0.750	0.350	10.400		125.580	
" C2	2*35	0.750	0.350	10.400		191.100	
" C4	8	0.750	0.350	10.400		21.840	
Beams Working Plat form & Office Floor xx	2*2*2*7	4.940	0.350	0.600		58.095	
" xx	2*2*7	3.360	0.350	0.600		19.757	
" xx	2*2*7	3.320	0.350	0.600		19.522	
" yy	2*2*9*6	4.800	0.350	0.600		217.728	
Roof Slabs Working Plat form	2*1	26.500	31.300	0.125		207.363	
office floor	2	31.300	26.500	0.150		248.835	
Lintels with Sunshade Working plat form & Office Room Long side	2*2	31.300	0.200	0.200		5.009	
Lintels with Sunshade Working plat form & Office Room Short side	2*2	26.500	0.600	0.100		6.360	
Sunshade Shorter side	2*2	27.100	0.600	0.100		6.505	
" Sunshade Longer side	2*2	31.900	0.600	0.100		7.656	
Above Floor V Level							
Compartment-1&2, Column upto tank bottom	42*2	0.350	0.750	3.400		74.970	
Compartment 1 Column additional height	42*1	0.350	0.750	2.800		30.870	

Bracing beam compartment	12	4.800	0.350	0.450		9.072	
Bracing beam Honge compartment	12*2	0.350	0.300	0.300	0.5	0.378	
Office level balance - Compartment-1&2, beam1	12*2	4.800	0.350	0.450		18.144	
Office level balance - Compartment-1&2, beam2	20*2	4.420	0.350	0.450		27.846	
Office level balance - Compartment-1&2, beam3	10*2	4.220	0.350	0.450		13.293	
Office level balance - Compartment-1&2, beam4	7*2*2	4.940	0.350	0.450		21.786	
Office level balance - Compartment-1&2, beam5	7*2*2	3.360	0.350	0.450		14.818	
Office level balance - Compartment-1&2, beam6	7*2*2	3.330	0.350	0.450		14.686	
Office level balance - Compartment-1&2, Floor Slab	1*2	31.350	26.500	0.150		249.233	
Upto tank bottom - Compartment-1&2, beam1	12*2	4.800	0.350	0.600		24.192	
Upto tank bottom - Compartment-1&2, beam2	20*2	4.420	0.350	0.600		37.128	
Upto tank bottom - Compartment-1&2, beam3	10*2	4.220	0.350	0.600		17.724	
Upto tank bottom - Compartment-1&2, beam3	7*2*2	4.940	0.350	0.600		29.048	
Upto tank bottom - Compartment-1&2, beam4	7*2*2	3.360	0.350	0.600		19.757	

Upto tank bottom - Compartment-1&2, beam5	7*2*2	3.330	0.350	0.600	19.581	
tank floor slab clear water	1	31.350	26.500	0.300	249.233	
tank floor wash water	1	23.200	10.540	0.275	67.246	
Inner column Compartment 2	5	0.300	0.300	1.800	0.810	
Tank Side wall - Compartment 2	2	26.500+31 .35	0.300	2.500	86.775	
Tank Top - Compartment 2	1	31.350	26.500	0.150	124.617	
Inner column - Compartment 1	20	0.300	0.300	2.200	3.960	
Tank Side wall - Compartment 1	2	23+10.34	0.200	1.800	24.005	
Tank Top - Compartment 1	1	23.200	10.540	0.150	36.680	
Walkway lintel	42*2	0.600	0.200	0.200	2.016	
Walkway slab	2	31.950	27.100	0.100	173.169	
Deduction floor slab Working plat form openings	2*12	7.000	2.800	0.125	-58.800	
Manholes	12*2	1.500	1.500	0.125	-6.750	
R.C.C Stair						
Beams	4*2	2.500	0.300	0.300	1.800	
"	4*2	1.400	0.300	0.300	1.008	
"	4*4	3.300	0.300	0.400	6.336	
"	4*2	3.300	0.300	0.400	3.168	
"	4*2	2.500	0.300	0.300	1.800	
Landing slabs	5	3.300	2.500	0.150	6.188	
"	2	4.700	2.200	0.150	3.103	
passage	4	10.900	1.200	0.150	7.848	
walk way	9	10.700	1.200	0.150	17.334	
waste slabs	18	5.020	1.500	0.150	20.331	
ro OHSR top	1	4.370	1.200	0.150	0.787	

	STEPS	2*13*8	1.500	0.300	0.15/2		7.020	
	To OHSR top	1*15	1.200	0.250	0.2/2		0.450	
Additional Filter Units RCC WORKS ABOVE PLINTH LEVEL								
	Up to working platform Columns - C1	1*41	0.750	0.350	4.050		43.589	
	" C2	1*16	0.450	0.450	4.050		13.122	
	FILTER HOUSE beams XX	2*5	1.000	0.350	1.000		3.500	
	" XX	2*5	3.140	0.350	1.000		10.990	
	" XX	2*5	3.360	0.350	1.000		11.760	
	" XX	2*7	3.120	0.350	1.000		15.288	
	" YY	2*7	4.800	0.350	1.000		23.520	
	for trough	2*6	8.400	1.800	0.120		21.773	
	Up Filter Roof slab bottom to f-C1	1*41	0.750	0.350	4.150		44.665	
	" C2	1*16	0.450	0.450	4.150		13.447	
	Beams Working Plat form & Office Floor xx	2*5	1.950	0.350	0.600		4.095	
	" xx	2*5	3.140	0.350	0.600		6.594	
	" xx	2*5	3.360	0.350	0.600		7.056	
	" xx	2*5	3.120	0.350	0.600		6.552	
	" yy	2*9	4.230	0.350	0.600		15.990	
	" yy	2*9	4.420	0.350	0.600		16.708	
	Roof Slabs Working Plat form	1	26.150	20.300	0.150		79.627	
	Working Plat form floor	1	26.150	20.300	0.150		79.627	
	Lintels with Working plat form Long side	2*1	26.150	0.200	0.150		1.570	
	Lintels with Working plat form Short side	2*1	20.300	0.200	0.150		1.219	
	Sunshade Working plat form Long side	2*2	27.350	0.600	0.100		6.564	
	Sunshade Shorter side	2*2	21.500	0.600	0.100		5.160	

	Wash water through wall	1*8	8.400	0.800	0.450		24.193		
	Filter Media side walls Longer side	1*2	26.150	0.350	4.150		75.966		
	" Shorter side	1*2	20.300	0.350	4.150		58.972		
	Channel	1*2	20.000	1.500	0.200		12.000		
	Total Quantity						5253.103 cum		
	Total Deducted Quantity						-65.550 cum		
	Net Total Quantity						5187.553 cum		
	Say 5187.553 cum @ Rs 11065.64 / cum							Rs 57403593.98	
14	5.38 Extra for R.C.C. /B.M.C/R.M.C. work above floor V level for each four floors or part thereof.								
	Above Floor V Level								
	Compartment-1&2, Column upto tank bottom	42*2	0.350	0.750	3.400		74.970		
	Office level balance - Compartment-1&2, beam1	12*2	4.800	0.350	0.450		18.144		
	Office level balance - Compartment-1&2, beam2	20*2	4.420	0.350	0.450		27.846		
	Office level balance - Compartment-1&2, beam3	10*2	4.220	0.350	0.450		13.293		
	Office level balance - Compartment-1&2, beam4	7*2*2	4.940	0.350	0.450		21.786		
	Office level balance - Compartment-1&2, beam5	7*2*2	3.360	0.350	0.450		14.818		
	Office level balance - Compartment-1&2, beam6	7*2*2	3.330	0.350	0.450		14.686		
	Office level balance - Compartment-1&2, Floor Slab	1*2	31.350	26.500	0.150		249.233		

	Upto tank bottom - Compartment-1&2, beam1	12*2	4.800	0.350	0.600		24.192	
	Upto tank bottom - Compartment-1&2, beam2	20*2	4.420	0.350	0.600		37.128	
	Upto tank bottom - Compartment-1&2, beam3	10*2	4.220	0.350	0.600		17.724	
	Upto tank bottom - Compartment-1&2, beam3	7*2*2	4.940	0.350	0.600		29.048	
	Upto tank bottom - Compartment-1&2, beam4	7*2*2	3.360	0.350	0.600		19.757	
	Upto tank bottom - Compartment-1&2, beam5	7*2*2	3.330	0.350	0.600		19.581	
	tank floor slab	1*2	31.350	26.500	0.300		498.466	
	Inner column Compartment 2	20	0.300	0.300	2.500		4.500	
	Tank Side wall - Compartment 2	2	26.500+31 .35	0.300	2.500		86.775	
	Tank Top - Compartment 2	1	31.350	26.500	0.150		124.617	
	Inner column - Compartment 1	20	0.300	0.300	2.200		3.960	
	Tank Side wall - Compartment 1	2	26.500+31 .35	0.300	2.200		76.363	
	Tank Top - Compartment 1	1	31.350	26.500	0.150		124.617	
	Sunshade lintle	42*2	0.600	0.200	0.200		2.016	
	Sunshade slab	2	31.950	27.100	0.100		173.169	
						Total Quantity	1676.689 cum	
						Total Deducted Quantity	0.000 cum	
						Net Total Quantity	1676.689 cum	
						Say 1676.689 cum @ Rs 330.70 / cum	Rs 554481.05	
15	5.34.1							

Extra for providing richer mixes at all floor levels. Note:- Excess/less cement over the specified cement content used is payable/ recoverable separately. Providing M-30 grade concrete instead of M-25 grade BMC/RMC. (Note:- Cement content considered in M-30 is @ 340 kg/cum).								
Above Floor V Level								
Compartment-1&2, Column upto tank bottom	42*2	0.350	0.750	3.400			74.970	
Compartment-1 Column additional Column height	42*1	0.350	0.450	2.800			18.522	
Bracing beam Compartment 1	12	4.800	0.350	0.450			9.072	
Bracing beam Honge Compartment1	12*2	0.350	0.300	0.300			0.756	
Upto tank bottom - Compartment-1&2, beam1	12*2	4.800	0.350	0.600			24.192	
Upto tank bottom - Compartment-1&2, beam2	20*2	4.420	0.350	0.600			37.128	
Upto tank bottom - Compartment-1&2, beam3	10*2	4.220	0.350	0.600			17.724	
Upto tank bottom - Compartment-1&2, beam4	7*2*2	4.940	0.350	0.600			29.048	
Upto tank bottom - Compartment-1&2, beam5	7*2*2	3.360	0.350	0.600			19.757	
Upto tank bottom - Compartment-1&2, beam6	7*2*2	3.330	0.350	0.600			19.581	
tank floor slab	2	31.350	26.500	0.300			498.466	
Inner column Compartment 2	20	0.300	0.300	2.500			4.500	
Tank Side wall - Compartment 2	2	26.500+31 .35	0.300	2.500			86.775	
Tank Top - Compartment 2	1	31.350	26.500	0.150			124.617	

	Inner column - Compartment 1	20	0.300	0.300	2.200		3.960		
	Tank Side wall - Compartment 1	2	26.500+31 .35	0.300	2.200		76.363		
	Tank Top - Compartment 1	2	31.350	26.500	0.150		249.233		
	Walkway lintel	42*2	0.600	0.200	0.200		2.016		
	Walkway slab	2	31.950	27.100	0.100		173.169		
	Qty same as item-12 and 13	1	3477.794+ 5187.553				8665.347		
	600 mm dia piles qty	1	440.850				440.850	1560x3.14 x(0.6x0.60)/4=440.85	
	750 mm dia piles	1	688.830				688.830	1920x3.14 x(0.75x0.7 5)/4=688.8 3=	
	Total Quantity						11264.876 cum		
	Total Deducted Quantity						0.000 cum		
	Net Total Quantity						11264.876 cum		
	Say 11264.876 cum @ Rs 82.10 / cum						Rs 924846.32		
16	5.9.1 Centering and shuttering including strutting, etc. and removal of form for: Foundations, footings, bases of columns, etc for mass concrete								
	Shuttering works plinth level								
	PC1	50*2	3.525+1.6 5		0.750		388.125		
	PC2	28*2	3+1.5		0.750		189.000		
	PC3	24*2	3+1.5		0.750		162.000		
	PC4	18*2*2	1.200		0.750		64.800		
	column C1	2*23	(0.750+0.3 5)*2		3.300		333.960		
	" C2	2*35	(0.75+0.35) *2		3.300		508.200		
	" C3	2*24	(0.45+0.45) *2		3.300		285.120		

" C4	8	(0.4+0.30) *2	3.300	36.960		
Pile cap tie beams and Sump floor						
Tie beams x-x	2*2*4	2.850	0.750	34.200		
"	2*2.*4	2.760	0.750	33.120		
"	2*2*4	2.530	0.750	30.360		
"	2*2*10	1.910	0.750	57.300		
"	2*2*10	1.820	0.750	54.600		
"	2*2*10	2.530	0.750	75.900		
Y-Y	2*2*4	4.020	0.750	48.240		
"	2*2*8	4.220	0.750	101.280		
"	2*2*4	.75+.55	0.750	15.601		
"	2*2*8	0.77+0.75	0.750	36.481		
Additional filter units						
Additional Filter units comp 1 Sump Raft	1*2	(26.850+2 1)	0.450	43.066		
Additional Filter units comp 1 Sump x-x	1*2*2*5	1.950	0.750	29.250		
"	1*5*2*2	3.240	0.750	48.600		
"	1*5*2*2	3.010	0.750	45.150		
"	1*5*2*2	2.780	0.750	41.700		
Additional Filter units comp 1 Sump y-y	1*2*2*2*9	4.230	0.750	228.421		
"	1*2*2*2*9	4.420	0.750	238.680		
Columns c2 - 75x60 cm	1*21	2.700	2.600	147.421		
Columns c3 - 45x45 cm	1*16	1.800	2.600	74.881		
columns c4 - 35x75 cm	1*24	2.200	2.600	137.281		
Total Quantity				3489.697 sqm		
Total Deducted Quantity				0.000 sqm		
Net Total Quantity				3489.697 sqm		
Say 3489.697 sqm @ Rs 335.31 / sqm				Rs 1170130.30		
17	5.9.5					

Centering and shuttering including strutting, etc. and removal of form for:Lintels, beams, plinth beams, girders bressumers and cantilevers								
Above Floor V Level								
Office level balance - Compartment-1&2, beam1	12*2*2	4.800		0.450		103.680		
Bracing beam bottom Compartment 1	12	4.800	0.350			20.160		
Bracing beam bottom Compartment 1	12*2	4.800		0.450		51.840		
Office level balance - Compartment-1&2, beam2	20*2*2	4.420		0.450		159.120		
	20*2	4.420	0.350			61.880		
Office level balance - Compartment-1&2, beam3	10*2*2	4.220		0.450		75.961		
	10*2	4.220	0.350			29.540		
Office level balance - Compartment-1&2, beam4	7*2*2*2	4.940		0.450		124.489		
	7*2*2	4.940	0.350			48.413		
Office level balance - Compartment-1&2, beam5	7*2*2*2	3.360		0.450		84.672		
	7*2*2	3.360	0.350			32.928		
Office level balance - Compartment-1&2, beam6	7*2*2*2	3.330		0.450		83.917		
	7*2*2	3.330	0.350			32.634		
Office level balance - Compartment-1&2, Floor Slab	1*2	30.650	25.800			1581.540		
Upto tank bottom - Compartment-1&2, beam1	12*2*2	4.800		0.600		138.240		
	12*2	4.800	0.350			40.320		

	Upto tank bottom - Compartment-1&2, beam2	20*2*2	4.420		0.600	212.160	
		20*2	4.420	0.350		61.880	
	Upto tank bottom - Compartment-1&2, beam3	10*2*2	4.220		0.600	101.280	
		10*2	4.220	0.350		29.540	
	Upto tank bottom - Compartment-1&2, beam3	7*2*2*2	4.940		0.600	165.984	
		7*2*2	4.940	0.350		48.413	
	Upto tank bottom - Compartment-1&2, beam4	7*2*2*2	3.360		0.600	112.896	
		7*2*2	3.360	0.350		32.928	
	Upto tank bottom - Compartment-1&2, beam5	7*2*2*2	3.330		0.600	111.888	
		7*2*2	3.330	0.350		32.634	
	tank floor slab	2	30.650	25.800	0.300	474.462	
	Tank Top Compartment 2	1	30.650	25.800	0.150	118.616	
	Tank Top Compartment 1	1	30.650	25.800	0.150	118.616	
	Walkway lintel	42*2*2	0.600		0.200	20.160	
		42*2	0.600	0.200		10.080	
	Walkway slab	2	23.550	18.700	0.100	88.077	
SHUTTERING WORKS UPTO PLINTH LEVEL							
	Beams xx SIDES	2*2*2*5	1.000+.35		1.000	54.000	
	"	2*2*2*5	3.140+.35		1.000	139.601	
	"	2*2*2*5	3.360+.35		1.000	148.400	
	Beams yy	2*2*7*6	4.800+.35		1.000	865.200	
	Beams xx BOTTOM	2*2*5	1.000	0.350		7.000	
		2*2*5	3.140	0.350		21.980	
		2*2*5	3.360	0.350		23.520	

	Beams YY BOTTOM	2*2*7*6	4.800	0.350			282.240	
	RCC WORKS ABOVE PLINTH LEVEL UPTO floor V Level							
	Beams Working Plat form & Office Floor xx beam side	2*2*2*7	4.940			0.600	331.968	
	Beams Working Plat form & Office Floor xx beam bottom	2*2*2*7	4.940	0.350			96.825	
	Beams Working Plat form & Office Floor xx beam side	2*2*2*7	3.360			0.600	112.896	
	Beams Working Plat form & Office Floor xx beam bottom	2*2*7	3.360	0.350			32.928	
	Beams Working Plat form & Office Floor xx beam side	2*2*2*7	3.320			0.600	111.552	
	Beams Working Plat form & Office Floor xx beam bottom	2*2*7	3.320	0.350			32.536	
	Beams Working Plat form & Office Floor yy beam side	2*2*2*9*6	4.800			0.600	1244.160	
	Beams Working Plat form & Office Floor xx beam bottom	2*2*9*6	4.800	0.350			362.880	
	Lintels Working plat form & Office Room Long side	2*2*2	31.300			0.200	50.081	
	Lintels Working plat form & Office Room Shorter side	2*2*2	26.500			0.200	42.401	
	Sunshade Shorter side Bottom	2*2	27.100	0.600			65.041	
	Sunshade Longer side Bottom	2*2	31.900	0.600			76.560	
	Window S Top Working plat form & Office Room	2*2*23	2.000	0.350			64.400	
	Additional Filter Units Form works							

	FILTER HOUSE beams Sides XX	2*5	1.000		1.000		10.000	
	" beam bottom	2*5	1.000	0.350			3.500	
	" beams Side XX	2*5	3.140		1.000		31.401	
	" beams bottom XX	2*5	3.140	0.350			10.990	
	" beams Side	2*5	3.360		1.000		33.600	
	" beam bottom	2*5	3.360	0.350			11.760	
	" beams Side	2*5	3.120		1.000		31.201	
	" beams bottom	2*5	3.080	0.350			10.780	
	" beams Side yy	2*2*7	4.230		1.000		118.441	
	" beams bottom yy	2*2*7	4.230	0.350			41.455	
	" beams Side YY	2*2*7	4.420		1.000		123.760	
	" beams bottom yy	2*2*7	4.420	0.350			43.316	
	Up Filter Roof slab bottom to f-C1	1*41	2.200		4.150		374.331	
	" C2	1*16	1.800		4.150		119.521	
	Beams Working Plat form Sides xx	2*5	1.000		0.600		6.000	
	" bottom	2*5	1.000	0.350			3.500	
	" beam sides xx	2*5	3.140		0.600		18.840	
	beam bottom	2*5	3.140	0.350			10.990	
	" beam sides xx	2*5	3.360		0.600		20.160	
	beam bottom	2*5	3.360	0.350			11.760	
	" beam sides xx	2*5	3.120		0.600		18.720	
	" beam sides	2*5	3.120	0.350			10.920	
	" beam sides yy	2*9	4.230		0.600		45.685	
	" beam sides yy	2*9	4.420		0.600		47.736	
	" beam bottom yy	2*9	4.420	0.350			27.846	
	Lintels with Working plat form Long side	2*2	26.150		0.150		15.690	
	Lintels with Working plat form Short side	2*2	20.300		0.150		12.180	
	Lintel windows openings	1*18	1.500	0.200			5.400	
						Total Quantity	9794.600 sqm	

		Total Deducted Quantity					0.000 sqm	
		Net Total Quantity					9794.600 sqm	
		Say 9794.600 sqm @ Rs 649.82 / sqm					Rs 6364726.97	
18	5.9.6 Centering and shuttering including strutting, etc. and removal of form for:Columns, Pillars, Piers, Abutments, Posts and Struts							
Above Floor V Level								
	Compartment-1&2, Column upto tank bottom	42*2*2	1.100		3.400	628.320		
	Compartment-1 Additional columns	42*1	1.600		2.800	188.160		
	Inner column Compartment 2	20*2	0.600		2.500	60.000		
	Inner column - Compartment 1	20*2	0.600		2.200	52.801		
SHUTTERING WORKS UPTO PLINTH LEVEL								
	Columns C1	50*2	0.750+0.3 5		4.450	489.501		
	Columns c2	56*2	0.750+0.3 5		4.450	548.240		
	Column c3	48*2	0.450+0.4 5		4.450	384.480		
	Column c4	28*2	0.750+.35		4.450	274.120		
RCC WORKS ABOVE PLINTH LEVEL UPTO floor V Level								
	Up to working platform Columns - C1	50*2	0.750+0.3 5		4.950	544.500		
	" C2	56*2	0.750+.35		4.950	609.840		
	" C4	28*2	0.750+0.3 5		4.950	304.920		
	Up to working platform - C 1	50*2	0.750+.35		7.360	809.601		
	" C2	56*2	0.750+.35		7.360	906.753		
	" C4	28*2	0.750+.35		7.360	453.377		
		Total Quantity					6254.613 sqm	
		Total Deducted Quantity					0.000 sqm	
		Net Total Quantity					6254.613 sqm	

	Say 6254.613 sqm @ Rs 863.64 / sqm						Rs 5401733.97	
19	5.9.7 Centering and shuttering including strutting, etc. and removal of form for:Stairs, (excluding landings) except spiral - staircases)							
	Form work Stair							
	Beams side	4*2*2	2.500		0.300		12.000	
	Beam bottom	4*2	2.500	0.300			6.000	
	Beams side	4*2*2	1.400		0.300		6.720	
	Beam bottom	4*2	1.400	0.300			3.360	
	Beams side	4*4*2	3.300		0.400		42.240	
	Beam bottom	4*4	3.300	0.300			15.840	
	Beams side	4*2*2	3.300		0.400		21.120	
	Beam bottom	4*2	3.300	0.300			7.920	
	Beams side	4*2*2	2.500		0.300		12.000	
	Beam bottom	4*2	2.500	0.300			6.000	
	Landing slab bottom	5	3.300	2.500			41.250	
	Landing slab bottom	2	4.700	2.200			20.681	
	Landing slab bottom	2	4.700	2.200			20.681	
	passage bottom	4	10.900	1.200			52.320	
	sides	4	10.900		0.150		6.540	
	"	4	1.200		0.150		0.720	
	walk way	9	10.700	1.200			115.560	
	sides	9	10.700		0.150		14.445	
	waste slabs	18	5.020	1.500			135.540	
	sides	18*2	5.020		0.350		63.252	
	to OHSR top	1*2	4.370		0.350		3.059	
	STEPS	2*13*8	1.500		0.150		46.800	
	To OHSR top	1*15	1.200		0.200		3.600	
	Total Quantity						657.648 sqm	
	Total Deducted Quantity						0.000 sqm	
	Net Total Quantity						657.648 sqm	
	Say 657.648 sqm @ Rs 732.52 / sqm						Rs 481740.31	
20	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.						
	SHUTTERING OF SUMP WALL & FILTER						
SHORT SIDE OUTER	2*2	26.500		3.600		381.600	
SHORTSIDE INNER	2*2	26.000		3.600		374.401	
LONG SIDE OUTER	2*2	30.600		3.600		440.641	
LONG SIDE INNER	2*2	29.930		3.600		430.992	
SHORT SIDE FILTER OUTER XX	2*2*5	1.000		4.150		83.000	
" XX	2*2*5	3.140		4.150		260.621	
" XX	2*2*5	3.360		4.150		278.880	
SHORT SIDE FILTER INNER XX	2*2*5	0.300		4.150		24.901	
" XX	2*2*5	2.440		4.150		202.521	
" XX	2*2*5	2.660		4.150		220.781	
LONGER SIDE OUTER YY	2*2*7*6	4.800		4.150		3346.561	
" INSIDE YY	2*2*7*6	4.100		4.150		2858.520	
	COLUMN CENTERING DEDUCTION FOR SUMP WALL						
COLUMN C1	2*24*2	0.750		3.600		-259.200	
COLUMN C2	2*4*2		0.350	3.600		-20.160	
	Additional filter units						
Sump wall Longer Out side	1*2	26.150		2.600		135.980	
" Shorter Out side	1*2	20.300		2.600		105.560	
Sump wall Longer Inside	1*2	25.450		2.600		132.340	
" Shorter Inside	1*2	19.600		4.150		162.681	
Filter media Longer out side	1*2	26.150		4.150		217.046	
" Shorter Out side	1*2	20.300		4.150		168.490	
Filter media Longer Inside	1*2	25.450		4.150		211.235	
" Shorter Inside	1*2	19.600		4.150		162.681	
	Additional filter Units Deduction						
Columns in Sump	1*20	1.500		2.600		-78.000	

	"	1*4	0.700		2.600		-7.279		
	Columns in Filter media	1*20	1.500		4.150		-124.500		
	"	1*4	0.700		4.150		-11.620		
	Total Quantity						10199.432 sqm		
	Total Deducted Quantity						-500.759 sqm		
	Net Total Quantity						9698.673 sqm		
	Say 9698.673 sqm @ Rs 717.20 / sqm						Rs 6955888.28		
21	5.9.3 Centering and shuttering including strutting, etc. and removal of form for:Suspended floors, roofs, landings, balconies and access platform								
	SLABS Form Work								
	Sump comp1,2	2	26.500	31.300			1658.900		
	Working plat form & Office room,Terrace floor,OHSR floor	4*2*2	26.500	31.300			13271.200		
	Additional Filter Units SLABS Form Work								
	Sump comp1	1	25.450	19.600			498.821		
	Working plat form & Filter media	1*2	25.450	19.600			997.641		
	Channel	1*2	1.350	0.350			0.945		
	"	1*2		0.350	1.150		0.805		
	"	1*2		0.350	0.800		0.560		
	Filter media channels	1*2	20.000	1.500			60.000		
	Total Quantity						16488.872 sqm		
	Total Deducted Quantity						0.000 sqm		
	Net Total Quantity						16488.872 sqm		
	Say 16488.872 sqm @ Rs 815.78 / sqm						Rs 13451292.00		
22	5.9.16.1 Centering and shuttering including strutting, etc. and removal of form for:Edges of slabs and breaks in floors and wallsUnder 20 cm wide								
	Edges								
	Roof slab working platform & office floor Shorter side	2*2	26.500				106.000		

	Roof slab working platform & office floor Longer side	2*2	31.300				125.200		
	Sunshade working platform & office floor Shorter side	2*2	27.100				108.400		
	Sunshade working platform & office floor Longer side	1	31.900				31.900		
	Additional Filter Units Edges								
	Roof slab working platform & Filter media & Sump Shorter side	3*2	20.300				121.801		
	Roof slab working platform & Filter media & Sump Longer side	3*2	26.150				156.900		
	Sunshade working platform Longer side	2*2	27.350				109.400		
	Sunshade working platform Shorter side	1*2	21.500				43.000		
	Total Quantity						802.601 metre		
	Total Deducted Quantity						0.000 metre		
	Net Total Quantity						802.601 metre		
	Say 802.601 metre @ Rs 203.93 / metre						Rs 163674.42		
23	5.11.1 Extra additional height in centering, shuttering where ever required with adequate bracing, propping etc. including cost of de-shuttering and decentering at all levels, over a height of 3.5m, for every additional height of 1 metre or part thereof (Plan area to be measured).Suspended floors, roofs, landing, beams and balconies (Plan area to be measured)								
		5*2	31.350	26.500			8307.750		
	Total Quantity						8307.750 sqm		
	Total Deducted Quantity						0.000 sqm		
	Net Total Quantity						8307.750 sqm		
	Say 8307.750 sqm @ Rs 338.36 / sqm						Rs 2811010.29		
24	50.6.2.1 Solid block masonry using pre cast solid blocks (Factory made) of size 30x20x15 cm or nearest available size confirming to IS 2185 part I of 1979 for foundation and plinth with thickness 15cm in: CM 1:6 (1 cement :6 coarse sand) etc complete								

		Solid Block						
	Working platform Shorter side	2*2	26.500	0.200	3.450		73.141	
	Working platform Longer side	2*2	31.300	0.200	3.450		86.389	
	Office floor Shorter side	2*2	26.500	0.200	3.450		73.141	
	Office floor Longer side	2*2	31.300	0.200	3.450		86.389	
	Inside wall	1	25.800	0.200	3.450		17.803	
	"	3	25.470	0.200	3.450		52.723	
	"	2	7.000	0.200	3.450		9.661	
	"	2	3.910	0.200	3.450		5.396	
	"	6	4.220	0.200	3.450		17.471	
Deduction for openings								
	Windows	2*2*23	2.000	0.200	1.500		-55.200	
	Door	2*2*2	1.200	0.200	2.100		-4.032	
	Ventilator	2*2*2	0.900	0.200	0.450		-0.648	
Additional filter unit								
	operating platform	1	(26.500+20.65)*2	0.200	3.600		67.896	
	parapet	1	(26.95+21.1)*2	0.150	1.200		17.298	
Additional filter unit								
	window long wall	5*2	1.000	0.350	1.500		-5.249	
	window short wall	4*2	1.000	0.350	1.500		-4.199	
Total Quantity							507.308 cum	
Total Deducted Quantity							-69.328 cum	
Net Total Quantity							437.980 cum	
Say 437.980 cum @ Rs 6237.61 / cum							Rs 2731948.43	
25	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 same as item-12 and 13	1	3477.794+5187.553			140.0	1213148.580	

	600 mm dia piles qty	1	351.215			130.0	45657.950	1242.80x3 .14x(0.6x0 .60)/4=351 .215	
	750 mm dia piles	1	675.414			80.0	54033.120	1529.60x3 .14x(0.75x 0.75)/4= 675.414	
	Total Quantity						1312839.650 kilogram		
	Total Deducted Quantity						0.000 kilogram		
	Net Total Quantity						1312839.650 kilogram		
	Say 1312839.650 kilogram @ Rs 98.30 / kilogram						Rs 129052137.59		
26	13.16.1 6 mm cement plaster of mix:1:3 (1 cement : 3 fine sand)								
	CEILING PLASTERING								
	Basement floor - Sump	2	30.640	25.800			1581.024		
	Ground floor- Filter house	2*12	7.700	4.800			887.040		
	Working platform	2	30.640	25.800			1581.024		
	Office floor	2	30.640	25.800			1581.024		
	Terrace floor	2	30.640	25.800			1581.024		
	Celing deduction								
	Deduction floor slab working plat form opening	2*12	7.000	2.800			-470.400		
	Manholes	12*2	1.500	1.500			-54.000		
	Additional filter unit								
	sump roof ceiling	1	26.150	20.300			530.845		
	filter media roof ceiling	1	26.150	20.300			530.845		
	operating platform roof ceiling	1	26.150	20.300			530.845		
	Total Quantity						8803.671 sqm		
	Total Deducted Quantity						-524.400 sqm		
	Net Total Quantity						8279.271 sqm		
	Say 8279.271 sqm @ Rs 267.59 / sqm						Rs 2215450.13		

27	13.7.1 12 mm cement plaster finished with a floating coat of neat cement of mix:1:3 (1 cement : 3 fine sand)							
Plastering Walls & Columns								
	sump sidewall	2*2*2	25.800		3.600		743.041	
		2*2*2	30.590		3.600		880.992	
	Sump inside columns	35*2	2.700		3.600		680.401	
Above Floor V Level								
	Office level balance - Compartment-1&2, beam1	12*2*2	4.800		0.450		103.680	
	Compartment 1 Bracing Beam Bottom	12	4.800	0.350			20.160	
	Compartment 1 Bracing Beam Sides	12*2	4.800		0.450		51.840	
	Office level balance - Compartment-1&2, beam2	20*2*2	4.420		0.450		159.120	
		20*2	4.420	0.350			61.880	
	Office level balance - Compartment-1&2, beam3	10*2*2	4.220		0.450		75.961	
		10*2	4.220	0.350			29.540	
	Office level balance - Compartment-1&2, beam4	7*2*2*2	4.940		0.450		124.489	
		7*2*2	4.940	0.350			48.413	
	Office level balance - Compartment-1&2, beam5	7*2*2*2	3.360		0.450		84.672	
		7*2*2	3.360	0.350			32.928	
	Office level balance - Compartment-1&2, beam6	7*2*2*2	3.330		0.450		83.917	
		7*2*2	3.330	0.350			32.634	
	Office level balance - Compartment-1&2, Floor Slab	1*2	30.650	25.800			1581.540	

	Upto tank bottom - Compartment-1&2, beam1	12*2*2	4.800		0.600	138.240	
		12*2	4.800	0.350		40.320	
	Upto tank bottom - Compartment-1&2, beam2	20*2*2	4.420		0.600	212.160	
		20*2	4.420	0.350		61.880	
	Upto tank bottom - Compartment-1&2, beam3	10*2*2	4.220		0.600	101.280	
		10*2	4.220	0.350		29.540	
	Upto tank bottom - Compartment-1&2, beam3	7*2*2*2	4.940		0.600	165.984	
		7*2*2	4.940	0.350		48.413	
	Upto tank bottom - Compartment-1&2, beam4	7*2*2*2	3.360		0.600	112.896	
		7*2*2	3.360	0.350		32.928	
	Upto tank bottom - Compartment-1&2, beam5	7*2*2*2	3.330		0.600	111.888	
		7*2*2	3.330	0.350		32.634	
	tank floor slab	2	30.650	25.800	0.300	474.462	
	Tank Top - Compartment 2	1	30.650	25.800	0.150	118.616	
	Tank Top - Compartment 1	1	30.650	25.800	0.150	118.616	
	Walkway lintel	42*2*2	0.600		0.200	20.160	
		42*2	0.600	0.200		10.080	
	Walkway slab	2	23.550	18.700	0.100	88.077	
Above Floor V Level							
	Compartment-1&2, Column upto tank bottom	42*2*2	1.100		3.400	628.320	
	Compartment - 1 Additional Columns	42	1.600		2.800	188.160	

	Inner column Compartment 2	20*2	0.600		2.500		60.000	
	Inner column - Compartment 1	20*2	0.600		2.200		52.801	
Above Floor V Level								
	Tank Side wall - Compartment 2	2*2*2	26.500+31 .35		2.500		1157.000	
	Tank Side wall - Compartment 1	2*2*2	26.500+31 .35		2.200		1018.161	
Sunshade								
	Working Plat form Top & bottom Shorter side	2*2*2	27.100	0.600			130.081	
	Working Plat form Top & bottom Longer side	2*2*2	31.900	0.600			153.120	
	Office room Top & bottom Shorter side	2*2*2	27.100	0.600			130.081	
	Office room Top & bottom Longer side	2*2*2	31.900	0.600			153.120	
	Sunshade edges Working Plat form & Office room Longer side	2*2*2	31.900		0.100		25.520	
	Sunshade edges Working Plat form & Office room Shorter side	2*2*2	27.100		0.100		21.681	
Plastering:-Working platform,Office floor								
	Working platform Shorter side	2*2*2	26.500		3.450		731.401	
	Working platform Longer side	2*2*2	31.300		3.450		863.881	
	Office floor Shorter side	2*2*2	26.500		3.450		731.401	
	Office floor Longer side	2*2*2	31.300		3.450		863.881	
	Inside wall	1*2	25.800		3.450		178.020	
	"	3*2	25.470		3.450		527.229	
	"	2*2	7.000		3.450		96.601	

"	2*2	3.910		3.450		53.959	
"	6*2	4.220		3.450		174.708	
Inside wall							
Inside wall	1*2	25.800	0.200	3.450		35.605	
"	3*2	25.470	0.200	3.450		105.446	
"	2*2	7.000	0.200	3.450		19.321	
"	2*2	3.910	0.200	3.450		10.792	
"	6*2	4.220	0.200	3.450		34.942	
Stair Plastering							
Beams side	4*2	2.500		0.300		6.000	
Beam bottom	4*2	2.500	0.300			6.000	
Beams side	4*2	1.400		0.300		3.360	
Beam bottom	4*2	1.400	0.300			3.360	
Beams side	4*4	3.300		0.400		21.120	
Beam bottom	4*4	3.300	0.300			15.840	
Beams side	4*2*2	3.300		0.400		21.120	
Beam bottom	4*2	3.300	0.300			7.920	
Beams side	4*2	2.500		0.300		6.000	
Beam bottom	4*2	2.500	0.300			6.000	
Landing slab bottom	5	3.300	2.500			41.250	
Landing slab bottom	2	4.700	2.200			20.681	
Landing slab bottom	2	4.700	2.200			20.681	
passage bottom	4	10.900	1.200			52.320	
sides	4	10.900		0.150		6.540	
"	4	1.200		0.150		0.720	
walk way	9	10.700	1.200			115.560	
sides	9	10.700		0.150		14.445	
waste slabs	18	5.020	1.500			135.540	
sides	18	5.020		0.350		31.626	
to OHSR top	1*2	4.370		0.350		3.059	
STEPS Riser	2*13*8	1.500		0.150		46.800	
Steps Tread	13*8	1.500	0.300			46.800	
OHSR top Riser	2*15	1.200		0.200		7.200	

	OHSR top Tread	1*15	1.200	0.200			3.600	
	Additional filter unit							
	operating platform outside	1	21+26.85		3.600	2.0	344.521	
	do inside	1	20.3+26.1 5		3.600	2.0	334.441	
	parapet outside	1	27.05+21. 2		1.200	2.0	115.800	
	do inside	1	20.3+26.1 5		1.200	2.0	111.480	
	do top	1	26.9+20.6	0.150			7.125	
	first floor outside	1	21+26.85		3.700		177.046	
	inside	1	20.3+26.1 5		3.700		171.865	
	filter wall	2*2	20.300		3.100		251.721	
	do top	2	20.300		0.350		14.210	
	ground floor outside	1	21+26.85		2.600		124.411	
	inside	1	20.3+26.1 5		2.600		120.771	
	beam side SUMP & FM longitude	(5+5)*2	3.140		1.000		62.801	
	beam side SUMP & FM longitude	(5+5)*2	3.360		1.000		67.200	
	beam side SUMP & FM longitude	(5+5)*2	3.120		1.000		62.401	
	beam side SUMP & FM trans	(7+7)*2	4.230		1.000		118.441	
	beam side SUMP & FM trans	(7+7)*2	4.420		1.000		123.760	
	beam side Operating platform Longitude	(5+5)*2	3.140		0.450		28.260	
	beam side Operating platform Longitude	(5+5)*2	3.360		0.450		30.241	
	beam side Operating platform Longitude	(5+5)*2	3.120		0.450		28.081	
	beam side Operating platform transverse	(7+7)*2	4.230		0.450		53.298	

	beam side Operating platform transverse	(7+7)*2	4.420		0.450		55.692		
	column SUMP 75x35	21*2		0.750	1.600		50.401		
	do	21*2		0.350	1.600		23.520		
	column 45x45	16*4		0.450+.45	3.150	2.0	362.880		
	do FM 75x35	21*2		0.750	3.150		99.225		
	do	21*2		0.350	3.150		46.305		
	column 45x45	16*4		0.450	3.150		90.720		
	do operating platform 75x35	21*2		0.750	3.600		113.400		
		21*2		0.350	3.600		52.920		
	column 45x45	16*4		0.450	3.600		103.680		
	Terrace area	1	20.300	26.150			530.845		
	Additional filter unit								
	window long wall	5*2	1.000	0.350	1.500		-5.249		
	window short wall	4*2	1.000	0.350	1.500		-4.199		
	Total Quantity						19379.618 sqm		
	Total Deducted Quantity						-9.448 sqm		
	Net Total Quantity						19370.170 sqm		
	Say 19370.170 sqm @ Rs 401.21 / sqm						Rs 7771505.91		
28	<p>11.46.2 Providing and laying Vitrified tiles indifferent sizes (thickness to be specified by manufacturer), with water absorption less than 0.08 % and conforming to I.S. 15622, of approved make, in all colours & shade, in skirting, riser of steps, over 12 mm thick bed of cement mortar 1:3 (1 cement : 3 coarse sand), including grouting the joint with white cement & matching pigments etc. complete. Size of Tile 600x600 mm</p>								
	Floor tiles								
	Sump Floor	2	29.900	25.800			1542.840		
	Filter House Floor	2	29.900	25.800			1542.840		
	Working Plat form	2	29.900	25.800			1542.840		
	Office room	2	29.900	25.800			1542.840		
	floor tiling								
	Bath rooms	2	7.000	5.170			72.380		
	"	2	3.910	4.950			38.709		
	Additional filter unit								
	operating platform	1	26.150	20.300			530.845		

	Filter media	1	26.150	20.300			530.845		
	Sump	1	26.150	20.300			530.845		
	Total Quantity						7874.984 sqm		
	Total Deducted Quantity						0.000 sqm		
	Net Total Quantity						7874.984 sqm		
	Say 7874.984 sqm @ Rs 1819.62 / sqm						Rs 14329478.39		
29	od371159/2021_2022 Providing and laying rectified Glazed Ceramic wall tiles of size 300x300 mm or more (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 cement mortar 1:4 (1 Cement : 4 Coarse sand) including pointing the joints with white cement and matching pigments etc., complete.								
	Wall tiles								
	Sump wall Longer side	2*2	29.900		3.600		430.560		
	Sump wall Shorter side	2*2	25.800		3.600		371.521		
	Columns	2*35	2.700		3.600		680.401		
	Filter House side walls	2*12	(7.7+4.8)* 2		4.150		2490.001		
	Toilet walls	2*2	7.000		2.100		58.801		
	"	2*2	3.910		2.100		32.844		
	"	6*2	4.220		2.100		106.344		
	Additional filter unit								
	filter media	1	(26.15+20. 3)*2		4.150		385.536		
	sump	1	(26.15+20. 3)*2		2.600		241.541		
	Total Quantity						4797.549 sqm		
	Total Deducted Quantity						0.000 sqm		
	Net Total Quantity						4797.549 sqm		
	Say 4797.549 sqm @ Rs 1356.93 / sqm						Rs 6509938.16		
30	11.49.2 Providing and laying Vitrified tiles in floor with different sizes (thickness to be specified by the manufacturer), with water absorption less than 0.08% and conforming to IS : 15622, of approved brand & manufacturer, in all colours and shade, laid with cement based high polymer modified quick set tile adhesive (water based) conforming to IS : 15477, in average 6 mm thickness, including grouting of joints (Payment for grouting of joints to be made separately).Size of Tiles 600x600 mm								

		Tile work							
	Landing slab Top	5	3.300	2.500			41.250		
	Landing slab Top	2	4.700	2.200			20.681		
	Landing slabTop	2	4.700	2.200			20.681		
	passage Top	4	10.900	1.200			52.320		
	walk way	9	10.700	1.200			115.560		
	waste slabs	18	5.020	1.500			135.540		
	to OHSR top	1*2	4.370		0.350		3.059		
	STEPS Riser	2*13*8	1.500		0.150		46.800		
	Steps Tread	13*8	1.500	0.300			46.800		
	OHSR top Riser	2*15	1.200		0.200		7.200		
	OHSR top Tread	1*15	1.200	0.200			3.600		
Total Quantity							493.491 sqm		
Total Deducted Quantity							0.000 sqm		
Net Total Quantity							493.491 sqm		
Say 493.491 sqm @ Rs 1895.07 / sqm							Rs 935199.99		
31	<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>								
Doors and Windows and Ventilators									
	Windows	3*2*23	6.000				828.000		
	Door	3*2*2	5.400				64.801		
	Ventilators	2*2*2	2.700				21.600		
Additional Filter Units Doors and Windows and Ventilators									
	Windows	1*18	6.000				108.000		
	Door	1	5.400				5.400		
Total Quantity							1027.801 kg		
Total Deducted Quantity							0.000 kg		
Net Total Quantity							1027.801 kg		

	Say 1027.801 kg @ Rs 499.04 / kg						Rs 512913.81	
32	21.3.2 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 5.50 mm thickness							
	Doors and Windows							
	Windows	3*2*23	1.500		1.500		310.500	
	Door	3*2*2	1.200		2.100		30.241	
	Additional Filter Units Doors and Windows and Ventilators							
	Windows	1*18	1.500		1.500		40.500	
	Door	1	1.200		2.100		2.520	
	Total Quantity						383.761 sqm	
	Total Deducted Quantity						0.000 sqm	
	Net Total Quantity						383.761 sqm	
	Say 383.761 sqm @ Rs 1526.00 / sqm						Rs 585619.29	
33	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.)							
	Walkway							
	Stair Hand rails 40mm	3*2	118.000			4.05	2867.400	
	Vertical 20mm	60*2	1.200			1.68	241.920	
	Tank top							
	Stair Hand rails 40mm	3*2	115.000			4.05	2794.500	
	Vertical 20mm	57*2	1.200			1.68	229.824	
	Working plat form							
	openings rail	2*12	(7.05+2.8) *2			4.05	1914.840	
	verticals	2*12*132	1.200			1.68	6386.688	
	Total Quantity						14435.172 kg	
	Total Deducted Quantity						0.000 kg	

	Net Total Quantity						14435.172 kg	
	Say 14435.172 kg @ Rs 677.34 / kg						Rs 9777519.40	
34	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							
	For filter house	2	3.300		3.450		22.770	
	Additional Filter units	1	3.000		3.450		10.351	
	Total Quantity						33.121 sqm	
	Total Deducted Quantity						0.000 sqm	
	Net Total Quantity						33.121 sqm	
	Say 33.121 sqm @ Rs 3300.13 / sqm						Rs 109303.61	
35	od362900/2021_2022 Providing and fixing Water Level Indicator with Aluminium channel so as to move the indicator pointer gauge marked on Aluminium sheet 5mm thick, 160mm 4kg PVC pipe fixed with S.S Clamps to move 140mm Dia. PVC Float tied with plastic stay wire, etc complete as per directions including all cost conveyance and labour charges.							
		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 12000.00 / No						Rs 24000.00	
36	od374375/2021_2022 Providing Lightning arrester earthing with copper strips 25 x5 mm size fixed with pvc clips as per the standard specifications and approval from the electric inspectorate etc. complete as per the directions of departmental officers							
		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 60000.00 / set						Rs 120000.00	
37	9.141 Providing and fixing PVC Door Frame of size 50x47 mm with a wall thickness of 5 mm (±0.2mm), made out of single piece extruded PVC profile, with mitred cut joints and with 2 nos of PVC bracket of size 190							

	mm x 100 mm long arms of cross section size 35 x 15 mm & self driven self tapping screws, the vertical door profiles to be reinforced with 40x20 mm M.S. rectangular tube of 0.8 mm, including providing EPDM rubber gasket weather seal throughout the frame, including jointing 5 mm PVC frame strip with PVC solvent cement on the back of the profile. The door frame to be fixed to the wall using 8x100 mm long anchor fasteners complete, all as per manufacturer's specification and direction of Engineer-in-charge.						
	Toilet doors	3	5.800				17.400
	Total Quantity						17.400 metre
	Total Deducted Quantity						0.000 metre
	Net Total Quantity						17.400 metre
	Say 17.400 metre @ Rs 537.68 / metre						Rs 9355.63
38	<p>9.142.1</p> <p>35 mm thick factory made Solid panel PVC Door shutter, made out of single piece extruded solid PVC (±0.2 mm) thick, having styles & rails (except lock rail) of size 95 mmx 35 mm x 5 mm, out of which 75 mm shall be flat and 20 mm shall be tapered (on both side), having one side thickness of 15 mm integrally extruded on the hinges side of the profile for better screw holding power, including reinforcing with MS tube of size 40 mm x 20 mm x 1 mm, joints of styles & rails to be mitered cut & joint with the help of PVC solvent cement, self driven self tapping screws & M.S. rectangular pipes bracket of size 190 mm x 100 mm of cross section size 35 mm x 17 mm s 1 mm at each corner. Single piece extruded 5 mm thick solid PVC Lock rail of size 115 mm x 35 mm x 35 mm, out of which 95 mm to be flat and 20 mm to be tapered at both ends, having 15 mm solid core in middle of rail section integrally extruded, fixing the styles & rails with the help of solvent and self driven self tapping screws of 125 mm x 11 mm, including providing 5 mm Single piece solid PVC extruded sheet inserted in the door as panel, all complete as per manufacturer's specification and direction of Engineer-in-charge. Non decorative finish (matt finish)</p>						
	Toilet door shutter	3	0.750	2.000			4.500
	Total Quantity						4.500 sqm
	Total Deducted Quantity						0.000 sqm
	Net Total Quantity						4.500 sqm
	Say 4.500 sqm @ Rs 3814.69 / sqm						Rs 17166.11
39	<p>13.85.3</p> <p>Applying priming coats with primer of approved brand and manufacture, having low VOC (Volatile Organic Compound) content. With water thinnable cement primer on walls surface having VOC content less than 50 grams / litre</p>						
	Cement primer						
	As per Qty item 26 & 27	1	8279.271+ 19370.170				27649.441
	Toilet walls	2*2	7.000		2.100		-58.800
	"	2*2	3.910		2.100		-32.844
	"	6*2	4.220		2.100		-106.344
	Sump inside wall	2*2*2	25.800		3.600		-743.040

	"	2*2*2	30.590		3.600		-880.992	
	Sump inside column	35*2	2.700		3.600		-680.400	
	Column offsets	26*2	0.200		3.600		-37.440	
	Filter House side wall	2*12	$(7.7+4.8)*$ 2		4.150		-2490.000	
Stair Plastering								
	walk way	9	10.700	1.200			-115.559	
	to OHSR top	1*2	4.370		0.350		-3.058	
	STEPS Riser	2*13*8	1.500		0.150		-46.800	
	Steps Tread	13*8	1.500	0.300			-46.800	
	OHSR top Riser	2*15	1.200		0.200		-7.199	
	OHSR top Tread	1*15	1.200	0.200			-3.599	
Additional filter unit Wall tile deduction								
	filter media	1	$(26.15+20.$ $3)*2$		4.150		-385.535	
	sump	1	$(26.15+20.$ $3)*2$		2.600		-241.540	
Total Quantity							27649.441 sqm	
Total Deducted Quantity							-5879.950 sqm	
Net Total Quantity							21769.491 sqm	
Say 21769.491 sqm @ Rs 70.64 / sqm							Rs 1537796.84	
40	13.48.1	Finishing with Deluxe Multi surface paint system for interiors and exteriors using primer as per manufacturers specifications:Two or more coats applied on walls @ 1.25 ltr/10 sqm over and including one coat of special primer applied @ 0.75 ltr /10 sqm						
Painting								
	As per Qty item 39	1	21769.491				21769.491	
Total Quantity							21769.491 sqm	
Total Deducted Quantity							0.000 sqm	
Net Total Quantity							21769.491 sqm	
Say 21769.491 sqm @ Rs 167.39 / sqm							Rs 3643995.10	
41	13.71	Lettering with black Japan pint of approved brand and manufacture						
		500	20.000				10000.000	
Total Quantity							10000.000 Letterxcm	

								ht	
								Total Deducted Quantity	0.000 Letterxcm ht
								Net Total Quantity	10000.000 Letterxcm ht
								Say 10000.000 Letterxcm ht @ Rs 5.56 / Letterxcm ht	Rs 55600.00
42	od394318/2021_2022 All charges for mechanical and electrical items in Filter house No.3 and all other required necessary works for filter No.3								
	Filter No.3	48						48.000	
								Total Quantity	48.000 MLD
								Total Deducted Quantity	0.000 MLD
								Net Total Quantity	48.000 MLD
								Say 48.000 MLD @ Rs 319035.52 / MLD	Rs 15313704.96
SI No	Description	No	L	B	D	CF	Quantity	Remark	
2FILTER SHELL (Cost Index:35.59 %)									
1	od373833/2021_2022 Supplying of 2 to 6 mm and 6 to 12 mm size fine Anthrasite (shall be hard, clean, free from clay, dust and other impurities), stacking in standard heaps for measurement including cost, conveyance up to 5 km and labour charges for stacking, spreading, testing and as per the directions of the department officers etc. complete as per CPHEEO specifications.								
		24	7.400	4.800	0.600		511.489		
	Additional Filter Units								
		8	7.400	4.800	0.600		170.496		
								Total Quantity	681.985 cum
								Total Deducted Quantity	0.000 cum
								Net Total Quantity	681.985 cum
								Say 681.985 cum @ Rs 51275.52 / cum	Rs 34969135.51
2	100.55.1 Supplying of 2 to 6 mm and 6 to 12 mm size fine pebble (pebbles shall be hard, clean, free from clay, dust and other impurities), stacking in standard heaps for measurement including cost, conveyance up to 5 km and labour charges for stacking, spreading, testing and as per the directions of the department officers etc. complete as per CPHEEO specifications.								
		24	7.700	4.800	0.250		221.760		
	Additional Filter Units								
		8	7.400	4.800	0.250		71.040		
								Total Quantity	292.800 cum

		Total Deducted Quantity					0.000 cum	
		Net Total Quantity					292.800 cum	
		Say 292.800 cum @ Rs 8525.22 / cum					Rs 2496184.42	
3	100.55.2	Supplying of 12 to 20mm size pebble (pebbles shall be hard, clean, free from clay, dust and other impurities), stacking in standard heaps for measurement including cost, conveyance up to 5km and labour charges for stacking, spreading, testing and as per the directions of the department officers etc complete and as per CPHEEO specification.						
		24	7.700	4.800	0.300		266.112	
		Additional Filter Units						
		8	7.400	4.800	0.300		85.248	
		Total Quantity					351.360 cum	
		Total Deducted Quantity					0.000 cum	
		Net Total Quantity					351.360 cum	
		Say 351.360 cum @ Rs 8525.22 / cum					Rs 2995421.30	
4	100.55.3	Supplying of 20 to 40 mm pebble (pebbles shall be hard, clean, free from clay, dust and other impurities), stacking in standard heaps for measurement including cost, conveyance up to 5 km and labour charges for stacking, spreading, testing and as per directions of the department officers etc. complete and as per CPHEEO specification.						
		24	7.700	4.800	0.300		266.112	
		Additional Filter Units						
		8	7.700	4.800	0.300		88.704	
		Total Quantity					354.816 cum	
		Total Deducted Quantity					0.000 cum	
		Net Total Quantity					354.816 cum	
		Say 354.816 cum @ Rs 8525.22 / cum					Rs 3024884.46	
5	100.98.235	Supply of uPVC Pipe, IS 4985: 2000 , 10kg/cm ² , 75mm Dia.						
		24*70	4.800				8064.000	
		Additional Filter Units						
		8	4.800				38.400	
		Total Quantity					8102.400 metre	
		Total Deducted Quantity					0.000 metre	
		Net Total Quantity					8102.400 metre	
		Say 8102.400 metre @ Rs 226.35 / metre					Rs 1833978.24	

Sl No	Description	No	L	B	D	CF	Quantity	Remark
3Water supply and sanitary works (Cost Index:35.59 %)								
1	17.3.1 Providing and fixing white vitreous china pedestal type water closet (European type) with seat and lid, 10 litre low level white vitreous china flushing cistern & C.P. flush bend with fittings & C.I. brackets, 40 mm flush bend, overflow arrangement with specials of standard make and mosquito proof coupling of approved municipal design complete, including painting of fittings and brackets, cutting and making good the walls and floors wherever required :W.C. pan with ISI marked white solid plastic seat and lid							
	Office 2,Lab 1, Pump house 1,Aerator office 3,Aerator 2	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 7868.90 / No	Rs 70820.10
2	17.28.1.2 Providing and fixing P.V.C. waste pipe for sink or wash basin including PVC.waste fittings complete.Semi rigid pipe40 mm dia							
		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 115.86 / No	Rs 1042.74
3	17.7.5 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 Angle back wash basin size 600x480 mm with single 15 mm C.P. brass pillar tap							
	Bath room3, Lab 2,Pump house 2	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 3238.50 / No	Rs 22669.50
4	17.10.1.1 Providing and fixing Stainless Steel A ISI 304 (18/8) kitchen sink as per IS 13983 with C.I. brackets and stainless steel plug 40 mm, including painting of fittings and brackets, cutting and making good the walls wherever required:Kitchen sink with drain board510x1040 mm bowl depth 250 mm							

	Lab	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 6069.08 / No						Rs 12138.16	
5	17.20.3 Providing and fixing solid plastic Seat with lid for pedestal type W.C. pan complete:Cloured (other than black & white) solid plastic seat with lid							
	Office 2,Lab 1, Pump house 1,Aerator office 3,Aerator 2	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 656.39 / No						Rs 5907.51	
6	17.28.2.2 Flexible pipe40 mm dia							
		20					20.000	
	Total Quantity						20.000 No	
	Total Deducted Quantity						0.000 No	
	Net Total Quantity						20.000 No	
	Say 20.000 No @ Rs 118.98 / No						Rs 2379.60	
7	17.29 Providing and fixing 100 mm sand cast Iron grating for gully trap.							
		13					13.000	
	Total Quantity						13.000 No	
	Total Deducted Quantity						0.000 No	
	Net Total Quantity						13.000 No	
	Say 13.000 No @ Rs 52.47 / No						Rs 682.11	
8	17.32.2 Providing and fixing mirror of superior glass (of approved quality) and of required shape and size with plastic moulded frame of approved make and shade with 6 mm thick hard board backing :Rectangular shape 453x357 mm							
		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 1318.61 / No					Rs 5274.44	
9	17.35.1.2 Providing and fixing soil, waste and vent pipes:100 mm diaCentrifugally cast (spun) iron socket & spigot (S & S) pipe as per IS : 3989							
	Filter house	1	50.000				50.000	
	Aerator	1	50.000				50.000	
	Pump house	1	25.000				25.000	
		Total Quantity					125.000 metre	
		Total Deducted Quantity					0.000 metre	
		Net Total Quantity					125.000 metre	
		Say 125.000 metre @ Rs 1285.66 / metre					Rs 160707.50	
10	17.60.1.1 Providing and fixing trap of self cleansing design with screwed down or hinged grating without vent arm complete, including cost of cutting and making good the walls and floors:100 mm inlet and 100 mm outletSand cast iron S & S as per IS : 3989							
		13					13.000	
		Total Quantity					13.000 No	
		Total Deducted Quantity					0.000 No	
		Net Total Quantity					13.000 No	
		Say 13.000 No @ Rs 1780.36 / No					Rs 23144.68	
11	17.71 Providing and fixing PTMT liquid soap container 109 mm wide, 125 mm high and 112 mm distance from wall of standard shape with bracket of the same materials with snap fittings of approved quality and colour, weighing not less than 105 gms							
		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 186.64 / No					Rs 746.56	
12	17.73.2 Providing and fixing PTMT towel rail complete with brackets fixed to wooden cleats with CP brass screws with concealed fitting arrangement of approved quality and colour600 mm long towel rail with total length of 645 mm, width 78 mm and effective height of 88 mm, weighting not less than 190 gms							
		4					4.000	

	per direction of Engineer-in-Charge 20 mm dia 12Kgf/cm ² - Internal work - Exposed on wall						
	1	60.000				60.000	
	Total Quantity					60.000 metre	
	Total Deducted Quantity					0.000 metre	
	Net Total Quantity					60.000 metre	
	Say 60.000 metre @ Rs 256.13 / metre					Rs 15367.80	
17	50.18.7.3.1 Providing and fixing PVC pipes, fittings including fixing the pipe with clamps at 1.00 m spacing. This includes jointing of pipes & fittings with one step PVC solvent cement and testing of joints complete as per direction of Engineer- in- Charge 25 mm dia 12 Kgf/cm ² - Internal work - Exposed on wall						
	1	150.000				150.000	
	Total Quantity					150.000 metre	
	Total Deducted Quantity					0.000 metre	
	Net Total Quantity					150.000 metre	
	Say 150.000 metre @ Rs 283.48 / metre					Rs 42522.00	
18	50.18.7.4.1 Providing and fixing PVC pipes, fittings including fixing the pipe with clamps at 1.00 m spacing. This includes jointing of pipes & fittings with one step PVC solvent cement and testing of joints complete as per direction of Engineer-in-Charge 32 mm dia 10Kgf/cm ² - Internal work - Exposed on wall						
	1	150.000				150.000	
	Total Quantity					150.000 metre	
	Total Deducted Quantity					0.000 metre	
	Net Total Quantity					150.000 metre	
	Say 150.000 metre @ Rs 317.42 / metre					Rs 47613.00	
19	50.18.7.5.1 Providing and fixing PVC pipes, fittings including fixing the pipe with clamps at 1.00m spacing. This includes jointing of pipes & fittings with one step PVC solvent cement and testing of joints complete as per direction of Engineer-in-Charge 40 mm dia 10 Kgf/cm ² - Internal work- exposed on wall						
	1	80.000				80.000	
	Total Quantity					80.000 metre	
	Total Deducted Quantity					0.000 metre	
	Net Total Quantity					80.000 metre	
	Say 80.000 metre @ Rs 407.45 / metre					Rs 32596.00	
20	50.18.7.6.1 Providing and fixing PVC pipes, fittings including fixing the pipe with clamps at 1.00 m spacing. This includes jointing of pipes & fittings with one step PVC solvent cement and testing of joints complete as						

	per direction of Engineer-in-Charge 50 mm dia 10 Kgf/cm - Internal work- Exposed on wall						
	1	30.000				30.000	
	Total Quantity					30.000 metre	
	Total Deducted Quantity					0.000 metre	
	Net Total Quantity					30.000 metre	
	Say 30.000 metre @ Rs 415.45 / metre					Rs 12463.50	
21	50.18.8.1.1 Providing and fixing PVC pipes, fittings including fixing the pipe with clamps at 1.00 m spacing. This includes jointing of pipes & fittings with one step PVC solvent cement and testing of joints complete as per direction of Engineer- in- Charge. Concealed work, including cutting chases and making good the wall etc. 15 mm pipe 12 Kgf/ cm2						
	1	30.000				30.000	
	Total Quantity					30.000 metre	
	Total Deducted Quantity					0.000 metre	
	Net Total Quantity					30.000 metre	
	Say 30.000 metre @ Rs 405.73 / metre					Rs 12171.90	
22	50.18.8.2.1 Providing and fixing PVC pipes, fittings including fixing the pipe with clamps at 1.00 m spacing. This includes jointing of pipes & fittings with one step PVC solvent cement and testing of joints complete as per direction of Engineer-in-Charge. Concealed work, including cutting chased and making good the wall etc. 20 mm pipe 12 Kgf/cm2						
	1	36.000				36.000	
	Total Quantity					36.000 metre	
	Total Deducted Quantity					0.000 metre	
	Net Total Quantity					36.000 metre	
	Say 36.000 metre @ Rs 409.48 / metre					Rs 14741.28	
23	50.18.8.3.1 Providing and fixing PVC pipes, fittings including fixing the pipe with clamps at 1.00 m spacing. This includes jointing of pipes & fittings with one step PVC solvent cement and testing of joints complete as per direction of Engineer-in-Charge. Concealed work, including cutting chases and making good the wall etc. 25 mm pipe 12 kgf/cm2						
	1	30.000				30.000	
	Total Quantity					30.000 metre	
	Total Deducted Quantity					0.000 metre	
	Net Total Quantity					30.000 metre	
	Say 30.000 metre @ Rs 440.43 / metre					Rs 13212.90	

24	18.22.2 Providing and fixing C.P. brass shower rose with 15 or 20 mm inlet:150 mm diameter								
		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 222.23 / No						Rs 888.92	
25	18.15.1 Providing and fixing brass bib cock of approved quality :15 mm nominal bore								
		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 356.13 / No						Rs 4273.56	
26	18.16.1 Providing and fixing brass stop cock of approved quality :15 mm nominal bore								
		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 356.13 / No						Rs 3561.30	
27	18.17.1 Providing and fixing gun metal gate valve with C.I. wheel of approved quality (screwed end) :25 mm nominal bore								
		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 585.21 / No						Rs 2926.05	
28	18.54.2 Providing and fixing PTMT bib cock of approved quality and colour.15 mm nominal bore, 122 mm long, weighing not less than 99 gms								
		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 190.78 / No						Rs 1907.80	
29	od376623/2021_2022 Providing and installing Ready made PVC Septic tank and Soak pit with standerd specifications including cost of materials,convence,earth work,installation charges etc complete as per direction of officers incharge								
		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 20907.00 / No						Rs 20907.00	
Sl No	Description	No	L	B	D	CF	Quantity	Remark	
4Supply and fixing of lab equipments (Cost Index:35.59 %)									
1	od379261/2021_2022 Supply, Installation and Commissioning of Digital Colony Counter lens having the following specification:- 110 mm Dia Magnifying Glass, Auto Marker pen, Audible Confirmation of each count, 4 digit Digital display, Dish size 100mm and with 1 spare pen								
		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 9000.00 / No						Rs 9000.00	
2	od379271/2021_2022 Supply, installation and commissioning of Visible Spectrophotometer of Micro Processor & Micro Controller Based, having wavelength Range – 340 – 1000nm, Bandwidth – 5 nm, Absorbance Range - ± 2 Abs, Readability – 1 nm, 0.01 %T & 0.0001 Abs, Detector – Silicon Photo Diode, USB interface for PC Connectivity, Printer Interface, Time Scan with minimum time interval of 1.0 sec, AutoZero facility, self check and self diagnostic modes.								
		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 110000.00 / No						Rs 110000.00	
3	od379272/2021_2022 Supply, Installation and setting up of Desktop computer system (Lenovo/Dell/HP) having Intel core i3- 10th Gen (6MB Cache, 4Cores, 3.60 GHz up to 4.20 GHz), 8GB DDR4, 1TB HDD/500GB SSD, DVDRW, Integrated graphics, Built-in WiFi, 22" (or nearest) FHD Display, Serial port, Bluetooth,								

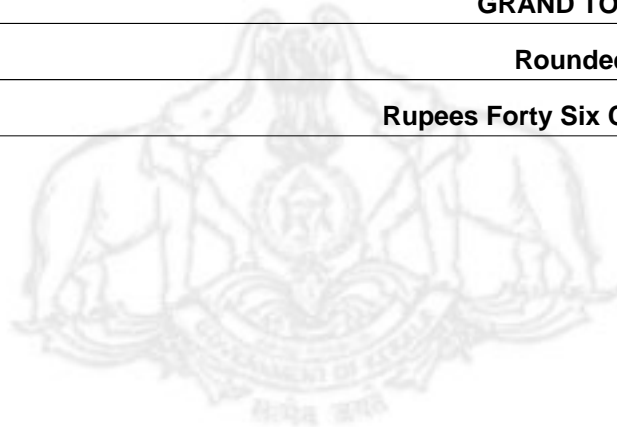
	Windows10, MS Office, USB Key board & Mouse, 3 year On site warranty. Inclusive of 600VA V-Guard UPS & Canon G3000 Multi function Color Printer									
		1						1.000		
		Total Quantity						1.000 No		
		Total Deducted Quantity						0.000 No		
		Net Total Quantity						1.000 No		
		Say 1.000 No @ Rs 49500.00 / No						Rs 49500.00		
4	od379360/2021_2022 Supply and installation of 2 ton inverter type split air conditioner (5 star) with stabilizer and other connected items .									
		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 60000.00 / No						Rs 60000.00		
5	od379361/2021_2022 A well equipped laboratory for physical, chemical . Test reagents required for three months use shall also be supplied. At least following testing equipment are essential. Necessey chemical for the lab with minimum quantity for oner year as per the direction of departmental officers. Lab equipment Jar test apparatus (minimum of 4 jars)-2set, Electronic balance (to weigh up to 1 mg and above)-1 Chlorine test kit-5set Gas mask-10set PH kit 2 Magnetic stirrer -1 Gas Cylinder- 1 Fume Cupboard -1 Electronic weighing balance -1 Test tube-20 Conical flask (standard size) -10 Standard flask -8 Pipette -10 100ml Standard bottle -15 Glass rod -10 Spatula -5 Porcelain dish- 5 double drawer table- 7 steel armed chairs- 8 steel Almarah of minimum size 135cm x 90cm x 50 cm 20 gauge or higher - 5,conductivity/TDS mete-1Nos,Conductivity meter-1Nos,Turbidity meter-3Nos,BOD incubator (2)-1Nos ,Bunsen burner-2Nos , Petri Can-10Nos ,microbiology media-6Nos ,screw cap bottles 100ml and 50ml- Each 10Nos,filtration Assembly-5Nos,Isopropyl Alcohol-500ml(2Nos),Vaccum pump-1Nos, 0.45 and 0.22 filter papers-10 roll,Forceps-4Nos,NaOH-5kg/Lr. metallic rack for the laboratory(Size 2mx0.6mx2m)-3nos,									
		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 375000.00 / No						Rs 375000.00		
6	od379362/2021_2022 Supply, installation and commissioning of Bacteriological Incubator of the following Specifications. Bottom heated type with digital temperature controller and indicator and with air circulation fan. Dimensions 450x450x450mm (min) with capacity 95lit (approx) with 2 shelves. Outer body made of Powder coated MS sheet and inner Stainless steel 304 and with glass wool insulation and glass door.									

	ISO 9001:2015 Certified								
		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 29760.00 / No					Rs 29760.00		
7	od379363/2021_2022 Supply, installation and commissioning of Autoclave Vertical type of capacity 75lit (min) with Stainless steel body inside and outside argon welded. The lid should be fitted with pressure gauge, safety valve and steam exhaust valve and silicon rubber gasket. Foot operated lifting mechanism for lid opening and with painted steel legs for the autoclave. The Autoclave should also be fitted with Digital Temperature control cum indicator, digital timer, auto water level cut-off and auto pressure cut-off and auto purging mechanism. ISO 9001:2015 Certified								
		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 88485.00 / No					Rs 88485.00		
8	od379364/2021_2022 Supply, installation and commissioning of Serological Water Bath rectangular type, 1500W, 12 lit capacity double-walled with inner chamber made of SS 403 and outer wall of GI sheet powder coated. The SS cover having 6 holes of size 7.5cm dia with lid. It shall have a built-in constant level arrangement. Temp range +5°C to 95°C with thermostatic control and supplied with thermometer. ISO 9001:2015 Certified								
		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 15500.00 / No					Rs 15500.00		
9	od379365/2021_2022 . Supply, installation and commissioning of Laminar Airflow Cabinet (Vertical flow) with working area 90 x60x60cm fitted with Magnahelic pressure gauge and all related accessories. ISO 9001:2015 Certified								
		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 94640.00 / No	Rs 94640.00
10	od379366/2021_2022	Supply, installation and commissioning of Hot Air Oven of 95 litre (min) capacity 1200W having 2 shelves, Outer body made of MS sheet powder coated and inner chamber Aluminium/SS with glass wool insulation in between. Oven shall be equipped with Digital electronic temperature controller and air circulation fan. ISO 9001:2015 Certified.							
		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 24190.00 / No							Rs 24190.00
11	od379367/2021_2022	Supply, installation and commissioning of Centrifuge of 6000rpm (max) with a capacity of 400ml equipped with brush-less induction motor with frequency drive, LED display of speed and time, dynamic brake, imbalance detector, safety lid lock, rotor identification with Swing out rotor suitable for 8 tubes of 15ml (supplied with glass tubes), timer range of 0-99. ISO 9001:2015 Certified							
		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 36310.00 / No							Rs 36310.00
12	od379368/2021_2022	9. supply, installation and commissioning of Hot Plate 1.6kW, 25 x 40 (or nearest) size having MS powder coated body and thick Stainless steel plate top. Temperature controlled by energy regulator. ISO 9001:2015 Certified 							
		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 8000.00 / No							Rs 8000.00
13	od379369/2021_2022	Supply and delivery of the following items:- Micro Pipette FAV Range 10-100µl - 1 No, Micro Pipette FAV Range 20-200µl - 1 No, Micro Pipette FAV Range 100-1000µl - 1 No & Fixed Micro Volume Pipette of FAV range 200µl - 1 No							
		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 20000.00 / No	Rs 20000.00
14	od379370/2021_2022 Supply,delivery,testing and commissioning of the following items:- Test tube basket with cover (110x120x150) - 4 Nos, Test tube rack Aluminium 24H x 19mm - 1 No, Absorbent Cotton - 1 roll, Petri Dish (80x17mm) - 10 Nos, Petri Dish (100 x 17mm) - 6 Nos, Graduated Pipette (10ml) with borosilicate glass - 2 Nos, Sampling glass bottle with stop cock (125ml) - 10 Nos, Rubber bulb for up to 100ml capacity pipette - 4 Nos, Non Absorbent Cotton - 2 rolls, Test tube 5ml of borosilicate glass - 20Nos,							
		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 12500.00 / No	Rs 12500.00
15	od379371/2021_2022 Supply, installation and commissioning of Digital pH Meter (Range 0-14 pH, Resolution 0.01pH)with standard glass and reference electrode with stand. 							
		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 10200.00 / No	Rs 10200.00
16	od379372/2021_2022 Supply, Installation and commissioning of horizontal type Double distillation unit of capacity 1.5 lit/hr with Borosilicate boiler and condenser and quartz heater and with automatic cut- off system							
		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 45000.00 / No	Rs 45000.00
17	od379373/2021_2022 Supply of 245 Lit (or nearest) 5 star frost free Inverter Refrigerator with stabilizer.(Samsung,LG, Whirlpool, Godrej, Panasonic). 							
		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 28500.00 / No	Rs 28500.00
	Total	396077735.34
	Centage @	0.0%
	Centage Amount	0.00
	Provision for GST payments (in %) @	18.0%
	Amount reserved for GST payments	71293992.36
	Total & Centage	467371727.70
	Lumpsum for round off	28272.30
	GRAND TOTAL Rs	467400000.00
	Rounded Grand Total Rs	46,74,00,000
	Rupees Forty Six Crore Seventy Four Lakh Only	



Kerala Water Authority

PRICE

General Abstract

State plan - Interim Augmentation of Kochi city and adjoining areas - phase-1-
Proposed WTP at Aluva -Clear water Pump house, Clear water channel from sump
to pump house and building for transformers & substation.

(Dsr year: 2018)

SI No	Heading Description	Amount
1	Clear Water Pump house	24724233.04
2	Clear water Channel	8904652.95
3	Building for Substation and transformer	4395859.22
	Total	38024745.21
	Centage @	0.0%
	Centage Amount	0.00
	Provision for GST payments (in %) @	18.0%
	Amount reserved for GST payments	6844454.14
	Total & Centage	44869199.35
	Lumpsum for round off	800.65
	GRAND TOTAL Rs	44870000.00
	Rounded Grand Total Rs 4,48,70,000	
	Rupees Four Crore Forty Eight Lakh Seventy Thousand Only	

Kerala Water Authority
PRICE

Detailed Estimate

State plan - Interim Augmentation of Kochi city and adjoining areas - phase-1-
Proposed WTP at Aluva -Clear water Pump house, Clear water channel from sump
to pump house and building for transformers & substation.

(Dsor year: 2018)

Sl No	Description	No	L	B	D	CF	Quantity	Remark	
1Clear Water Pump house (Cost Index:35.59 %)									
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	20.150	17.850	3.000		1079.033		
		Total Quantity						1079.033 cum	
		Total Deducted Quantity						0.000 cum	
		Net Total Quantity						1079.033 cum	
		Say 1079.033 cum @ Rs 214.03 / cum						Rs 230945.43	
2	2.26.1 Extra for every additional lift 1.5 m or part there of in excavation / banking excavated or stacked materials.All kinds of soil								
		1	20.150	17.850	1.500		539.517		
		Total Quantity						539.517 cum	
		Total Deducted Quantity						0.000 cum	
		Net Total Quantity						539.517 cum	
		Say 539.517 cum @ Rs 106.37 / cum						Rs 57388.42	
3	2.7.1 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.Ordinary rock								
		1	20.150	17.850	1.950		701.372		
	Foundation Long	6	19.350	0.700	0.800		65.017		
	Foundation Short	5	17.050	0.700	0.800		47.740		
		Total Quantity						814.129 cum	
		Total Deducted Quantity						0.000 cum	

		Net Total Quantity						814.129 cum
		Say 814.129 cum @ Rs 414.84 / cum						Rs 337733.27
4	2.26.2 Extra for every additional lift 1.5 m or part there of in excavation / banking excavated or stacked materials. Ordinary or hard rock							
		3	20.150	17.850	1.500		1618.549	
		Total Quantity						1618.549 cum
		Total Deducted Quantity						0.000 cum
		Net Total Quantity						1618.549 cum
		Say 1618.549 cum @ Rs 190.78 / cum						Rs 308786.78
5	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.							
		2	20.150	17.850	0.500		359.678	
		Total Quantity						359.678 cum
		Total Deducted Quantity						0.000 cum
		Net Total Quantity						359.678 cum
		Say 359.678 cum @ Rs 258.57 / cum						Rs 93001.94
6	4.1.4 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 (1 cement : 2 coarse sand : 4 graded stone aggregate 40 mm nominal size)							
	Foundation Long	6	19.350	2.150	0.150		37.443	
	Foundation Short	5	17.050	2.150	0.150		27.494	
		Total Quantity						64.937 cum
		Total Deducted Quantity						0.000 cum
		Net Total Quantity						64.937 cum
		Say 64.937 cum @ Rs 7863.27 / cum						Rs 510617.16
7	5.33.1 Providing and laying in position machine batched and machine mixed design mix M-25 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 upto plinth level							

	Foundation Long	6	19.3500	0.450	1.150		60.082	
	Foundation Short	5	17.050	0.450	1.150		44.117	
		30	0.450	0.450	1.150		-6.986	
	Sump side wall Long	4	18.150	0.450	5.050		164.984	
	Sump side wall Short	2	15.850	0.450	5.050		72.039	
	Sump Floor Slab	1	18.150	15.850	0.150		43.152	
	Column	6	0.450	0.450	5.050		6.136	
	Beam long	8	3.970	0.450	0.450		6.432	
	Beam short 1	6	3.500	0.450	0.450		4.253	
	Beam short 2	3	3.100	0.450	0.450		1.884	
	Beam Short 3	6	2.550	0.450	0.450		3.099	
	Duct	1	18.150	3.100	0.500		28.133	
	Floor Slab opening	7	3.550	2.920	0.150		-10.884	
	Manhole	2	3.500	0.800	0.150		-0.840	
		20	0.450	0.450	5.050		-20.452	
						Total Quantity	434.311 cum	
						Total Deducted Quantity	-39.162 cum	
						Net Total Quantity	395.149 cum	
						Say 395.149 cum @ Rs 9413.54 / cum	Rs 3719750.92	
8	5.33.2 Providing and laying in position machine batched and machine mixed design mix M-25 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							
	Columns	30	0.450	0.450	6.030		36.633	
	Top Slab	1	18.450	16.150	0.120		35.757	
	Beam long	24	3.970	0.450	0.450		19.295	
	Beam Short 1	2*5	2.550	0.450	0.450		5.164	
	Beam Short 2	2*5	3.500	0.450	0.450		7.088	
	Beam Short 3	5	3.100	0.450	0.450		3.139	

	Sunshade	2	18.750+16 .450	0.600	0.085		3.591		
	Lintle	22	0.600	0.200	0.150		0.396		
	Kerb	4	18.150	0.300	0.750		16.335		
	Kerb	4	18.150	0.400	0.150	0.5	-2.178		
	Total Quantity						127.398 cum		
	Total Deducted Quantity						-2.178 cum		
	Net Total Quantity						125.220 cum		
	Say 125.220 cum @ Rs 11065.64 / cum						Rs 1385639.44		
9	5.34.1 Extra for providing richer mixes at all floor levels. Note:- Excess/less cement over the specified cement content used is payable/ recoverable separately. Providing M-30 grade concrete instead of M-25 grade BMC/RMC. (Note:- Cement content considered in M-30 is @ 340 kg/cum).								
	Foundation Long	6	19.3500	0.450	1.150		60.082		
	Foundation Short	5	17.050	0.450	1.150		44.117		
		30	0.450	0.450	1.150		-6.986		
	Sump side wall Long	4	18.150	0.450	5.050		164.984		
	Sump side wall Short	2	15.850	0.450	5.050		72.039		
	Sump Floor Slab	1	18.150	15.850	0.150		43.152		
	Column	6	0.450	0.450	5.050		6.136		
	Beam long	8	3.970	0.450	0.450		6.432		
	Beam short 1	6	3.500	0.450	0.450		4.253		
	Beam short 2	3	3.100	0.450	0.450		1.884		
	Beam Short 3	6	2.550	0.450	0.450		3.099		
	Duct	1	18.150	3.100	0.500		28.133		
	Floor Slab opening	7	3.550	2.920	0.150		-10.884		
	Manhole	2	3.500	0.800	0.150		-0.840		
		20	0.450	0.450	5.050		-20.452		
	Total Quantity						434.311 cum		
	Total Deducted Quantity						-39.162 cum		
	Net Total Quantity						395.149 cum		
	Say 395.149 cum @ Rs 82.10 / cum						Rs 32441.73		
10	5.9.1 Centering and shuttering including strutting, etc. and removal of form for: Foundations, footings, bases of columns, etc for mass concrete								

	Foundation Long for PCC	6*2	19.350	0.350			81.270		
	Foundation Short for PCC	5*2	17.050	0.350			59.676		
	Total Quantity						140.946 sqm		
	Total Deducted Quantity						0.000 sqm		
	Net Total Quantity						140.946 sqm		
	Say 140.946 sqm @ Rs 335.31 / sqm							Rs 47260.60	
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.								
	Sump Long wall	8	18.150	5.050			733.260		
	Sump Short wall	4	15.850	5.050			320.170		
	Total Quantity						1053.430 sqm		
	Total Deducted Quantity						0.000 sqm		
	Net Total Quantity						1053.430 sqm		
	Say 1053.430 sqm @ Rs 717.20 / sqm							Rs 755520.00	
12	5.9.3 Centering and shuttering including strutting, etc. and removal of form for:Suspended floors, roofs, landings, balconies and access platform								
	Platform	1	18.150	15.800			286.770		
	roof slab bottom	1	18.450	16.100			297.045		
	column deduction for roof slab	12	0.450	0.450			-2.430		
	column deduction for slab at slup top	12	0.450	0.450			-2.430		
	Sunshade	2	18.75+16.4	0.600			-42.180		
	Total Quantity						583.815 sqm		
	Total Deducted Quantity						-47.040 sqm		
	Net Total Quantity						536.775 sqm		
	Say 536.775 sqm @ Rs 815.78 / sqm							Rs 437890.31	
13	5.9.5 Centering and shuttering including strutting, etc. and removal of form for:Lintels, beams, plinth beams, girders bressumers and cantilevers								
	Long Beam floor & top	6*2*2	15.880	1.350			514.513		

	Long Beam floor & top	5*2	14.500	1.350			195.751		
	Lintle	22	0.550	0.600			7.261		
	Beam long	8	3.970	1.350			42.877		
	Beam short 1	6	3.500	1.350			28.350		
	Beam short 2	3	3.100	1.350			12.556		
	Beam shot3	6	2.550	1.350			20.655		
	Kerb	4	18.140	1.050			76.188		
	Total Quantity						898.151 sqm		
	Total Deducted Quantity						0.000 sqm		
	Net Total Quantity						898.151 sqm		
	Say 898.151 sqm @ Rs 649.82 / sqm						Rs 583636.48		
14	5.9.6 Centering and shuttering including strutting, etc. and removal of form for:Columns, Pillars, Piers, Abutments, Posts and Struts								
	Column	30	1.800		9.350		504.900		
	Column sump	6	1.800		4.850		52.380		
	Total Quantity						557.280 sqm		
	Total Deducted Quantity						0.000 sqm		
	Net Total Quantity						557.280 sqm		
	Say 557.280 sqm @ Rs 863.64 / sqm						Rs 481289.30		
15	5.9.16.1 Centering and shuttering including strutting, etc. and removal of form for:Edges of slabs and breaks in floors and wallsUnder 20 cm wide								
	Roof slab	2	18.45+17.05				71.000		
	Sun shade	2	18.750+16.450				70.400		
	Total Quantity						141.400 metre		
	Total Deducted Quantity						0.000 metre		
	Net Total Quantity						141.400 metre		
	Say 141.400 metre @ Rs 203.93 / metre						Rs 28835.70		
16	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	395.149			180.0	71126.820		

						Total Quantity	71126.820 kilogram
						Total Deducted Quantity	0.000 kilogram
						Net Total Quantity	71126.820 kilogram
						Say 71126.820 kilogram @ Rs 98.30 / kilogram	Rs 6991766.41
17	5.22A.6	Steel reinforcement for R.C.C work including straightening, cutting, bending, placing in position and binding all complete above plinth level. Thermo - Mechanically Treated bars of grade Fe-500D or more					
		1	125.220			180.0	22539.600
						Total Quantity	22539.600 kg
						Total Deducted Quantity	0.000 kg
						Net Total Quantity	22539.600 kg
						Say 22539.600 kg @ Rs 98.30 / kg	Rs 2215642.68
18	50.6.1.2	Solid block masonry using pre cast solid blocks (Factory made) of size 40x20x20cm or nearest available size confirming to IS 2185 part I of 1979 for super structure up to floor two level thickness 20cm and above in: CM 1:6 (1 cement: 6 coarse sand) etc complete.					
	Side wall long	2	15.880	0.200	5.500		34.936
	Side wall Short	2	14.450	0.200	5.500		31.791
	partition wall	1	10.020	0.200	5.500		11.022
	toilet	1	2.975	0.200	5.500		3.273
	parapet long	2	18.450	0.200	0.500		3.690
	parapet short	2	16.150	0.200	0.500		3.230
	Ventilator	16	0.600	0.200	0.500		-0.960
	rolling shutter	1	2.350	0.200	4.350		-2.044
	windows ground floor - w2	16	1.500	0.200	1.500		-7.200
						Total Quantity	87.942 cum
						Total Deducted Quantity	-10.204 cum
						Net Total Quantity	77.738 cum
						Say 77.738 cum @ Rs 6602.09 / cum	Rs 513233.27
19	21.1.1.2	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 portion Powder coated aluminium (minimum thickness of powder coating 50 micron)							
	Window (0.567kg/m ²)	16	6.000			0.57	54.432	
	ventilator (0.567 kg / m ²)	16	2.200			0.57	19.959	
	Door (0.567kg/m ²)	1	9.000			0.57	5.103	
	Ventilator toilet (0.567kg/m ²)	1	2.200			0.57	1.248	
		1				10.0	10.000	
	Total Quantity						90.742 kg	
	Total Deducted Quantity						0.000 kg	
	Net Total Quantity						90.742 kg	
	Say 90.742 kg @ Rs 537.07 / kg						Rs 48734.81	
20	21.3.2 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 5.50 mm thickness							
	Window	16	1.500	1.500			36.000	
	Ventilator	16	0.600	0.500			4.800	
	Door	1	1.200	2.100			2.520	
	Ventilator toilet	1	0.600	0.500			0.300	
	Total Quantity						43.620 sqm	
	Total Deducted Quantity						0.000 sqm	
	Net Total Quantity						43.620 sqm	
	Say 43.620 sqm @ Rs 1526.00 / sqm						Rs 66564.12	
21	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.)							
	SS 304 Schedule 40							

	40mm tube 12,94m per opening (SH 40)	7	12.940			4.05	366.849		
	25 mm tube 52 nos per opening (52*1.2=62.11m) (SH 40)	7	63.000			2.5	1102.500		
	Man hole (40mm tube 12,94m per opening) (SH 40)	2	8.600			4.05	69.660		
	Man hole (25 mm tube 42 nos per opening) (SH 40)	2	52.000			2.5	260.000		
	Ladder for sump @ 2 . 5 k g / m (25x25x1.2mm SS hollow tube)	6	20.000			2.5	300.000		
	Total Quantity						2099.009 kg		
	Total Deducted Quantity						0.000 kg		
	Net Total Quantity						2099.009 kg		
	Say 2099.009 kg @ Rs 677.34 / kg						Rs 1421742.76		
22	<p>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</p>								
	rolling shutter	1		2.350	4.350		10.223		
	Total Quantity						10.223 sqm		
	Total Deducted Quantity						0.000 sqm		
	Net Total Quantity						10.223 sqm		
	Say 10.223 sqm @ Rs 3300.13 / sqm						Rs 33737.23		
23	<p>13.50.3 Applying priming coat:With ready mixed red oxide zinc chromate primer of approved brand and manufacture on steel galvanised iron /steel works</p>								
	rolling shutter	1		2.350	4.350	2.25	23.001		
	Total Quantity						23.001 sqm		
	Total Deducted Quantity						0.000 sqm		

27	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.							
	Manhole							
	Manhole ladder @ 8.99 kg/m	1	120.000			8.99	1078.800	
	Total Quantity						1078.800 kg	
	Total Deducted Quantity						0.000 kg	
	Net Total Quantity						1078.800 kg	
	Say 1078.800 kg @ Rs 119.79 / kg						Rs 129229.45	
28	13.7.1 12 mm cement plaster finished with a floating coat of neat cement of mix:1:3 (1 cement : 3 fine sand)							
	Sump Floor	1	18.150	15.850			287.678	
	Sump Long wall	8	18.150	5.050			733.260	
	Sump Short wall	4	15.850	5.050			320.170	
	slab for sump	2	18.150	15.850			575.355	
	roof slab	2	18.450	16.150			595.935	
	column deduction for roof slab	12	0.450	0.450			-2.430	
	column deduction for slab at sump top	12	0.450	0.450			-2.430	
	Sunshade	2	18.75+16. 45	0.600			-42.240	
	Long Beam floor & top	6*2*2	15.880	1.350			514.513	
	Long Beam floor & top	5*2	14.450	1.350			195.075	
	Lintle	22	0.550	0.600			7.261	
	Beam long	8	3.970	1.350			42.877	
	Beam short 1	6	3.500	1.350			28.350	
	Beam short 2	3	3.100	1.350			12.556	
	Beam short 3	6	2.550	1.350			20.655	
	Column	12	1.800		9.350		201.960	
	Column sump	6	1.800		5.050		54.540	
	Roof slab	2	18.450	17.050			629.145	
	Sun shade	2	18.750	0.600			22.500	
		2	16.400	0.600			19.680	

	Side wall long	2*2	18.150		5.930		430.518		
	Side wall Short	2*2	15.850		5.930		375.962		
	partition wall	1*2	10.020		5.930		118.838		
	toilet	1*2	2.975		5.930		35.284		
	parapet long	2*2	18.440		0.500		36.880		
	parapet short	2*2	16.150		0.500		32.300		
	Ventilator	16	0.600	0.200	0.500		-0.960		
	rolling shutter	1	2.350	0.200	4.350		-2.044		
	windows ground floor - w2	16	1.500	0.200	1.500		-7.200		
	Total Quantity						5291.292 sqm		
	Total Deducted Quantity						-57.304 sqm		
	Net Total Quantity						5233.988 sqm		
	Say 5233.988 sqm @ Rs 401.21 / sqm						Rs 2099928.33		
29	13.21 Extra for providing and mixing water proofing material in cement plaster work in proportion recommended by the manufacturers.								
	Sump Floor	1	18.150	15.850			287.678		
	Sump Long wall	8	18.150	5.050			733.260		
	Sump Short wall	4	15.850	5.050			320.170		
	slab for sump	2	18.150	15.850			575.355		
	Column sump	6	1.800		5.050		54.540		
	Total Quantity						1971.003 kg		
	Total Deducted Quantity						0.000 kg		
	Net Total Quantity						1971.003 kg		
	Say 1971.003 kg @ Rs 1.42 / kg						Rs 2798.82		
30	13.48.2 Finishing with Deluxe Multi surface paint system for interiors and exteriors using primer as per manufacturers specifications:Painting wood work with Deluxe Multi Surface Paint of required shade. Two or more coat applied @ 0.90 ltr/10 sqm over an under coat of primer applied @ 0.75 ltr/10 sqm of approved brand and manufacture								
	slab for sump	1	18.150	15.850			287.678		
	roof slab	2	18.450	16.150			595.935		
	column deduction for roof slab	12	0.450	0.450			-2.430		

	column deduction for slab at slup top	12	0.450	0.450			-2.430	
	Sunshade	2	18.75+16.45	0.600			-42.240	
	Long Beam floor & top	6*2*2	15.880	1.350			514.513	
	Long Beam floor & top	5*2	14.450	1.350			195.075	
	Lintle	22	0.550	0.600			7.261	
	Beam long	8	3.970	1.350			42.877	
	Beam short 1	6	3.500	1.350			28.350	
	Beam short 2	3	3.100	1.350			12.556	
	Beam short3	6	2.550	1.350			20.655	
	Roof slab	2	18.450	17.050			629.145	
	Sun shade 1	2	18.750	0.600			22.500	
	Sun shade 2	2	16.450	0.600			19.740	
	Side wall long	2*2	15.880		5.950		377.944	
	Side wall Short	2*2	15.200		5.950		361.760	
	partition wall	1*2	10.020		5.950		119.238	
	toilet	1*2	2.375		5.950		28.263	
	parapet long	2*2	18.450		0.500		36.900	
	parapet short	2*2	16.100		0.500		32.201	
	Ventilator	16	0.600	0.200	0.500		-0.960	
	rolling shutter	1	2.350	0.200	4.350		-2.044	
	windows ground floor - w2	16	1.500	0.200	1.500		-7.200	
							Total Quantity	3332.591 sqm
							Total Deducted Quantity	-57.304 sqm
							Net Total Quantity	3275.287 sqm
							Say 3275.287 sqm @ Rs 153.28 / sqm	Rs 502035.99
31	od373523/2021_2022 Supply, Erection, Commissioning and Trial run of 3 TON capacity electrically operated overhead travelling crane conforming to IS: 807, 3177 & 3938 with all supporting accessories complete, tested to 25% overload with a span 3.4 meters, Lift 6 meters and bay length 18 meters as per the direction of 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 580750.00 / No				Rs 1161500.00	
32	11.46.2 Providing and laying Vitrified tiles indifferent sizes (thickness to be specified by manufacturer), with water absorption less than 0.08 % and conforming to I.S. 15622, of approved make, in all colours & shade, in skirting, riser of steps, over 12 mm thick bed of cement mortar 1:3 (1 cement : 3 coarse sand), including grouting the joint with white cement & matching pigments etc. complete. Size of Tile 600x600 mm						
	Platform floor	1	18.150	15.650			284.048
	Skirting	1	18.150+15 .65	0.100			3.380
	Pump Opening	7	3.550	2.920			-72.562
	Manhole	2	3.500	0.800			-5.600
		Total Quantity				287.428 sqm	
		Total Deducted Quantity				-78.162 sqm	
		Net Total Quantity				209.266 sqm	
		Say 209.266 sqm @ Rs 1819.62 / sqm				Rs 380784.60	
33	od373565/2021_2022 Providing and laying rectified Glazed Ceramic wall tiles of size 300x300 mm or more (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 cement mortar 1:4 (1 Cement : 4 Coarse sand) including pointing the joints with white cement and matching pigments etc., complete.						
		2	2.550		3.000		15.300
		2	1.550		3.000		9.300
	Door	1	0.900		2.100		-1.890
		Total Quantity				24.600 sqm	
		Total Deducted Quantity				-1.890 sqm	
		Net Total Quantity				22.710 sqm	
		Say 22.710 sqm @ Rs 1356.93 / sqm				Rs 30815.88	
34	17.3.1 Providing and fixing white vitreous china pedestal type water closet (European type) with seat and lid, 10 litre low level white vitreous china flushing cistern & C.P. flush bend with fittings & C.I. brackets, 40 mm flush bend, overflow arrangement with specials of standard make and mosquito proof coupling of approved municipal design complete, including painting of fittings and brackets, cutting and making good the walls and floors wherever required :W.C. pan with ISI marked white solid plastic seat and lid						
		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 7868.90 / No					Rs 7868.90
35	17.7.1	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 630x450 mm with a pair of 15 mm C.P. brass pillar taps					
		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 3634.56 / No					Rs 3634.56
36	17.10.1.2	Providing and fixing Stainless Steel A ISI 304 (18/8) kitchen sink as per IS 13983 with C.I. brackets and stainless steel plug 40 mm, including painting of fittings and brackets, cutting and making good the walls wherever required:Kitchen sink with drain board510x 1040 mm bowl depth 225 mm					
		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 6887.97 / No					Rs 6887.97
37	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 1510.40 / No					Rs 1510.40
38	17.33	Providing and fixing 600x120x5 mm glass shelf with edges round off supported on anodised aluminium angle frame with C.P. brass brackets and guard rail complete fixed with 40 mm long screws, rawl plugs etc., 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 990.89 / No						Rs 990.89
39	17.34.1	Providing and fixing toilet paper holder:C.P. brass						
		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 687.17 / Nos						Rs 687.17
40	17.35.1.1	Providing and fixing soil, waste and vent pipes:100 mm diaSand cast iron S & S pipe as per IS : 1729						
		1	5.000				5.000	
		Total Quantity						5.000 metre
		Total Deducted Quantity						0.000 metre
		Net Total Quantity						5.000 metre
		Say 5.000 metre @ Rs 1186.75 / metre						Rs 5933.75
41	50.17.1.5	Supplying and fixing CP Health Faucet superior quality (Jagur or equivalent make) including cost of materials and labour charges etc complete as per the direction of site Engineer-in-charge.						
		1	5.000				5.000	
		Total Quantity						5.000 Nos
		Total Deducted Quantity						0.000 Nos
		Net Total Quantity						5.000 Nos
		Say 5.000 Nos @ Rs 1280.77 / Nos						Rs 6403.85
42	od375773/2021_2022	Supplying and fixing Stainless steel (304 Grade) Towel rod 60cm or nearest available length including cost of materials and labour charges etc complete as per the direction of site Engineer-in-charge.						
		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 238.60 / Nos						Rs 238.60
43	od375711/2021_2022	Supply and fixing of approved brand Class - C type 3kg CO fire extinguishing confirming to IS:15222						

	having discharge time more then 08 sec, with complete accessories as per the direction of Engineer in charge.							
		6					6.000	
	Total Quantity						6.000 No	
	Total Deducted Quantity						0.000 No	
	Net Total Quantity						6.000 No	
	Say 6.000 No @ Rs 4762.15 / No						Rs 28572.90	
44	17.28.1.2 Providing and fixing P.V.C. waste pipe for sink or wash basin including PVC.waste fittings complete.Semi rigid pipe40 mm dia							
		1	6.000				6.000	
	Total Quantity						6.000 No	
	Total Deducted Quantity						0.000 No	
	Net Total Quantity						6.000 No	
	Say 6.000 No @ Rs 115.86 / No						Rs 695.16	
45	17.71 Providing and fixing PTMT liquid soap container 109 mm wide, 125 mm high and 112 mm distance from wall of standard shape with bracket of the same materials with snap fittings of approved quality and colour, weighing not less than 105 gms							
		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 186.64 / No						Rs 186.64	
46	50.18.7.1.1 Providing and fixing PVC pipes, fittings including fixing the pipe with clamps at 1.00 m spacing. This includes jointing of pipes & fittings with one step PVC solvent cement and testing of joints complete as per direction of Engineer-in-Charge 15mm dia 12kgf/cm2 -Internal work- Exposed on wall							
		1	6.000				6.000	
	Total Quantity						6.000 metre	
	Total Deducted Quantity						0.000 metre	
	Net Total Quantity						6.000 metre	
	Say 6.000 metre @ Rs 235.63 / metre						Rs 1413.78	
47	50.18.7.3.1 Providing and fixing PVC pipes, fittings including fixing the pipe with clamps at 1.00 m spacing. This includes jointing of pipes & fittings with one step PVC solvent cement and testing of joints complete as							

	per direction of Engineer- in- Charge 25 mm dia 12 Kgf/cm2 - Internal work - Exposed on wall							
		1	10.000				10.000	
	Total Quantity						10.000 metre	
	Total Deducted Quantity						0.000 metre	
	Net Total Quantity						10.000 metre	
	Say 10.000 metre @ Rs 283.48 / metre						Rs 2834.80	
48	od376082/2021_2022 Providing and fixing approved brand Stainless steel (304 Grade) tap/tower type with complete fittings etc..as per the direction of 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 638.83 / No						Rs 638.83	
49	od376486/2021_2022 Supply of Steel almirah size 1980mm(H)x900mm(W)x480mm(D) manufactured from 22 gauge for body and 20 gauge for doors. The Almirah should have four shelves making five compartments of standard size. The doors of almirah provided with stiffeners made of MS sheet spot welded to the doors. Powder coating thickness shall be not less than 70 microne etc.. complete as per the direction of 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 14518.75 / No						Rs 14518.75	
50	od376487/2021_2022 Supply of office chair having Seat & Back Assembly : The seat and back shall be made of PU foam of density 45 ± 2 Kg/m3 upholstered with changeable fabric upholstery covers (as per requirement).Back Size: 480 mm. (W) X 550 mm (H) Approx. Seat Size: 480 mm (W) X650 mm. (D) Approx.b. Base : Shall made of SS 304 grde hollow tube and pneumatic up & down with one point locking mechanism. Handle armrest : The armrest shall be gas-assisted injection molded from black polypropylene. Revolving & tilt : Chair should have a full 360 degree revolving mechanism with 17 deg. maximum tilt only and tilt tension adjustment facility. Height of chair : Maximum and minimum height is approx. is 930mm and 830 mm respectively. Powder coating : Other visible metal parts and seat base support metal parts should be powder coated with dry film thickness more than 50 microns, Salt Spray test to withstand more than 1000 hours, Pencil scratch hardness more than 2H, Adhesion as per DIN 53152 Standards. The powder coating shall be of good quality (7 process) to ensure good adhesion of life of the coating. Colour of seat upholster : Any color of seat fabric as per the direction of engineer in-charge. Fabric : Composition, Surface – 100% Polyamide, Substrate - 65 % (polyester) 35% (cotton) Fabric shall have quality of user							

	friendly for maintain cleanliness by simple vacuuming. etc.. complete as per the direction of Engineer in-charge.								
		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 5226.75 / No						Rs 15680.25		
51	<p>od376488/2021_2022</p> <p>Supply of executive steel table having over all Size : (L)1500 X (W) 900 (H) 750 mm. Table Top :- 5mm thick ISI Marked Prelaminated MDF board IS-14587-1998 , Leapping :- Teak wood half round 50mm wide, supported from inside by Jungle wood 25 x 25 mm. OR PVC leapping 25mm with proper edge banding machine., Frame Structure :- ERW Square pipe 32x32x1.25mm in size1350(L)x750(W)x725(H) mm. with Center Support as indicated, To be welded in center below the top, Pannel (On Fame) :- 18mm thick Pre-laminated MDF board covering frame structure from 3 Sides (Height-600mm) with proper edge leapping and fixed on 4 flats of 18 x 3 mm with nut bolts (Not to be fixed directly with main leg pipe), Drawer & Cupboard:- CR sheet 0.80mm thick Confirming to IS-513,Cupboard Size :- size 600(D) x400(W) x450mm(H), Drawer Size :- 500(L)X100mm(D) Minimum. Drawer 3Nop. And one folding shelf in cup Board, Drawer Sliding :- Nylon tear resistant wheels rolling in C channels between drawer & box, Cupboard Shutter :- BOX TYPE made of 0.80mm CRCA Sheet Confirming to IS-513, Footrest :- ERW square pipe 32x32x1.25mm in full length and with 100mm gapbe tween two pipes, P.U/Rubber Shoes :- P.U / Rubber shoe`s are to be used compulsorily in legs, Also General Requirements for Welding / Painting / Finishing / Packing & etc shall be done as per the direction of Engineer in charge.</p>								
		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 4646.00 / No						Rs 4646.00		
SI No	Description	No	L	B	D	CF	Quantity	Remark	
2Clear water Channel (Cost Index:35.59 %)									
1	<p>2.6.1</p> <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>								
	for channel	1	46.700	5.400	1.500		378.271		
	Total Quantity						378.271 cum		
	Total Deducted Quantity						0.000 cum		
	Net Total Quantity						378.271 cum		
	Say 378.271 cum @ Rs 214.03 / cum						Rs 80961.34		

2	2.7.1 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. Ordinary rock								
	for channel	1	46.700	5.400	4.300		1084.374		
		Total Quantity					1084.374 cum		
		Total Deducted Quantity					0.000 cum		
		Net Total Quantity					1084.374 cum		
		Say 1084.374 cum @ Rs 414.84 / cum					Rs 449841.71		
3	2.26.2 Extra for every additional lift 1.5 m or part there of in excavation / banking excavated or stacked materials. Ordinary or hard rock								
	Ordinary rock	4	46.700	4.100	1.500		1148.820		
		Total Quantity					1148.820 cum		
		Total Deducted Quantity					0.000 cum		
		Net Total Quantity					1148.820 cum		
		Say 1148.820 cum @ Rs 190.78 / cum					Rs 219171.88		
4	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.								
	for channel	1	46.700	5.400	3.475		876.326		
		Total Quantity					876.326 cum		
		Total Deducted Quantity					0.000 cum		
		Net Total Quantity					876.326 cum		
		Say 876.326 cum @ Rs 258.57 / cum					Rs 226591.61		
5	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 channel	1	46.700	5.400	0.100		25.219		
		Total Quantity					25.219 cum		
		Total Deducted Quantity					0.000 cum		
		Net Total Quantity					25.219 cum		
		Say 25.219 cum @ Rs 7990.86 / cum					Rs 201521.50		
6	5.33.1								

	Providing and laying in position machine batched and machine mixed design mix M-25 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 upto plinth level							
	Bottom slab	1	46.700	5.200	0.350		84.994	
	side wall	2	46.700	4.300	0.350		140.567	
	haunches	2	46.700	0.350	0.350	0.5	5.721	
	Top Slab	1	46.700	3.200	0.200		29.889	
	Total Quantity						261.171 cum	
	Total Deducted Quantity						0.000 cum	
	Net Total Quantity						261.171 cum	
	Say 261.171 cum @ Rs 9413.54 / cum						Rs 2458543.66	
7	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).							
	Bottom slab	1	46.700	5.200	0.350		84.994	
	side wall	2	46.700	4.300	0.350		140.567	
	haunches	2	46.700	0.350	0.350	0.5	5.721	
	Top Slab	1	46.700	3.200	0.200		29.889	
	Total Quantity						261.171 cum	
	Total Deducted Quantity						0.000 cum	
	Net Total Quantity						261.171 cum	
	Say 261.171 cum @ Rs 82.10 / cum						Rs 21442.14	
8	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.							
	Side Wall Outer	2	46.700		5.050		471.670	
	Side Wall Inner	2	46.700		4.300		401.620	
	Total Quantity						873.290 sqm	
	Total Deducted Quantity						0.000 sqm	
	Net Total Quantity						873.290 sqm	
	Say 873.290 sqm @ Rs 717.20 / sqm						Rs 626323.59	

9	5.9.3 Centering and shuttering including strutting, etc. and removal of form for:Suspended floors, roofs, landings, balconies and access platform							
	Top slab	1	46.700	2.500			116.750	
	Total Quantity						116.750 sqm	
	Total Deducted Quantity						0.000 sqm	
	Net Total Quantity						116.750 sqm	
	Say 116.750 sqm @ Rs 815.78 / sqm						Rs 95242.32	
10	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							
	R . C . C . qty - 261.171 @120kg/m3	1	261.171			120.0	31340.520	
	Total Quantity						31340.520 kilogram	
	Total Deducted Quantity						0.000 kilogram	
	Net Total Quantity						31340.520 kilogram	
	Say 31340.520 kilogram @ Rs 98.30 / kilogram						Rs 3080773.12	
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)							
	Side Wall Outer	2	46.700		5.050		471.670	
	Side Wall Inner	2	46.700		4.300		401.620	
	Bottom	1	46.700	2.500			116.750	
	Top slab bottom	1	46.700	0.250			11.675	
	Top slab upper side	1	46.700	3.200			149.441	
	Total Quantity						1151.156 sqm	
	Total Deducted Quantity						0.000 sqm	
	Net Total Quantity						1151.156 sqm	
	Say 1151.156 sqm @ Rs 401.21 / sqm						Rs 461855.30	
12	13.21 Extra for providing and mixing water proofing material in cement plaster work in proportion recommended by the manufacturers.							
	Side Wall Outer	2	46.700		5.050		471.670	
	Side Wall Inner	2	46.700		4.300		401.620	
	Bottom	1	46.700	2.500			116.750	
	Total Quantity						990.040 kg	

Total Deducted Quantity							0.000 kg	
Net Total Quantity							990.040 kg	
Say 990.040 kg @ Rs 1.42 / kg							Rs 1405.86	
13	11.21.2.1	Providing and fixing 10 mm thick acid and /or alkali resistant tiles of approved make and colour using acid and / or alkali resisting mortar bedding, and joints filled with acid and /or alkali resisting cement as per IS : 4457, complete as per the direction of Engineer-in-Charge.In dado/ skirting on 12 mm thick mortar 1:4 (1 acid proof cement : 4 coarse sand)Acid and alkali resistant tile						
	Side Wall Inner	2	46.700		4.300		401.620	
	Bottom	1	46.700	2.500			116.750	
Total Quantity							518.370 sqm	
Total Deducted Quantity							0.000 sqm	
Net Total Quantity							518.370 sqm	
Say 518.370 sqm @ Rs 1892.43 / sqm							Rs 980978.94	
SI No	Description	No	L	B	D	CF	Quantity	Remark
3Building for Substation and transformer (Cost Index:35.59 %)								
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						
		18+10	1.700	1.700	1.450		117.334	
Total Quantity							117.334 cum	
Total Deducted Quantity							0.000 cum	
Net Total Quantity							117.334 cum	
Say 117.334 cum @ Rs 214.03 / cum							Rs 25113.00	
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)						
	Column footing	18+10	1.700	1.700	0.100		8.092	
	Floor	1	19.400	11.500	0.150		33.465	
	Duct 1	1	11.450	3.100	0.100		3.550	
	Duct 2	2	8.750	1.100	0.100		1.925	
	Duct1	1	11.500	2.500	0.150		-4.312	
	Duct 2	2	9.000	0.500	0.200		-1.800	

		Total Quantity					47.032 cum	
		Total Deducted Quantity					-6.112 cum	
		Net Total Quantity					40.920 cum	
		Say 40.920 cum @ Rs 7990.86 / cum					Rs 326985.99	
3	5.33.1 Providing and laying in position machine batched and machine mixed design mix M-25 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 upto plinth level							
	Footing	18+10	1.500	1.500	0.450		28.350	
	Column footing	18+10	0.300	0.300	0.850		2.142	
	Plinth beam long	4	20.000	0.300	0.350		8.400	
	Plinth beam short	7	11.450	0.300	0.350		8.416	
	Duct 1	1	11.450	5.000	0.200		11.451	
	Duct 2	2	8.750	2.600	0.200		9.100	
		Total Quantity					67.859 cum	
		Total Deducted Quantity					0.000 cum	
		Net Total Quantity					67.859 cum	
		Say 67.859 cum @ Rs 9413.54 / cum					Rs 638793.41	
4	5.33.2 Providing and laying in position machine batched and machine mixed design mix M-25 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	18	0.300	0.300	4.500		7.290	
		Total Quantity					7.290 cum	
		Total Deducted Quantity					0.000 cum	
		Net Total Quantity					7.290 cum	
		Say 7.290 cum @ Rs 11065.64 / cum					Rs 80668.52	
5	13.1.1 12 mm cement plaster of mix:1:4 (1 cement : 4 fine sand)							

	Footing	28*4	1.500		0.450		75.601		
		28*4		0.300	0.850		28.561		
	Plinth beam long	4*3	20.000		0.350		84.000		
	Plinth beam short	7*3	11.450		0.350		84.158		
	Duct 1	2	11.450	5.000			114.500		
	Duct 2	2*2	8.750	2.600			91.000		
	Wall long	2*2	20.000		4.500		360.000		
	Wall short	2*2	11.450		4.500		206.100		
	Window	14	1.200		1.500		-25.199		
	Rolling Shutter	2	3.000		3.500		-21.000		
	Total Quantity							1043.920 sqm	
	Total Deducted Quantity							-46.199 sqm	
	Net Total Quantity							997.721 sqm	
	Say 997.721 sqm @ Rs 314.09 / sqm							Rs 313374.19	
6	5.9.1 Centering and shuttering including strutting, etc. and removal of form for:Foundations, footings, bases of columns, etc for mass concrete								
	Footing	28*4	1.500		0.450		75.601		
	Plinth beam long	4*3	20.000		0.350		84.000		
	Plinth beam short	7*3	11.450		0.350		84.158		
	Duct 1	2	11.450	5.000			114.500		
	Duct 2	2*2	8.750	2.600			91.000		
	Total Quantity							449.259 sqm	
	Total Deducted Quantity							0.000 sqm	
	Net Total Quantity							449.259 sqm	
	Say 449.259 sqm @ Rs 335.31 / sqm							Rs 150641.04	
7	5.9.6 Centering and shuttering including strutting, etc. and removal of form for:Columns, Pillars, Piers, Abutments, Posts and Struts								
	Column	18	1.200		4.500		97.200		
	Column footing	28	1.200		0.850		28.561		
	Total Quantity							125.761 sqm	
	Total Deducted Quantity							0.000 sqm	
	Net Total Quantity							125.761 sqm	

	Say 125.761 sqm @ Rs 863.64 / sqm						Rs 108612.23	
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							
		1				67.86	67.859	
	Total Quantity						67.859 kilogram	
	Total Deducted Quantity						0.000 kilogram	
	Net Total Quantity						67.859 kilogram	
	Say 67.859 kilogram @ Rs 98.30 / kilogram						Rs 6670.54	
9	5.22A.6 Steel reinforcement for R.C.C work including straightening, cutting, bending, placing in position and binding all complete above plinth level. Thermo - Mechanically Treated bars of grade Fe-500D or more							
		1				7.29	7.290	
	Total Quantity						7.290 kg	
	Total Deducted Quantity						0.000 kg	
	Net Total Quantity						7.290 kg	
	Say 7.290 kg @ Rs 98.30 / kg						Rs 716.61	
10	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.							
	Floor	1	19.400	11.500	1.100		245.411	
	Duct1	1	11.500	2.500	1.100		-31.625	
	Duct 2	2	9.000	0.500	1.100		-9.900	
	Total Quantity						245.411 cum	
	Total Deducted Quantity						-41.525 cum	
	Net Total Quantity						203.886 cum	
	Say 203.886 cum @ Rs 258.57 / cum						Rs 52718.80	
11	50.6.1.2 Solid block masonry using pre cast solid blocks (Factory made) of size 40x20x20cm or nearest available size confirming to IS 2185 part I of 1979 for super structure up to floor two level thickness 20cm and above in: CM 1:6 (1 cement: 6 coarse sand) etc complete.							
	Wall long	2	20.000	0.200	4.500		36.000	
	Wall short	2	11.450	0.200	4.500		20.610	
	Ramp	1	2.400	0.200	0.500		0.240	
	Windows	14	1.200	0.200	1.500		-5.040	

	Column	18	0.200	0.200	4.500		-3.240		
	Rolling Shutter	2	3.000	0.200	3.500		-4.200		
	Total Quantity						56.850 cum		
	Total Deducted Quantity						-12.480 cum		
	Net Total Quantity						44.370 cum		
	Say 44.370 cum @ Rs 6602.09 / cum						Rs 292934.73		
12	<p>21.1.1.2 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 portion Powder coated aluminium (minimum thickness of powder coating 50 micron)</p>								
	Window @0.567kg/m	14	5.400			0.57	43.092		
	Partition @0.867kg/m	2	64.000			0.87	111.360		
	Control Room	1	64.000			0.87	55.680		
	Total Quantity						210.132 kg		
	Total Deducted Quantity						0.000 kg		
	Net Total Quantity						210.132 kg		
	Say 210.132 kg @ Rs 537.07 / kg						Rs 112855.59		
13	<p>21.3.2 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 5.50 mm thickness</p>								
	Window	14		1.200	1.500		25.200		
	Transformer partition	2		13.500	3.000		81.000		
	Control room	1		11.500	3.000		34.500		
	Total Quantity						140.700 sqm		
	Total Deducted Quantity						0.000 sqm		
	Net Total Quantity						140.700 sqm		
	Say 140.700 sqm @ Rs 1526.00 / sqm						Rs 214708.20		
14	<p>10.16.2 Steel work in built up tubular (round, square or rectangular hollow tubes etc.) trusses etc., including</p>								

	cutting, hoisting, fixing position and applying a priming coat of approved steel primer, including welding and bolted with special shaped washers etc. complete.Hot finished seamless type tubes						
	Rafter @ 5.61kg/m (100x50x2.5mm thickness)	1	276+30			5.61	1716.660
	Parling @ 1.55 kg/m (50x20x2mm thickness)	1	300+50			2.02	707.000
	Base plate 200X200x10mm thick and bolt	18				6.0	108.000
	Tie beam top (100x100X2.5mm)	2	140.800			7.57	2131.713
	Total Quantity						4663.373 kg
	Total Deducted Quantity						0.000 kg
	Net Total Quantity						4663.373 kg
	Say 4663.373 kg @ Rs 185.35 / kg						Rs 864356.19
15	od374300/2021_2022 Providing powder coated 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. Electro statically polyester powder coated of thickness shall be 60 microns (minimum).						
	Sheet	2	21.200	6.950			294.680
	Ridge	2	21.200	0.200			8.480
	Total Quantity						303.160 sqm
	Total Deducted Quantity						0.000 sqm
	Net Total Quantity						303.160 sqm
	Say 303.160 sqm @ Rs 1161.02 / sqm						Rs 351974.82
16	13.48.2 Finishing with Deluxe Multi surface paint system for interiors and exteriors using primer as per manufacturers specifications:Painting wood work with Deluxe Multi Surface Paint of required shade. Two or more coat applied @ 0.90 ltr/10 sqm over an under coat of primer applied @ 0.75 ltr/10 sqm of approved brand and manufacture						
	Duct 1	2	11.450	5.000			114.500
	Duct 2	2*2	8.750	2.600			91.000

	Wall long	2*2	20.000		4.500		360.000		
	Wall short	2*2	11.450		4.500		206.100		
	Window	14	1.200		1.500		-25.199		
	Rolling Shutter	2	3.000		3.500		-21.000		
	Total Quantity							771.600 sqm	
	Total Deducted Quantity							-46.199 sqm	
	Net Total Quantity							725.401 sqm	
	Say 725.401 sqm @ Rs 153.28 / sqm							Rs 111189.47	
17	11.46.2 Providing and laying Vitrified tiles indifferent sizes (thickness to be specified by manufacturer), with water absorption less than 0.08 % and conforming to I.S. 15622, of approved make, in all colours & shade, in skirting, riser of steps, over 12 mm thick bed of cement mortar 1:3 (1 cement : 3 coarse sand), including grouting the joint with white cement & matching pigments etc. complete. Size of Tile 600x600 mm								
	Floor	1	19.700	11.450			225.565		
	Ramp	2	3.000	2.400			14.400		
	Total Quantity							239.965 sqm	
	Total Deducted Quantity							0.000 sqm	
	Net Total Quantity							239.965 sqm	
	Say 239.965 sqm @ Rs 1819.62 / sqm							Rs 436645.11	
18	10.25.1 Item Shifted to Sub head 14 as item 14.73 Item Shifted to head 14 as item 14.74 Steel work welded in built up sections/framed work, including cutting, hoisting, fixing in position and applying a priming coat of approved steel primer using structural steel etc. as required. In stringers, treads, landings etc. of stair cases, including use of chequered plate wherever required, all complete								
	Frame	1	100.000			8.99	899.000		
	Plate	14				42.0	588.000		
	Total Quantity							1487.000 kg	
	Total Deducted Quantity							0.000 kg	
	Net Total Quantity							1487.000 kg	
	Say 1487.000 kg @ Rs 110.23 / kg							Rs 163912.01	
19	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								
		2	3.000		3.500		21.000		
		Total Quantity					21.000 sqm		
		Total Deducted Quantity					0.000 sqm		
		Net Total Quantity					21.000 sqm		
		Say 21.000 sqm @ Rs 3300.13 / sqm					Rs 69302.73		
20	13.50.3 Applying priming coat:With ready mixed red oxide zinc chromate primer of approved brand and manufacture on steel galvanised iron /steel works								
		2	3.000		3.500	2.25	47.250		
		Total Quantity					47.250 sqm		
		Total Deducted Quantity					0.000 sqm		
		Net Total Quantity					47.250 sqm		
		Say 47.250 sqm @ Rs 59.66 / sqm					Rs 2818.94		
21	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 .								
		2	3.000		3.500	2.25	47.250		
		Total Quantity					47.250 sqm		
		Total Deducted Quantity					0.000 sqm		
		Net Total Quantity					47.250 sqm		
		Say 47.250 sqm @ Rs 208.54 / sqm					Rs 9853.52		
22	od375711/2021_2022 Supply and fixing of approved brand Class - C type 3kg CO fire extinguishing confirming to IS:15222 having discharge time more then 08 sec, with complete accessories as per the direction of Engineer in charge.								
		6					6.000		
		Total Quantity					6.000 No		
		Total Deducted Quantity					0.000 No		
		Net Total Quantity					6.000 No		
		Say 6.000 No @ Rs 4762.15 / No					Rs 28572.90		
23	od375712/2021_2022 Supply and laying rubber floor mat of different size and colour with thickness not less than 25 mm as per the direction of engineer in-charge.								
		1	11.500	3.000			34.500		

		1	9.000	0.600			5.400	
	Total Quantity						39.900 sqm	
	Total Deducted Quantity						0.000 sqm	
	Net Total Quantity						39.900 sqm	
	Say 39.900 sqm @ Rs 813.05 / sqm						Rs 32440.69	
	Total						38024745.21	
	Centage @						0.0%	
	Centage Amount						0.00	
	Provision for GST payments (in %) @						18.0%	
	Amount reserved for GST payments						6844454.14	
	Total & Centage						44869199.35	
	Lumpsum for round off						800.65	
	GRAND TOTAL Rs						44870000.00	
	Rounded Grand Total Rs 4,48,70,000							
	Rupees Four Crore Forty Eight Lakh Seventy Thousand Only							

Kerala Water Authority
PRICE

General Abstract

**State Plan-Interim Augmentation of Kochi city and adjoining areas-Phase1-
Proposed WTP at Aluva-Clear water pumping main to Edathala and
Keezhmad, Realignment of existing pipeline to existing OHSR, Valve Chamber etc.at
WTP site.**

(Dsr year: 2018)

SI No	Heading Description	Amount
1	Relaying the pipe lines - Working charges	1500646.62
2	Relaying of pipe line -Cost of materials	3531790.69
3	Road restoration charges	50917718.70
4	Clear water pumping main- working charge	20722759.24
5	Clear water pumping main - Cost of materials	62324485.37
6	Valve chamber	285260.20
	Total	139282660.83
	Centage @	0.0%
	Centage Amount	0.00
	Provision for GST payments (in %) @	18.0%
	Amount reserved for GST payments	25070878.95
	Total & Centage	164353539.78
	Lumpsum for round off	46460.22
	GRAND TOTAL Rs	164400000.00
	Rounded Grand Total Rs 16,44,00,000	
	Rupees Sixteen Crore Forty Four Lakh Only	

Detailed Estimate

**State Plan-Interim Augmentation of Kochi city and adjoining areas-Phase1-
Proposed WTP at Aluva-Clear water pumping main to Edathala and
Keezhmad, Realignment of existing pipeline to existing OHSR, Valve Chamber etc.at
WTP site.**

(Dsr year: 2018)

Sl No	Description	No	L	B	D	CF	Quantity	Remark	
1 Relaying the pipe lines - Working charges (Cost Index:35.59 %)									
1	100.1.1 Excavating trenches of required width for pipes, cables, etc including excavation for sockets, and dressing of sides, ramming of bottoms, depth up to 1.5 m, including getting out the excavated soil, and then returning the soil as required, in layers not exceeding 20 cm in depth, including consolidating each deposited layer by ramming, watering, etc. and disposing of surplus excavated soil as directed, within a lead of 50 m : All kinds of soil (Ref. Item No. 2.10.1 of DSR)								
Relaying existing pipelines (Pumping main and distribution of UWSS Aluva)									
	500 mm DI pipe	1	170.000	1.600	1.450	0.85	335.240		
	400mm DI pipe	1	170.000	1.100	1.350	0.85	214.583		
	300mm DI pipe	1	170.000	1.000	1.250	0.85	180.625		
	150mm DI pipe	1	170.000	0.900	1.100	0.85	143.055		
	110 mm PVC pipe	1	170.000	0.600	1.050	0.85	91.036		
	Total Quantity							964.539 cum	
	Total Deducted Quantity							0.000 cum	
	Net Total Quantity							964.539 cum	
	Say 964.539 cum @ Rs 555.51 / cum							Rs 535811.06	
2	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)								
	500 mm DI pipe	1	170.000	1.600	1.450	0.15	59.160		
	400mm DI pipe	1	170.000	1.100	1.350	0.15	37.868		

	300mm DI pipe	1	170.000	1.000	1.250	0.15	31.875		
	150mm DI pipe	1	170.000	0.900	1.100	0.15	25.245		
	110 mm PVC pipe	1	170.000	0.600	1.050	0.15	16.066		
	Total Quantity						170.214 cum		
	Total Deducted Quantity						0.000 cum		
	Net Total Quantity						170.214 cum		
	Say 170.214 cum @ Rs 806.76 / cum						Rs 137321.85		
3	100.9.9 Laying UPVC pipes of class 2 to class 6 and specials, lowering to the trenches already made, placing in position aligning the pipe line to the lines and levels and jointing the pipes and specials with solvent cement and testing the pipe line with water to the required test pressure (excluding cost of pipes and specials). 110 mm nominal outer dia pipes.								
	110 mm PVC pipe	1	170.000				170.000		
	Total Quantity						170.000 metre		
	Total Deducted Quantity						0.000 metre		
	Net Total Quantity						170.000 metre		
	Say 170.000 metre @ Rs 128.27 / metre						Rs 21805.90		
4	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								
		1	170.000				170.000		
	Total Quantity						170.000 metre		
	Total Deducted Quantity						0.000 metre		
	Net Total Quantity						170.000 metre		
	Say 170.000 metre @ Rs 87.66 / metre						Rs 14902.20		
5	100.14.5 Conveying and laying S&S Centrifugally Cast (Spun) / Ductile Iron Pipes conforming to IS: 8329 excluding cost of pipes and specials : 300 mm dia Ductile Iron Class K-9 Pipes Data derived from 18.72.19 in DAR								
	300 mm dia Ductile Iron Class K-9 Pipes	1	170.000				170.000		
	Total Quantity						170.000 metre		
	Total Deducted Quantity						0.000 metre		

	Net Total Quantity						170.000 metre	
	Say 170.000 metre @ Rs 205.15 / metre						Rs 34875.50	
6	100.14.7 Conveying and laying S&S Centrifugally Cast (Spun) / Ductile Iron Pipes conforming to IS: 8329 excluding cost of pipes and specials : 400 mm dia Ductile Iron Class K-9 Pipes Data derived from 18.72.21 in DAR							
	400 mm dia Ductile Iron Class K-9 Pipes	1	170.000				170.000	
	Total Quantity						170.000 metre	
	Total Deducted Quantity						0.000 metre	
	Net Total Quantity						170.000 metre	
	Say 170.000 metre @ Rs 327.31 / metre						Rs 55642.70	
7	100.14.9 Conveying and laying S&S Centrifugally Cast (Spun) / Ductile Iron Pipes conforming to IS: 8329 excluding cost of pipes and specials : 500 mm dia Ductile Iron Class K-9 Pipes Data derived from 18.72.23 in DAR							
	500 mm dia Ductile Iron Class K-9 Pipes	1	170.000				170.000	
	Kerala Water Authority Total Quantity						170.000 metre	
	Total Deducted Quantity						0.000 metre	
	Net Total Quantity						170.000 metre	
	Say 170.000 metre @ Rs 442.43 / metre						Rs 75213.10	
8	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							
		35					35.000	
	Total Quantity						35.000 joint	
	Total Deducted Quantity						0.000 joint	
	Net Total Quantity						35.000 joint	
	Say 35.000 joint @ Rs 176.40 / joint						Rs 6174.00	
9	18.70.5 Providing push - on-joints to Centrifugally (Spun) Cast Iron Pipes or Ductile Iron Pipes including testing of joints and including the cost of rubber gasket:300 mm dia pipe							
		35					35.000	
	Total Quantity						35.000 joint	

							Total Deducted Quantity	0.000 joint
							Net Total Quantity	35.000 joint
							Say 35.000 joint @ Rs 412.60 / joint	Rs 14441.00
10	18.70.7	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:400 mm dia pipes						
		35						35.000
							Total Quantity	35.000 joint
							Total Deducted Quantity	0.000 joint
							Net Total Quantity	35.000 joint
							Say 35.000 joint @ Rs 681.34 / joint	Rs 23846.90
11	18.70.9	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:500 mm dia pipes						
		42						42.000
							Total Quantity	42.000 joint
							Total Deducted Quantity	0.000 joint
							Net Total Quantity	42.000 joint
							Say 42.000 joint @ Rs 835.71 / joint	Rs 35099.82
12	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						
		1	170.000					170.000
							Total Quantity	170.000 metre
							Total Deducted Quantity	0.000 metre
							Net Total Quantity	170.000 metre
							Say 170.000 metre @ Rs 31.55 / metre	Rs 5363.50
13	100.35.5	Testing 300mm DI/CI pipeline with potable water to the required test pressure. 300 mm dia Observed Data derived from item no.1023 of PHED DATA						
		1	170.000					170.000
							Total Quantity	170.000 metre
							Total Deducted Quantity	0.000 metre
							Net Total Quantity	170.000 metre

	Say 170.000 metre @ Rs 55.59 / metre							Rs 9450.30
14	100.35.7 Testing 400mm DI/CI pipeline with potable water to the required test pressure. 400 mm dia Observed Data derived from item no.1026 of PHED DATA							
		1	170.000				170.000	
	Total Quantity							170.000 metre
	Total Deducted Quantity							0.000 metre
	Net Total Quantity							170.000 metre
	Say 170.000 metre @ Rs 85.49 / metre							Rs 14533.30
15	100.35.9 Testing 500mm DI/CI pipeline with potable water to the required test pressure. 500 mm dia Observed Data derived from item no.1028 of PHED DATA							
		1	170.000				170.000	
	Total Quantity							170.000 metre
	Total Deducted Quantity							0.000 metre
	Net Total Quantity							170.000 metre
	Say 170.000 metre @ Rs 109.29 / metre							Rs 18579.30
16	100.8.1 Fencing one side of trenches, 1.50 m height with two rows of 10 cm plastic caution tape in vertical casuarina pole (girth 15cm to 24cm) fixed at 2 m intervals. (Data Prepared based on PWD SDB - Item No.1009)							
		1	150.000				150.000	
	Total Quantity							150.000 metre
	Total Deducted Quantity							0.000 metre
	Net Total Quantity							150.000 metre
	Say 150.000 metre @ Rs 28.01 / metre							Rs 4201.50
17	18.83.4 Labour for cutting C.I. pipe with steel saw.150 mm diameter C.I. pipe							
		1	5.000				5.000	
	Total Quantity							5.000 Each Cut
	Total Deducted Quantity							0.000 Each Cut
	Net Total Quantity							5.000 Each Cut
	Say 5.000 Each Cut @ Rs 322.98 / Each Cut							Rs 1614.90
18	18.83.7							

	Labour for cutting C.I. pipe with steel saw.300 mm diameter C.I. pipe							
	300 mm diameter C.I. pipe	5					5.000	
	Total Quantity						5.000 Each Cut	
	Total Deducted Quantity						0.000 Each Cut	
	Net Total Quantity						5.000 Each Cut	
	Say 5.000 Each Cut @ Rs 643.44 / Each Cut						Rs 3217.20	
19	18.83.9 Labour for cutting C.I. pipe with steel saw.400 mm diameter C.I. pipe							
	400 mm diameter C.I. pipe	5					5.000	
	Total Quantity						5.000 Each Cut	
	Total Deducted Quantity						0.000 Each Cut	
	Net Total Quantity						5.000 Each Cut	
	Say 5.000 Each Cut @ Rs 855.71 / Each Cut						Rs 4278.55	
20	18.83.11 Labour for cutting C.I. pipe with steel saw.500 mm diameter C.I pipe							
	500 mm diameter C.I. pipe	5					5.000	
	Total Quantity						5.000 Each Cut	
	Total Deducted Quantity						0.000 Each Cut	
	Net Total Quantity						5.000 Each Cut	
	Say 5.000 Each Cut @ Rs 1068.45 / Each Cut						Rs 5342.25	
21	18.30.7 Providing flanged joints to double flanged C.I./ D.I pipes and specials, including testing of joints:300 mm diameter pipe							
		2					2.000	
	Total Quantity						2.000 Nos	
	Total Deducted Quantity						0.000 Nos	
	Net Total Quantity						2.000 Nos	
	Say 2.000 Nos @ Rs 578.43 / Nos						Rs 1156.86	
22	18.30.9 Providing flanged joints to double flanged C.I./ D.I pipes and specials, including testing of joints:400 mm diameter pipe							
		2					2.000	
	Total Quantity						2.000 Nos	

	Say 2050.790 kilogram @ Rs 98.30 / kilogram						Rs 201592.66	
27	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	300.000				300.000	
	Total Quantity						300.000 Kwh	
	Total Deducted Quantity						0.000 Kwh	
	Net Total Quantity						300.000 Kwh	
	Say 300.000 Kwh @ Rs 18.44 / Kwh						Rs 5532.00	
SI No	Description	No	L	B	D	CF	Quantity	Remark
2Relaying of pipe line -Cost of materials (Cost Index:35.59 %)								
1	100.98.119 Supply of DI K9 Pipe Conforming to IS 8329/2000, 300mm Dia.							
	Supply of DI K9 Pipe Conforming to IS 8329/2000, 300mm Dia.	1	170.000				170.000	
	Total Quantity						170.000 metre	
	Total Deducted Quantity						0.000 metre	
	Net Total Quantity						170.000 metre	
	Say 170.000 metre @ Rs 3537.65 / metre						Rs 601400.50	
2	100.98.121 Supply of DI K9 Pipe Conforming to IS 8329/2000, 400mm Dia.							
	Supply of DI K9 Pipe Conforming to IS 8329/2000, 400mm Dia	1	170.000				170.000	
	Total Quantity						170.000 metre	
	Total Deducted Quantity						0.000 metre	
	Net Total Quantity						170.000 metre	
	Say 170.000 metre @ Rs 5377.35 / metre						Rs 914149.50	
3	100.98.123 Supply of DI K9 Pipe Conforming to IS 8329/2000, 500mm Dia.							

	Supply of DI K9 Pipe Conforming to IS 8329/2000, 500mm Dia	1	170.000				170.000	
	Total Quantity						170.000 metre	
	Total Deducted Quantity						0.000 metre	
	Net Total Quantity						170.000 metre	
	Say 170.000 metre @ Rs 7517.25 / metre						Rs 1277932.50	
4	100.98.214 Supply of uPVC Pipe, IS 4985: 2000 , 6kg/cm2, 110mm Dia.							
	Supply of PVC Pipe, 6kg/cm2, 110mm Dia	1	170.000				170.000	
	Total Quantity						170.000 metre	
	Total Deducted Quantity						0.000 metre	
	Net Total Quantity						170.000 metre	
	Say 170.000 metre @ Rs 291.80 / metre						Rs 49606.00	
5	100.98.116 Supply of DI K9 Pipe Conforming to IS 8329/2000, 150mm Dia.							
	Supply of DI K9 Pipe Conforming to IS 8329/2000, 150mm Dia.	1	170.000				170.000	
	Total Quantity						170.000 metre	
	Total Deducted Quantity						0.000 metre	
	Net Total Quantity						170.000 metre	
	Say 170.000 metre @ Rs 1673.35 / metre						Rs 284469.50	
6	od363935/2021_2022 Supply of DI specials							
	300 mm DI D/S 90 bend	5				0.68	3.401	
	400 mm DI D/S 90 bend	5				1.15	5.750	
	500 mm DI D/S 90 bend	5				1.85	9.250	
	150 mm DI D/S 90 bend	5				0.2	1.000	

	300 mm DI D/S 45 bend	1				0.5	0.500		
	400 mm DI D/S 45 bend	1				0.85	0.850		
	500 mm DI D/S 45 bend	1				1.85	1.850		
	150 mm DI D/S 45 bend	1				0.16	0.160		
	Total Quantity						22.761 quintal		
	Total Deducted Quantity						0.000 quintal		
	Net Total Quantity						22.761 quintal		
	Say 22.761 quintal @ Rs 17694.50 / quintal						Rs 402744.51		
7	od363936/2021_2022 Supply of PVC specials								
	Supply of PVC specials	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 1488.18 / set						Rs 1488.18		
SI No	Description	No	L	B	D	CF	Quantity	Remark	
3Road restoration charges (Cost Index:35.59 %)									
1	od363921/2021_2022 BM & BC road restoration charges								
	PWD road scour drain	1	500.000	1.600		1.5	1200.000		
	PWD road keezhmad pumping	1	950.000	1.600		1.5	2280.000		
	PWD road Edathala pumping	1	3000.000	1.700		1.5	7650.000		
	Total Quantity						11130.000 sqm		
	Total Deducted Quantity						0.000 sqm		
	Net Total Quantity						11130.000 sqm		
	Say 11130.000 sqm @ Rs 3633.49 / sqm						Rs 40440743.70		
2	od363930/2021_2022 Road restoration LSDG road 								

	LSGD road Edathala pumping	1	2500.000			1.5	3750.000	
							Total Quantity	3750.000 sqm
							Total Deducted Quantity	0.000 sqm
							Net Total Quantity	3750.000 sqm
							Say 3750.000 sqm @ Rs 2793.86 / sqm	Rs 10476975.00
SI No	Description	No	L	B	D	CF	Quantity	Remark
4Clear water pumping main- working charge (Cost Index:35.59 %)								
1	100.1.1 Excavating trenches of required width for pipes, cables, etc including excavation for sockets, and dressing of sides, ramming of bottoms, depth up to 1.5 m, including getting out the excavated soil, and then returning the soil as required, in layers not exceeding 20 cm in depth, including consolidating each deposited layer by ramming, watering, etc. and disposing of surplus excavated soil as directed, within a lead of 50 m : All kinds of soil (Ref. Item No. 2.10.1 of DSR)							
	500 mm DI-K9 to Aluva OHSR	1	12.000	1.600	1.450		27.841	
	400 mm DI-K9 to Keezhmad	1	950.000	1.100	0.783		818.235	
	600mm DI-K9 pipe to Edathala	1	5550.000	1.700	1.040		9812.400	
	1250mm MS to Kalamassery	1	30.000	2.400	2.150		154.800	
							Total Quantity	10813.276 cum
							Total Deducted Quantity	0.000 cum
							Net Total Quantity	10813.276 cum
							Say 10813.276 cum @ Rs 555.51 / cum	Rs 6006882.95
2	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)							
	400 mm DI-K9 to Keezhmad	1	950.000	1.100	0.383		400.235	

	600mm DI-K9 pipe to Edathala	1	5550.000	1.700	0.360		3396.600		
	1250mm MS to Kalamassery	1	30.000	2.400	2.150		154.800		
	Total Quantity						3951.635 cum		
	Total Deducted Quantity						0.000 cum		
	Net Total Quantity						3951.635 cum		
	Say 3951.635 cum @ Rs 806.76 / cum							Rs 3188021.05	
3	<p>100.2.2 Excavation work by mechanical means (Hydraulic excavator) / manual means in foundation trenches or drains (not exceeding 1.5 m in width or 10 m² 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 soils as directed, within a lead of 50 m. Medium Rock (blasting prohibited) New Data derived from Item No.2.9.3</p>								
	400 mm DI-K9 to Keezhmad	1	950.000	1.100	0.183		191.235		
	600mm DI-K9 pipe to Edathala	1	5550.000	1.700	0.150		1415.250		
	1250mm MS to Kalamassery	1	30.000	2.400	2.150		154.800		
	Total Quantity						1761.285 cum		
	Total Deducted Quantity						0.000 cum		
	Net Total Quantity						1761.285 cum		
	Say 1761.285 cum @ Rs 1059.91 / cum							Rs 1866803.58	
4	<p>100.14.7 Conveying and laying S&S Centrifugally Cast (Spun) / Ductile Iron Pipes conforming to IS: 8329 excluding cost of pipes and specials : 400 mm dia Ductile Iron Class K-9 Pipes Data derived from 18.72.21 in DAR</p>								
		1	950.000				950.000		
	Total Quantity						950.000 metre		
	Total Deducted Quantity						0.000 metre		
	Net Total Quantity						950.000 metre		
	Say 950.000 metre @ Rs 327.31 / metre							Rs 310944.50	
5	<p>18.70.7 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:400 mm dia pipes</p>								

		190					190.000	
	Total Quantity						190.000 joint	
	Total Deducted Quantity						0.000 joint	
	Net Total Quantity						190.000 joint	
	Say 190.000 joint @ Rs 681.34 / joint						Rs 129454.60	
6	18.70.9 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:500 mm dia pipes							
		2					2.000	
	Total Quantity						2.000 joint	
	Total Deducted Quantity						0.000 joint	
	Net Total Quantity						2.000 joint	
	Say 2.000 joint @ Rs 835.71 / joint						Rs 1671.42	
7	18.70.10 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:600 mm dia pipes							
		975					975.000	
	Total Quantity						975.000 joint	
	Total Deducted Quantity						0.000 joint	
	Net Total Quantity						975.000 joint	
	Say 975.000 joint @ Rs 1093.40 / joint						Rs 1066065.00	
8	18.30.9 Providing flanged joints to double flanged C.I./ D.I pipes and specials, including testing of joints:400 mm diameter pipe							
		6					6.000	
	Total Quantity						6.000 Nos	
	Total Deducted Quantity						0.000 Nos	
	Net Total Quantity						6.000 Nos	
	Say 6.000 Nos @ Rs 1066.42 / Nos						Rs 6398.52	
9	18.30.11 Providing flanged joints to double flanged C.I./ D.I pipes and specials, including testing of joints:500 mm diameter pipe							
		5					5.000	
	Total Quantity						5.000 Nos	
	Total Deducted Quantity						0.000 Nos	

		Net Total Quantity						5.000 Nos
		Say 5.000 Nos @ Rs 1486.95 / Nos						Rs 7434.75
10	18.30.12	Providing flanged joints to double flanged C.I./ D.I pipes and specials, including testing of joints:600 mm diameter pipe						
		4					4.000	
		Total Quantity						4.000 Nos
		Total Deducted Quantity						0.000 Nos
		Net Total Quantity						4.000 Nos
		Say 4.000 Nos @ Rs 1739.89 / Nos						Rs 6959.56
11	18.83.9	Labour for cutting C.I. pipe with steel saw.400 mm diameter C.I. pipe						
		12					12.000	
		Total Quantity						12.000 Each Cut
		Total Deducted Quantity						0.000 Each Cut
		Net Total Quantity						12.000 Each Cut
		Say 12.000 Each Cut @ Rs 855.71 / Each Cut						Rs 10268.52
12	18.83.11	Labour for cutting C.I. pipe with steel saw.500 mm diameter C.I. pipe						
		3					3.000	
		Total Quantity						3.000 Each Cut
		Total Deducted Quantity						0.000 Each Cut
		Net Total Quantity						3.000 Each Cut
		Say 3.000 Each Cut @ Rs 1068.45 / Each Cut						Rs 3205.35
13	18.83.12	Labour for cutting C.I. pipe with steel saw.600 mm diameter C.I. pipe						
		60					60.000	
		Total Quantity						60.000 No
		Total Deducted Quantity						0.000 No
		Net Total Quantity						60.000 No
		Say 60.000 No @ Rs 1275.43 / No						Rs 76525.80
14	100.14.9	Conveying and laying S&S Centrifugally Cast (Spun) / Ductile Iron Pipes conforming to IS: 8329 excluding cost of pipes and specials : 500 mm dia Ductile Iron Class K-9 Pipes Data derived from 18.72.23 in DAR						

		1	12.000				12.000	
	Total Quantity						12.000 metre	
	Total Deducted Quantity						0.000 metre	
	Net Total Quantity						12.000 metre	
	Say 12.000 metre @ Rs 442.43 / metre						Rs 5309.16	
15	100.14.10 Conveying and laying S&S Centrifugally Cast (Spun) / Ductile Iron Pipes conforming to IS: 8329 excluding cost of pipes and specials : 600 mm dia Ductile Iron Class K-9 Pipes Data derived from 18.72.24 in DAR							
		1	5550.000				5550.000	
	Total Quantity						5550.000 metre	
	Total Deducted Quantity						0.000 metre	
	Net Total Quantity						5550.000 metre	
	Say 5550.000 metre @ Rs 584.19 / metre						Rs 3242254.50	
16	100.37.14.1 Fabricating MS pipes of size 600mm (ID) using 8 mm thick MS plate including cost and conveyance charges of MS plate, all fabrication charges, charges of painting the steel work with two or more coat deluxe multi surface paint to give an even shade over an under coat of primer etc. complete: For pipes fabricated with 8mm thick MS plates.							
		1	30.000				30.000	
	Total Quantity						30.000 metre	
	Total Deducted Quantity						0.000 metre	
	Net Total Quantity						30.000 metre	
	Say 30.000 metre @ Rs 13511.88 / metre						Rs 405356.40	
17	100.37.14.2 Fabricating MS flanges of diameter 600 mm using 16 mm thick MS plate including cost and conveyance charges of MS plate, all fabrication charges, charges of painting the steel work with two or more coat deluxe multi surface paint to give an even shade over an under coat of primer etc. complete: For pipes fabricated with 8mm thick MS plates.							
		6					6.000	
	Total Quantity						6.000 Nos	
	Total Deducted Quantity						0.000 Nos	
	Net Total Quantity						6.000 Nos	
	Say 6.000 Nos @ Rs 7891.43 / Nos						Rs 47348.58	
18	100.37.14.3							

	Cutting 600mm (ID) MS pipes for making bends and other specials by gas cutting including cost of gas, all labour and hire charges of tools etc. complete: For pipes fabricated with 8mm thick MS plates.						
		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 603.51 / No						Rs 3621.06
19	100.37.14.4 Welding 600 mm (ID) MS pipes for making bends and other specials by gas/electric welding machine including cost of gas and welding rods ,all labour and hire charges of tools etc. complete: For pipes fabricated with 8mm thick MS plates.						
		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 2309.10 / No						Rs 13854.60
20	100.37.14.5 Grinding cut and weld edges of 600 mm (ID) MS pipes during fabrication work including all labour and hire charges of tools etc. complete: For pipes fabricated with 8mm thick MS plates.						
		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 432.94 / No						Rs 2597.64
21	od363948/2021_2022 Welding 1219mm (ID) MS pipes for making bends and other specials by gas/electric welding machine including cost of gas and welding rods ,all labour and hire charges of tools etc. complete: For pipes fabricated with 10mm thick MS plates.						
		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 4642.06 / No						Rs 18568.24
22	od363950/2021_2022 Cutting 1219 mm (ID) MS pipes for making bends and other specials by gas cutting including cost of gas, all labour and hire charges of tools etc. complete: For pipes fabricated with 10mm thick MS plates.						

		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 1214.56 / No						Rs 4858.24	
23	od363951/2021_2022 Fabricating MS flanges of diameter 1219 mm using 16 mm thick MS plate including cost and conveyance charges of MS plate, all fabrication charges, charges of painting the steel work with two or more coat deluxe multi surface paint to give an even shade over an under coat of primer etc. complete: For pipes fabricated with 10mm thick MS plates.							
		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 19492.89 / No						Rs 77971.56	
24	od363954/2021_2022 Fabricating MS pipes of size 1219 mm (ID) using 11 mm thick MS plate including cost and conveyance charges of MS plate, all fabrication charges, charges of painting the steel work with two or more coat deluxe multi surface paint to give an even shade over an under coat of primer etc. complete: For pipes fabricated with 10mm thick MS plates.							
		1	30.000				30.000	
	Total Quantity						30.000 metre	
	Total Deducted Quantity						0.000 metre	
	Net Total Quantity						30.000 metre	
	Say 30.000 metre @ Rs 28748.00 / metre						Rs 862440.00	
25	100.8.1 Fencing one side of trenches, 1.50 m height with two rows of 10 cm plastic caution tape in vertical casuarina pole (girth 15cm to 24cm) fixed at 2 m intervals. (Data Prepared based on PWD SDB - Item No.1009)							
		1	3500.000				3500.000	
	Total Quantity						3500.000 metre	
	Total Deducted Quantity						0.000 metre	
	Net Total Quantity						3500.000 metre	
	Say 3500.000 metre @ Rs 28.01 / metre						Rs 98035.00	
26	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)							
		1	200.000				200.000	
	Total Quantity						200.000 metre	
	Total Deducted Quantity						0.000 metre	
	Net Total Quantity						200.000 metre	
	Say 200.000 metre @ Rs 96.33 / metre						Rs 19266.00	
27	<p>od363959/2021_2022</p> <p>Supplying and fixing Electro magnetic flow meter confirming to protection level IP-68 for flow sensor and IP-67 for transmitter and having an accuracy level of 0.5% with LED/LCD unit suitable to measure the discharge of the transmission main of 400 mm DI . The flow meter should having the housing (flow sensor) to be made of SS 304/Carbon steel with anti corrosive protection and inside lining to be made up of Hard Rubber/ Neoprene are confirming to drinking water standard. The flow meter should be coupled with HART for data acquisition and transfer with provision for wireless transfer through GSM. The manufactures should have the calibration standards as per ISO 17025 and the product shall have sufficient warranty provision. Flow meter should be tested and calibrated at FCRI, Palakkad and test certificate should be produced. Flow meter should be calibrated with physical measurement at site after installation. A battery back of min 24 hrs should be provided. For clear water pumping main at Alua Plant.</p>							
		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 220424.08 / No						Rs 220424.08	
28	<p>od363960/2021_2022</p> <p>Supplying and fixing Electro magnetic flow meter confirming to protection level IP-68 for flow sensor and IP-67 for transmitter and having an accuracy level of 0.5% with LED/LCD unit suitable to measure the discharge of the transmission main of 600 mm MS pipe . The flow meter should having the housing (flow sensor) to be made of SS 304/Carbon steel with anti corrosive protection and inside lining to be made up of Hard Rubber/ Neoprene are confirming to drinking water standard. The flow meter should be coupled with HART for data acquisition and transfer with provision for wireless transfer through GSM. The manufactures should have the calibration standards as per ISO 17025 and the product shall have sufficient warranty provision. Flow meter should be tested and calibrated at FCRI, Palakkad and test certificate should be produced. Flow meter should be calibrated with physical measurement at site after installation. A battery back of min 24 hrs should be provided. For clear water pumping main at Alua Plant.</p>							
	To measure the discharge of the transmission main of 600 mm MS pipe to Edathala	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 259305.29 / No					Rs 259305.29	
29	od363963/2021_2022	<p>Supplying and fixing Electro magnetic flow meter confirming to protection level IP-68 for flow sensor and IP-67 for transmitter and having an accuracy level of 0.5% with LED/LCD unit suitable to measure the discharge of the transmission main of 1250 mm MS pipe . The flow meter should having the housing (flow sensor) to be made of SS 304/Carbon steel with anti corrosive protection and inside lining to be made up of Hard Rubber/ Neoprene are confirming to drinking water standard. The flow meter should be coupled with HART for data acquisition and transfer with provision for wireless transfer through GSM. The manufactures should have the calibration standards as per ISO 17025 and the product shall have sufficient warranty provision. Flow meter should be tested and calibrated at FCRI, Palakkad and test certificate should be produced. Flow meter should be calibrated with physical measurement at site after installation. A battery back of min 24 hrs should be provided. For clear water pumping main at Alua Plant.</p>						
		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 557480.78 / No					Rs 557480.78	
30	od363964/2021_2022	<p>Supplying and fixing Electro magnetic flow meter confirming to protection level IP-68 for flow sensor and IP-67 for transmitter and having an accuracy level of 0.5% with LED/LCD unit suitable to measure the discharge of the transmission main of 500 mm DI . The flow meter should having the housing (flow sensor) to be made of SS 304/Carbon steel with anti corrosive protection and inside lining to be made up of Hard Rubber/ Neoprene are confirming to drinking water standard. The flow meter should be coupled with HART for data acquisition and transfer with provision for wireless transfer through GSM. The manufactures should have the calibration standards as per ISO 17025 and the product shall have sufficient warranty provision. Flow meter should be tested and calibrated at FCRI, Palakkad and test certificate should be produced. Flow meter should be calibrated with physical measurement at site after installation. A battery back of min 24 hrs should be provided. For clear water pumping main at Alua Plant.</p>						
		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 241360.12 / No					Rs 241360.12	
31	100.35.7	<p>Testing 400mm DI/CI pipeline with potable water to the required test pressure. 400 mm dia Observed Data derived from item no.1026 of PHED DATA</p>						
		1	950.000				950.000	
		Total Quantity					950.000 metre	

	Total Deducted Quantity							0.000 metre
	Net Total Quantity							950.000 metre
	Say 950.000 metre @ Rs 85.49 / metre							Rs 81215.50
32	100.35.9 Testing 500mm DI/CI pipeline with potable water to the required test pressure. 500 mm dia Observed Data derived from item no.1028 of PHED DATA							
		1	12.000				12.000	
	Total Quantity							12.000 metre
	Total Deducted Quantity							0.000 metre
	Net Total Quantity							12.000 metre
	Say 12.000 metre @ Rs 109.29 / metre							Rs 1311.48
33	100.35.10 Testing 600mm DI/CI pipeline with potable water to the required test pressure. 600 mm dia Observed Data derived from item no.1029 of PHED DATA							
		1	5550.000				5550.000	
	Total Quantity							5550.000 metre
	Total Deducted Quantity							0.000 metre
	Net Total Quantity							5550.000 metre
	Say 5550.000 metre @ Rs 130.87 / metre							Rs 726328.50
34	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)							
	Anchor block -400mm	2	0.900	0.900	0.900		1.459	
	Anchor block - 500 mm	2	1.100	1.100	1.100		2.663	
	Anchor block - 600 mm	30	1.200	1.200	1.200		51.840	
	Anchor block - 1295 mm	2	1.900	1.900	1.900		13.718	
	Total Quantity							69.680 cum
	Total Deducted Quantity							0.000 cum
	Net Total Quantity							69.680 cum
	Say 69.680 cum @ Rs 7990.86 / cum							Rs 556803.12

35	5.9.1 Centering and shuttering including strutting, etc. and removal of form for:Foundations, footings, bases of columns, etc for mass concrete							
	Anchor block -400mm	2	3.600		0.900		6.480	
	Anchor block - 500 mm	2	4.400		1.100		9.681	
	Anchor block - 600 mm	30	4.800		1.200		172.800	
	Anchor block - 1295 mm	2	7.600		1.900		28.880	
	Total Quantity						217.841 sqm	
	Total Deducted Quantity						0.000 sqm	
	Net Total Quantity						217.841 sqm	
	Say 217.841 sqm @ Rs 335.31 / sqm						Rs 73044.27	
36	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							
	69.68 @ 60 kg/m3	1	69.680		60.0		4180.800	
	Total Quantity						4180.800 kilogram	
	Total Deducted Quantity						0.000 kilogram	
	Net Total Quantity						4180.800 kilogram	
	Say 4180.800 kilogram @ Rs 98.30 / kilogram						Rs 410972.64	
37	100.31.1.9 "Conveying and fixing C.I. sluice valves (with cap) by providing complete with bolts, nuts, rubber insertions etc. excluding the cost of valve (the tail pieces if required will be paid separately) : 400 mm diameter. Class I" Observed Data derived from item no.18.31.of DAR							
		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 4576.37 / Nos						Rs 4576.37	
38	100.31.1.11 Conveying and fixing C.I. sluice valves (with cap) by providing complete with bolts, nuts, rubber insertions etc. excluding the cost of valve (the tail pieces if required will be paid separately) : 500 mm diameter. Class I" Observed Data derived from item no.18.31.of DAR							

		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 6674.76 / Nos						Rs 6674.76	
39	<p>100.31.1.12 "Conveying and fixing C.I. sluice valves (with cap) by providing complete with bolts, nuts, rubber insertions etc. excluding the cost of valve (the tail pieces if required will be paid separately) : 600 mm diameter. Class I" Observed Data derived from item no.18.31.of DAR</p>							
		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 8700.67 / Nos						Rs 8700.67	
40	<p>100.31.1.17 Conveying and fixing C.I. sluice valves (with cap) by providing complete with bolts, nuts, rubber insertions etc. excluding the cost of valve (the tail pieces if required will be paid separately) : 1000 mm diameter. Class I" Observed Data derived from item no.18.31.of DAR</p>							
		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 22916.97 / Nos						Rs 22916.97	
41	<p>od363980/2021_2022 Interconnecting 400 mm MS with 350 mm ms and 250 mm MS pipe at site including Earth work excavation in all classes of soil , Ordinary rock to the required depth ,cutting 350 mm MS pipe diametrically perpendicular to the axis ,grinding and cleaning the surface, Fabricating 350 mm MS flanges using 12 mm thick MS plate and 250 mm MS flanges using 12 mm thick MS plate, welding to the pipe,Fabricating 400 x 350 reducer and 400x250mm Tee with 8 mm MS plate ,conveying and placing the ms fabricated reducer to the correct line and levels in trenches, jointing to the already laid pipes at both ends using mechanical collar joint to make a water tight joint including bailing out water from trench using pumpset, Fencing, on sides of trench with two rows ploes tied with coir yarn on vertical poles at 1.5m intervals and dismantling shoring ,encing etc after completion of work, back filling trenches of all labour, hire charges and conveyance for equipments, tools and plants and sundries etc. complete as per directions.</p>							
		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 69528.10 / No						Rs 69528.10	
SI No	Description	No	L	B	D	CF	Quantity	Remark
5Clear water pumping main - Cost of materials (Cost Index:35.59 %)								
1	100.98.121 Supply of DI K9 Pipe Conforming to IS 8329/2000, 400mm Dia.							
		1	950.000				950.000	
	Total Quantity						950.000 metre	
	Total Deducted Quantity						0.000 metre	
	Net Total Quantity						950.000 metre	
	Say 950.000 metre @ Rs 5377.35 / metre						Rs 5108482.50	
2	100.98.117 Supply of DI K9 Pipe Conforming to IS 8329/2000, 200mm Dia.							
	for scour	1	6.000				6.000	
	Total Quantity						6.000 metre	
	Total Deducted Quantity						0.000 metre	
	Net Total Quantity						6.000 metre	
	Say 6.000 metre @ Rs 2100.55 / metre						Rs 12603.30	
3	100.98.123 Supply of DI K9 Pipe Conforming to IS 8329/2000, 500mm Dia.							
		1	12.000				12.000	
	Total Quantity						12.000 metre	
	Total Deducted Quantity						0.000 metre	
	Net Total Quantity						12.000 metre	
	Say 12.000 metre @ Rs 7517.25 / metre						Rs 90207.00	
4	100.98.124 Supply of DI K9 Pipe Conforming to IS 8329/2000, 600mm Dia.							
	Pumping main to Edathala	1	5550.000				5550.000	
	Total Quantity						5550.000 metre	
	Total Deducted Quantity						0.000 metre	
	Net Total Quantity						5550.000 metre	
	Say 5550.000 metre @ Rs 9835.35 / metre						Rs 54586192.50	

5	100.98.461 Supply of CI Double Flanged Sluice Valve Conforming to IS 14846 - 2000, Sluice Valve with Cap PN 1.6, Size 200mm.									
		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 11794.00 / No						Rs 11794.00		
6	100.98.489 Supply of CI Double Flanged Sluice Valve Conforming to IS 14846 - 2000, Sluice Valve with Hand Wheel PN 1.6, Size 400mm.									
		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 45858.80 / No						Rs 45858.80		
7	100.98.491 Supply of CI Double Flanged Sluice Valve Conforming to IS 14846 - 2000, Sluice Valve with Hand Wheel PN 1.6, Size 500mm.									
		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 78620.20 / No						Rs 78620.20		
8	100.98.492 Supply of CI Double Flanged Sluice Valve Conforming to IS 14846 - 2000, Sluice Valve with Hand Wheel PN 1.6, Size 600mm.									
		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 101913.70 / No						Rs 101913.70		
9	od363944/2021_2022 Supply of CI Double Flanged Sluice Valve Conforming to IS 14846 - 2000, Sluice Valve with Hand Wheel PN 1.6, Size 1000mm.									
		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 250000.00 / No						Rs 250000.00	
10	od363945/2021_2022 Supply of DI specials							
	400mm DI 90 bend	2				1.15	2.300	
	500mm DI 90 bend	6				1.85	11.101	5 nos for scour pipr
	500mm DI 45 bend	3				1.35	4.051	for scour
	400mm DI 45 bend	2				0.85	1.700	
	400mm DI 22.50 bend	2				0.7	1.400	
	500mm DI 45 bend	1				1.35	1.350	
	600mm DI 45 bend	20				1.98	39.600	
	600mm DI 90 bend	10				2.81	28.100	
	600mm DI 22.1/2 bend	15				1.58	23.701	
	600x600x200 mm Tee	1				1.72	1.720	
	200 mm Tail piece	1				0.2	0.200	
	Total Quantity						115.223 quintal	
	Total Deducted Quantity						0.000 quintal	
	Net Total Quantity						115.223 quintal	
	Say 115.223 quintal @ Rs 17694.50 / quintal						Rs 2038813.37	
SI No	Description	No	L	B	D	CF	Quantity	Remark
6Valve chamber (Cost Index:35.59 %)								
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							
	valve chamber size 100*100	2	1.500	1.500	1.500		6.750	
	valve chamber size 120*120	3	1.700	1.700	1.500		13.005	
	valve chamber size 220*220	1	2.700	2.700	1.500		10.936	

						Total Quantity	30.691 cum	
						Total Deducted Quantity	0.000 cum	
						Net Total Quantity	30.691 cum	
						Say 30.691 cum @ Rs 214.03 / cum	Rs 6568.79	
2	2.7.1	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. Ordinary rock						
	valve chamber size 120*120	3	1.700	1.700	0.150		1.301	
	valve chamber size 220*220	1	2.700	2.700	0.950		6.926	
						Total Quantity	8.227 cum	
						Total Deducted Quantity	0.000 cum	
						Net Total Quantity	8.227 cum	
						Say 8.227 cum @ Rs 414.84 / cum	Rs 3412.89	
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)						
	valve chamber size 100*100	2	1.500	1.500	0.100		0.450	
	valve chamber size 120*120	3	1.700	1.700	0.100		0.867	
	valve chamber size 220*220	1	2.700	2.700	0.100		0.730	
						Total Quantity	2.047 cum	
						Total Deducted Quantity	0.000 cum	
						Net Total Quantity	2.047 cum	
						Say 2.047 cum @ Rs 7990.86 / cum	Rs 16357.29	
4	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							
	valve chamber size 100*100	2	1.300	1.300	0.150		0.507	
	sides	2	1.15*4	0.150	1.300		1.794	
	cover slab	2	1.300	1.300	0.150		0.507	
	valve chamber size 120*120	3	1.500	1.500	0.150		1.013	
	sides	3	1.35*4	0.150	1.400		3.402	
	cover slab	3	1.500	1.500	0.150		1.013	
	valve chamber size 220*220	1	2.500	2.500	0.150		0.938	
	sides	1	2.35*4	0.150	2.200		3.102	
	cover slab	1	1.700	1.700	0.150		0.434	
	Total Quantity						12.710 cum	
	Total Deducted Quantity						0.000 cum	
	Net Total Quantity						12.710 cum	
	Say 12.710 cum @ Rs 9886.00 / cum						Rs 125651.06	
5	5.22.6 Kerala Water Authority 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							
		1	12.710			90.0	1143.900	@80kg/m ³
	Total Quantity						1143.900 kilogram	
	Total Deducted Quantity						0.000 kilogram	
	Net Total Quantity						1143.900 kilogram	
	Say 1143.900 kilogram @ Rs 98.30 / kilogram						Rs 112445.37	
6	13.1.1 12 mm cement plaster of mix:1:4 (1 cement : 4 fine sand)							
	valve chamber size 100*100 floor	2	1.000	1.000			2.000	
	sides	2	1.00*4		1.300		10.400	
	Top	2	1.15*4	0.150			1.380	
	valve chamber size 120*120 floor	3	1.200	1.200			4.320	
	sides	3	1.20*4		1.400		20.160	

	top	3	1.35*4	0.150			2.430		
	valve chamber size 220*220 floor	1	2.200	2.200			4.841		
	sides	1	2.20*4		2.200		19.361		
	top	1	2.350*4	0.150			1.410		
	Total Quantity						66.302 sqm		
	Total Deducted Quantity						0.000 sqm		
	Net Total Quantity						66.302 sqm		
	Say 66.302 sqm @ Rs 314.09 / sqm						Rs 20824.80		
	Total						139282660.83		
	Centage @						0.0%		
	Centage Amount						0.00		
	Provision for GST payments (in %) @						18.0%		
	Amount reserved for GST payments						25070878.95		
	Total & Centage						164353539.78		
	Lumpsum for round off						46460.22		
	GRAND TOTAL Rs						164400000.00		
	Rounded Grand Total Rs						16,44,00,000		
	Rupees Sixteen Crore Forty Four Lakh Only								

Kerala Water Authority
PRICE

General Abstract

State Plan-Interim Augmentation of Kochi city and Adjoining areas-Proposed WTP at Aluva-Demolishing existing structures,Construction of compound wall,Service road,Yard lighting,Solar energy installation,CCTV,Landscape,Drainage,Protection works to existing pumping main.

(Dsr year: 2018)

SI No	Heading Description	Amount
1	Demolishing existing structures	3200049.25
2	Compound wall	10640551.89
3	Service road	3634463.35
4	Yard lighting	2536312.71
5	Solar Energy Installation	7200000.00
6	CCTV Camera installation	452400.00
7	Land scapping & Gardening	1288207.28
8	Drainage Arrangements	1897883.95
9	Protection Works to existing 42" & 36" Clear water pumping mains - Providing of RCC Duct	13065497.52
Total		43915365.94
Centage @		0.0%
Kerala Water Authority Centage Amount		0.00
Provision for GST payments (in %) @		18.0%
Amount reserved for GST payments		7904765.87
Total & Centage		51820131.81
Lumpsum for round off		79868.19
GRAND TOTAL Rs		51900000.00
Rounded Grand Total Rs		5,19,00,000
Rupees Five Crore Nineteen Lakh Only		

Detailed Estimate

**State Plan-Interim Augmentation of Kochi city and Adjoining areas-Propoosed WTP
at Aluva-Demolishing existing structures,Construction of compound wall,Service
road,Yard lighting,Solar energy instaiiation,CCTV,Landscape,Drainage,Protection
works to existing pumping main.**

(Dsr year: 2018)

Sl No	Description	No	L	B	D	CF	Quantity	Remark
1Demolishing existing structures (Cost Index:35.59 %)								
1	15.3 Demolishing R.C.C. work manually / by mechanical means including stacking of steel bars and disposal of unserviceable material with in 50 metres lead as per direction of Engineer -in-Charge.							
	Existing OHSR - column	12	0.380	0.380	8.000		13.863	
	Brace beam outer	2*8	0.250	0.380	3.900		5.928	
	Brace beam inner	8	0.250	0.380	2.500		1.900	
		4	0.250	0.380	3.750		1.425	
	Tank Bottom	1	3.140	10.80*10.80/4	0.250		22.891	
	Tank side wall	1	3.14*9.00	3.000	0.250		21.195	
	Tank inside column	4	0.250	0.250	3.000		0.750	
	Tank roof	1	3.140	9.00*9.00/4	0.150		9.538	
	Carshed - Columns	8	0.350	0.350	2.800		2.744	
	" beams	6	3.800	0.250	0.300		1.710	
	"	4	5.050	0.250	0.300		1.515	
	Roof slab with balcony	1	13.700	7.550	0.120		12.413	
	F.F Recreation hall columns	8	0.350	0.350	2.800		2.744	
	beams	6	3.800	0.250	0.300		1.710	
	"	4	5.050	0.250	0.300		1.515	
	sunshade all around	1	20.750	0.600	0.075		0.934	
	lintel all around	1	36.220	0.220	0.150		1.196	
	Roof slab	1	13.200	6.150	0.120		9.742	

	Total Quantity						113.713 cum	
	Total Deducted Quantity						0.000 cum	
	Net Total Quantity						113.713 cum	
	Say 113.713 cum @ Rs 2983.59 / cum						Rs 339272.97	
2	od364463/2021_2022 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.							
	D type quarters block	7	72.650	0.220	3.000		335.643	L = Total centre line
	E type quarters block	3	117.520	0.200	3.700		260.895	
	F type quarters block	12	106.380	0.220	3.700		1039.120	
	Store	1	128.860	0.220	3.800		107.727	
	Security	1	27.040	0.220	3.700		22.011	
	Total Quantity						1765.396 cum	
	Total Deducted Quantity						0.000 cum	
	Net Total Quantity						1765.396 cum	
	Say 1765.396 cum @ Rs 921.46 / cum						Rs 1626741.80	
3	15.7.4 Demolishing brick work 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. In cement mortar							
		1	30.000	0.220	2.500		16.500	
	Total Quantity						16.500 cum	
	Total Deducted Quantity						0.000 cum	
	Net Total Quantity						16.500 cum	
	Say 16.500 cum @ Rs 1730.20 / cum						Rs 28548.30	
4	15.9.2 Demolishing stone rubble masonry manually / by mechanical means including stacking of serviceable material and disposal of unserviceable material within 50 metres lead as per direction of Engineer -in-Charges: In cement mortar							
	D type quarters block	7	72.650	0.450	0.300		68.655	
	E type quarters block	3	117.520	0.450	0.300		47.596	
	F type quarters block	12	106.380	0.450	0.300		172.336	
	Store building	1	75.000	0.450	0.300		10.125	
	Total Quantity						298.712 cum	

		Total Deducted Quantity				0.000 cum	
		Net Total Quantity				298.712 cum	
		Say 298.712 cum @ Rs 2064.97 / cum				Rs 616831.32	
5	15.28.2 Dismantling roofing including ridges, hips, velleys and gutters etc., and stacking the material within 50 metres lead of :Asbestos Sheet						
	Store building	1	378.000			1.2	453.600
		Total Quantity				453.600 sqm	
		Total Deducted Quantity				0.000 sqm	
		Net Total Quantity				453.600 sqm	
		Say 453.600 sqm @ Rs 66.98 / sqm				Rs 30382.13	
6	15.31 Dismantling tiled roofing with battens, boarding etc. complete including stacking of serviceable material and disposal of unserviceable material within 50 metres lead.						
	D type	7	79.730			1.3	725.543
	E type	3	123.280			1.3	480.793
	F type	12	90.100			1.3	1405.560
	Security cabin	1	59.490			1.3	77.337
		Kerala Water Authority Total Quantity				2689.233 sqm	
		Total Deducted Quantity				0.000 sqm	
		Net Total Quantity				2689.233 sqm	
		Say 2689.233 sqm @ Rs 176.54 / sqm				Rs 474757.19	
7	15.13.1 Taking out doors, windows and clerestory window shutters (steel or wood) including stacking within 50 metres lead:Of area 3 sq. metres and below						
	D type quarters block	7*19					133.000
	E type quarters block	3*32					96.000
	F type quarters block	12*34					408.000
	Store building	1*22					22.000
	security cabin	1*3					3.000
		Total Quantity				662.000 No	
		Total Deducted Quantity				0.000 No	
		Net Total Quantity				662.000 No	
		Say 662.000 No @ Rs 125.42 / No				Rs 83028.04	
8	15.19						

	Dismantling steel work manually / by mechanical means in built up sections without dismembering and stacking within 50 metres lead as per directions of Engineer -in-Charge.							
	Rolling shutters -porch	3				50.0	150.000	
	Total Quantity						150.000 kg	
	Total Deducted Quantity						0.000 kg	
	Net Total Quantity						150.000 kg	
	Say 150.000 kg @ Rs 3.25 / kg						Rs 487.50	
SI No	Description	No	L	B	D	CF	Quantity	Remark
2Compound wall (Cost Index:35.59 %)								
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							
	compound wall foundation	1	452.000	0.800	1.000		361.600	
	Retaining wall portion	1	160.000	1.300	3.000		624.000	
	Total Quantity						985.600 cum	
	Total Deducted Quantity						0.000 cum	
	Net Total Quantity						985.600 cum	
	Say 985.600 cum @ Rs 214.03 / cum						Rs 210947.97	
2	2.26.2 Extra for every additional lift 1.5 m or part there of in excavation / banking excavated or stacked materials.Ordinary or hard rock							
		1	160.000	1.300	1.500		312.000	
	Total Quantity						312.000 cum	
	Total Deducted Quantity						0.000 cum	
	Net Total Quantity						312.000 cum	
	Say 312.000 cum @ Rs 190.78 / cum						Rs 59523.36	
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	1	452.000	0.800	1.000		361.600	
	Basement	1	452.000	0.600	0.500		135.600	
	Total Quantity						497.200 cum	

		Total Deducted Quantity					0.000 cum	
		Net Total Quantity					497.200 cum	
		Say 497.200 cum @ Rs 7204.78 / cum					Rs 3582216.62	
4	50.6.1.5 Solid block masonry using pre cast solid blocks (Factory made) of size 30x20x20cm or nearest available size confirming to IS 2185 Part I of 1979 for super structure up to floor two level thickness 20cm and above in: CM 1:6 (1 cement : 6 coarse sand) etc complete							
		1	612.000	0.200	1.600		195.841	
	Extra for pillar	200	2*0.40	0.100	1.600		25.601	
		Total Quantity					221.442 cum	
		Total Deducted Quantity					0.000 cum	
		Net Total Quantity					221.442 cum	
		Say 221.442 cum @ Rs 6644.12 / cum					Rs 1471287.22	
5	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	612.000	3.400			2080.800	
	Extra for pillar	200	2*.8	1.600			512.001	
		Total Quantity					2592.801 sqm	
		Total Deducted Quantity					0.000 sqm	
		Net Total Quantity					2592.801 sqm	
		Say 2592.801 sqm @ Rs 401.21 / sqm					Rs 1040257.69	
6	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)							
	foundation	1	160.000	1.300	0.100		20.800	
		Total Quantity					20.800 cum	
		Total Deducted Quantity					0.000 cum	
		Net Total Quantity					20.800 cum	
		Say 20.800 cum @ Rs 7990.86 / cum					Rs 166209.89	
7	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)							
		1	160.000	1.100	0.300		52.800	
		1	160.000	0.300	3.000		144.000	

		1*53	3.000	(0+0.90)/2	0.250		17.888	
	Total Quantity						214.688 cum	
	Total Deducted Quantity						0.000 cum	
	Net Total Quantity						214.688 cum	
	Say 214.688 cum @ Rs 8588.47 / cum						Rs 1843841.45	
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							
		1	214.688			80.0	17175.040	@80 kg/m3
	Total Quantity						17175.040 kilogram	
	Total Deducted Quantity						0.000 kilogram	
	Net Total Quantity						17175.040 kilogram	
	Say 17175.040 kilogram @ Rs 98.30 / kilogram						Rs 1688306.43	
9	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	612.000	3.400			2080.800	
	Extra for pillar	200	2*.8	1.600			512.001	
	Total Quantity						2592.801 sqm	
	Total Deducted Quantity						0.000 sqm	
	Net Total Quantity						2592.801 sqm	
	Say 2592.801 sqm @ Rs 222.91 / sqm						Rs 577961.27	
SI No	Description	No	L	B	D	CF	Quantity	Remark
3Service road (Cost Index:35.59 %)								
1	16.1 Preparation and consolidation of sub grade with power road roller of 8 to 12 tonne capacity after excavating earth to an average of 22.5 cm depth, dressing to camber and consolidating with road roller including making good the undulations etc. and re-rolling the sub grade and disposal of surplus earth with lead upto 50 metres.							
		1	435.000	4.000			1740.000	
	Total Quantity						1740.000 sqm	
	Total Deducted Quantity						0.000 sqm	
	Net Total Quantity						1740.000 sqm	
	Say 1740.000 sqm @ Rs 184.54 / sqm						Rs 321099.60	

2	16.78.1 Construction of granular sub- base by Providing close graded Material conforming to specifications, mixing in a mechanical mix plant at OMC, Carriage of mixed material by tippers to work site, for all leads & lifts, spreading in uniform layers of specified thickness with motor grader on prepared surface and compacting with vibratory power roller to achieve the desired density, complete as per specifications and directions of Engineer-in- Charge.With Material conforming to Grade - I (size range 75 mm to 0.075 mm) having CBR Value- 30							
	new	1	435.000	4.000	0.200		348.000	
	Total Quantity						348.000 cum	
	Total Deducted Quantity						0.000 cum	
	Net Total Quantity						348.000 cum	
	Say 348.000 cum @ Rs 2963.59 / cum						Rs 1031329.32	
3	16.91.2 Providing and laying factory made chamfered edge Cement Concrete paver blocks in footpath, parks, lawns, drive ways or light traffic parking etc, of required strength,thickness & size/ shape, made by table vibratory method using PU mould, laid in required colour & pattern over 50mm thick compacted bed of sand, compacting and proper embedding/laying of inter locking paver blocks into the sand bedding layer through vibratory compaction by using plate vibrator, filling the joints with sand and cutting of paver blocks as per required size and pattern, finishing and sweeping extra sand. complete all as per direction of Engineer-in-Charge.80 mm thick C.C. paver block of M-30 grade with approved color design and pattern.							
		1	435.000	4.000			1740.000	
	Total Quantity						1740.000 sqm	
	Total Deducted Quantity						0.000 sqm	
	Net Total Quantity						1740.000 sqm	
	Say 1740.000 sqm @ Rs 1121.80 / sqm						Rs 1951932.00	
4	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)							
		1*2	435.000	0.300	0.150		39.150	
		2*2	4.000	0.300	0.150		0.720	
		2*2	8.000	0.300	0.150		1.440	
	Total Quantity						41.310 cum	
	Total Deducted Quantity						0.000 cum	
	Net Total Quantity						41.310 cum	
	Say 41.310 cum @ Rs 7990.86 / cum						Rs 330102.43	
SI No	Description	No	L	B	D	CF	Quantity	Remark

4Yard lighting (Cost Index:35.59 %)								
1	2.10.1.1	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 soilPipes, cables etc, not exceeding 80 mm dia						
		25	25.000	0.500	0.600		187.500	
		35	20.000	0.500	0.600		210.000	
		28	30.000	0.500	0.600		252.000	
		25	60.000	0.500	0.600		450.000	
		Total Quantity					1099.500 metre	
		Total Deducted Quantity					0.000 metre	
		Net Total Quantity					1099.500 metre	
		Say 1099.500 metre @ Rs 262.50 / metre					Rs 288618.75	
2	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						
	80 mm GI pipe	34	0.500	0.500	0.800		6.801	
	50 mm GI pipe	45	0.400	0.400	0.600		4.320	
		Total Quantity					11.121 cum	
		Total Deducted Quantity					0.000 cum	
		Net Total Quantity					11.121 cum	
		Say 11.121 cum @ Rs 214.03 / cum					Rs 2380.23	
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)						
	80 mm GI pipe	34	0.500	0.500	0.100		0.851	
	50 mm GI pipe	45	0.400	0.400	0.100		0.721	
		Total Quantity					1.572 cum	
		Total Deducted Quantity					0.000 cum	
		Net Total Quantity					1.572 cum	
		Say 1.572 cum @ Rs 6814.89 / cum					Rs 10713.01	

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)								
	80 mm GI pipe	34	0.400	0.400	0.600		3.265		
	50 mm GI pipe	45	0.300	0.300	0.500		2.025		
	Total Quantity						5.290 cum		
	Total Deducted Quantity						0.000 cum		
	Net Total Quantity						5.290 cum		
	Say 5.290 cum @ Rs 8588.47 / cum							Rs 45433.01	
5	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								
		1	5.290			150.0	793.500		
	Total Quantity						793.500 kg		
	Total Deducted Quantity						0.000 kg		
	Net Total Quantity						793.500 kg		
	Say 793.500 kg @ Rs 96.68 / kg							Rs 76715.58	
6	13.52.1 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 steel work								
	80 mm GI pipe	34	7.000	0.500			119.000		
	50 mm GI pipe	45	7.000	0.320			100.801		
	Total Quantity						219.801 sqm		
	Total Deducted Quantity						0.000 sqm		
	Net Total Quantity						219.801 sqm		
	Say 219.801 sqm @ Rs 223.32 / sqm							Rs 49085.96	
7	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								
	80 mm GI pipe	34	7.000			6.72	1599.360		
	50 mm GI pipe	45	7.000			5.03	1584.450		
	Total Quantity						3183.810 kg		
	Total Deducted Quantity						0.000 kg		

		Net Total Quantity					3183.810 kg	
		Say 3183.810 kg @ Rs 189.89 / kg					Rs 604573.68	
8	od364467/2021_2022 Supplying and laying 2 core 4 sqmm copper UG cable , as per the direction of depatmental officers.							
		1	3665.000				3665.000	
		Total Quantity					3665.000 metre	
		Total Deducted Quantity					0.000 metre	
		Net Total Quantity					3665.000 metre	
		Say 3665.000 metre @ Rs 278.10 / metre					Rs 1019236.50	
9	od364468/2021_2022 Supplying and fixing sintex box(16 Amp DB) on each post as per the direction of Departmentals officers.							
		79					79.000	
		Total Quantity					79.000 No	
		Total Deducted Quantity					0.000 No	
		Net Total Quantity					79.000 No	
		Say 79.000 No @ Rs 547.00 / No					Rs 43213.00	
10	od364469/2021_2022 Supply fixing testing and commissioning of pre-wired LED street light fitting 36/45W							
		79					79.000	
		Total Quantity					79.000 No	
		Total Deducted Quantity					0.000 No	
		Net Total Quantity					79.000 No	
		Say 79.000 No @ Rs 4690.00 / No					Rs 370510.00	
11	od364470/2021_2022 Supply and drawing 650/1100 V Grade PVC insulated copper conductor cables in the existing surface / recess conduit and giving connections 1.5 sq.mm. 2 run.							
		79					79.000	
		Total Quantity					79.000 metre	
		Total Deducted Quantity					0.000 metre	
		Net Total Quantity					79.000 metre	
		Say 79.000 metre @ Rs 61.00 / metre					Rs 4819.00	
12	od364472/2021_2022 Supply and fixing 6A modular switch 6 A in existing board front plates and giving connection							
		79					79.000	
		Total Quantity					79.000 No	

Total Deducted Quantity							0.000 No	
Net Total Quantity							79.000 No	
Say 79.000 No @ Rs 119.00 / No							Rs 9401.00	
13	od364473/2021_2022 Supply and fixing 6A modular switch 6 A in existing board front plates and giving connection 6A Universal Socket							
		79					79.000	
Total Quantity							79.000 No	
Total Deducted Quantity							0.000 No	
Net Total Quantity							79.000 No	
Say 79.000 No @ Rs 147.00 / No							Rs 11613.00	
SI No	Description	No	L	B	D	CF	Quantity	Remark
5Solar Energy Installation (Cost Index:35.59 %)								
1	od364460/2021_2022 Survey/design/supply/erection/testing/commissioning /mono crystalline type grid connecting solar system with suitable structure/ panel board/inverter/indicating meters /net/solar meter as per KSEBL requirement and specification including testing, earthing/minimum 17% cell efficiency connecting to KSEBL grid and approval from Electrical Inspectrate and KSEBL with 5 year maintenance and Guarantee complete. The capacity will be calculated after performing Performance Guarantee Test for 90 days. The unit in Kwp							
	Units in KWP	120					120.000	
Total Quantity							120.000 No	
Total Deducted Quantity							0.000 No	
Net Total Quantity							120.000 No	
Say 120.000 No @ Rs 60000.00 / No							Rs 7200000.00	
SI No	Description	No	L	B	D	CF	Quantity	Remark
6CCTV Camera installation (Cost Index:35.59 %)								
1	od364452/2021_2022 Supplying, installing, testing and commissioning of 2MP Full HD ir Bullet Camera 37 nos 30m range, 40 channel NVR-2 SATA, Hard disc 10 TB, 40 port PoE Switch, Network UTP cable, PVC Conduit 6U Rack, 3 kva UPS LI etc. complete to the satisfaction of KWA							
	Supplying, installing, testing and commissioning of 2MP Full HD ir Bullet Camera 37 nos	1					1.000	
Total Quantity							1.000 set	
Total Deducted Quantity							0.000 set	

SI No	Description	No	L	B	D	CF	Quantity	Remark
Net Total Quantity							1.000 set	
Say 1.000 set @ Rs 452400.00 / set							Rs 452400.00	
7Land scapping & Gardening (Cost Index:35.59 %)								
1	od364453/2021_2022 Providing land scapping and gardening including formation of yard , necessary earth work for forming to the required level using red earth, planting grass, garden trees, side protection works, watering etc as directed by the KWA officials							
		1	5.000	10.000			50.000	
		2	10.000	6.000			120.000	
		1	12.000	3.000			36.000	
		3	15.000	5.000			225.000	
Total Quantity							431.000 sqm	
Total Deducted Quantity							0.000 sqm	
Net Total Quantity							431.000 sqm	
Say 431.000 sqm @ Rs 2988.88 / sqm							Rs 1288207.28	
SI No	Description	No	L	B	D	CF	Quantity	Remark
8Drainage Arrangements (Cost Index:35.59 %)								
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	315.000	0.900	0.800		226.800	
Total Quantity							226.800 cum	
Total Deducted Quantity							0.000 cum	
Net Total Quantity							226.800 cum	
Say 226.800 cum @ Rs 214.03 / cum							Rs 48542.00	
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)							
		1	315.000	0.900	0.100		28.350	
Total Quantity							28.350 cum	
Total Deducted Quantity							0.000 cum	
Net Total Quantity							28.350 cum	

	Say 28.350 cum @ Rs 7990.86 / cum						Rs 226540.88	
3	5.33.1 Providing and laying in position machine batched and machine mixed design mix M-25 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 upto plinth level							
	floor	1	315.000	0.700	0.100		22.050	
	sides	2	315.000	0.100	0.600		37.800	
	Cover slab	630	0.500	0.700	0.100		22.050	
	Total Quantity						81.900 cum	
	Total Deducted Quantity						0.000 cum	
	Net Total Quantity						81.900 cum	
	Say 81.900 cum @ Rs 9413.54 / cum						Rs 770968.93	
4	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							
		1	81.900			80.0	6552.000	@80 kg/m3
	Total Quantity						6552.000 kilogram	
	Total Deducted Quantity						0.000 kilogram	
	Net Total Quantity						6552.000 kilogram	
	Say 6552.000 kilogram @ Rs 98.30 / kilogram						Rs 644061.60	
5	13.1.1 12 mm cement plaster of mix:1:4 (1 cement : 4 fine sand)							
	Floor	1	315.000	0.500			157.500	
	Sides	2	315.000	0.800			504.000	
	Total Quantity						661.500 sqm	
	Total Deducted Quantity						0.000 sqm	
	Net Total Quantity						661.500 sqm	
	Say 661.500 sqm @ Rs 314.09 / sqm						Rs 207770.53	
SI No	Description	No	L	B	D	CF	Quantity	Remark
9Protection Works to existing 42" & 36" Clear water pumping mains - Providing of RCC Duct (Cost Index:35.59 %)								

1	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							
	cutting bituminous road way for duct foundation work at both ways of existing pipe lines	2	50.000	1.500	0.200		30.000	
	Total Quantity						30.000 sqm	
	Total Deducted Quantity						0.000 sqm	
	Net Total Quantity						30.000 sqm	
	Say 30.000 sqm @ Rs 360.94 / sqm						Rs 10828.20	
2	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 foundation trenches at both sides of existing pipe line	2	210.000	1.200	0.500		252.000	
	Total Quantity						252.000 cum	
	Total Deducted Quantity						0.000 cum	
	Net Total Quantity						252.000 cum	
	Say 252.000 cum @ Rs 296.94 / cum						Rs 74828.88	
3	2.9.1 Excavation work 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 soils as directed, within a lead of 50 m.Ordinary rock							
	1st lift	2	210.000	1.200	0.900		453.600	
	2nd lift	2	210.000	1.200	1.000		504.000	
	Total Quantity						957.600 cum	
	Total Deducted Quantity						0.000 cum	
	Net Total Quantity						957.600 cum	
	Say 957.600 cum @ Rs 527.51 / cum						Rs 505143.58	
4	2.16.1 Close timbering in trenches including strutting, shoring and packing cavities (wherever required) complete (Measurements to be taken of the face area timbered).Depth not exceeding 1.5m							

	for cc	4	210.000		1.500		1260.000	
	Total Quantity						1260.000 sqm	
	Total Deducted Quantity						0.000 sqm	
	Net Total Quantity						1260.000 sqm	
	Say 1260.000 sqm @ Rs 152.95 / sqm						Rs 192717.00	
5	2.16.2 Close timbering in trenches including strutting, shoring and packing cavities (wherever required) complete (Measurements to be taken of the face area timbered).Depth exceeding 1.5 m but not exceeding 3 m							
	2nd lift	4	210.000		1.000		840.000	
	Total Quantity						840.000 sqm	
	Total Deducted Quantity						0.000 sqm	
	Net Total Quantity						840.000 sqm	
	Say 840.000 sqm @ Rs 166.17 / sqm						Rs 139582.80	
6	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)							
	pcc	2	210.000	1.200	0.100		50.401	
	Total Quantity						50.401 cum	
	Total Deducted Quantity						0.000 cum	
	Net Total Quantity						50.401 cum	
	Say 50.401 cum @ Rs 7211.15 / cum						Rs 363449.17	
7	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)							
	Base beam	2	210.000	1.000	0.350		147.000	
	duct wall	2	210.000	$(0.30+0.50)/2$	2.000		336.000	
	Total Quantity						483.000 cum	
	Total Deducted Quantity						0.000 cum	
	Net Total Quantity						483.000 cum	
	Say 483.000 cum @ Rs 8588.47 / cum						Rs 4148231.01	
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							

	steel @ 80kg/m3	1	483.000			80.0	38640.000	
	Total Quantity						38640.000 kilogram	
	Total Deducted Quantity						0.000 kilogram	
	Net Total Quantity						38640.000 kilogram	
	Say 38640.000 kilogram @ Rs 98.30 / kilogram						Rs 3798312.00	
9	5.9.1 Centering and shuttering including strutting, etc. and removal of form for:Foundations, footings, bases of columns, etc for mass concrete							
		4	210.000		0.100		84.000	
		4	210.000		0.350		294.000	
	Total Quantity						378.000 sqm	
	Total Deducted Quantity						0.000 sqm	
	Net Total Quantity						378.000 sqm	
	Say 378.000 sqm @ Rs 335.31 / sqm						Rs 126747.18	
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.							
		4	210.000		2.000		1680.000	
	Total Quantity						1680.000 sqm	
	Total Deducted Quantity						0.000 sqm	
	Net Total Quantity						1680.000 sqm	
	Say 1680.000 sqm @ Rs 717.20 / sqm						Rs 1204896.00	
11	2.26.2 Extra for every additional lift 1.5 m or part there of in excavation / banking excavated or stacked materials.Ordinary or hard rock							
	2nd lift	2	210.000	1.500	1.000		630.000	
	Total Quantity						630.000 cum	
	Total Deducted Quantity						0.000 cum	
	Net Total Quantity						630.000 cum	
	Say 630.000 cum @ Rs 190.78 / cum						Rs 120191.40	
12	16.91.2 Providing and laying factory made chamfered edge Cement Concrete paver blocksin footpath, parks, lawns, drive ways or light traffic parking etc, of required strength,thickness & size/ shape, made by table vibratory method using PU mould, laid inrequired colour & pattern over 50mm thick compacted bed of sand, compacting andproper embedding/laying of inter locking paver blocks into the sand bedding layerthrough vibratory compaction by using plate vibrator, filling the joints with sand andcutting of paver							

	blocks as per required size and pattern, finishing and sweeping extra sand. complete all as per direction of Engineer-in-Charge. 80 mm thick C.C. paver block of M-30 grade with approved color design and pattern.						
		1	220.000	9.400			2068.000
	Total Quantity						2068.000 sqm
	Total Deducted Quantity						0.000 sqm
	Net Total Quantity						2068.000 sqm
	Say 2068.000 sqm @ Rs 1121.80 / sqm						Rs 2319882.40
13	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)						
		4	210.000			0.75	630.000
	Total Quantity						630.000 metre
	Total Deducted Quantity						0.000 metre
	Net Total Quantity						630.000 metre
	Say 630.000 metre @ Rs 96.33 / metre						Rs 60687.90
	Total						43915365.94
	Centage @						0.0%
	Centage Amount						0.00
	Provision for GST payments (in %) @						18.0%
	-Amount reserved for GST payments						7904765.87
	Total & Centage						51820131.81
	Lumpsum for round off						79868.19
	GRAND TOTAL Rs						51900000.00
	Rounded Grand Total Rs 5,19,00,000						
	Rupees Five Crore Nineteen Lakh Only						

General Abstract

State Plan-Interim Augmentation of Kochi city and adjoining areas-Phase-1-
Providing SCADA and AUTOMATION, Indoor type transformer, Supply erection of
clear water pumpsets

(Dsr year: 2018)

SI No	Heading Description	Amount
1	Supply erection, commissioning of clear water pumpsets	10251348.20
2	Supply, erection and commissioning of 1000KVA-11KV/433V 2 No, 500 KVA 11/3.3KV-2 No Indoor type transformer, connected works and Building	12330921.77
3	SCADA and AUTOMATION	41644521.05
4	UG CABLING AND POWER ALLOCATION	9000000.00
	Total	73226791.02
	Centage @	0.0%
	Centage Amount	0.00
	Provision for GST payments (in %) @	18.0%
	Amount reserved for GST payments	13180822.38
	Total & Centage	86407613.40
	Lumpsum for round off	92386.60
	GRAND TOTAL Rs	86500000.00
	Rounded Grand Total Rs	8,65,00,000
	Rupees Eight Crore Sixty Five Lakh Only	

Detailed Estimate

**State Plan-Interim Augmentation of Kochi city and adjoining areas-Phase-1-
Providing SCADA and AUTOMATION, Indoor type transformer, Supply erection of
clear water pumpsets**

(Dsr year: 2018)

SI No	Description	No	L	B	D	CF	Quantity	Remark
1 Supply erection, commissioning of clear water pumpsets (Cost Index:35.59 %)								
1	od369282/2021_2022 Design, Supply, erection, testing and commissioning of V T pump set- 2 Nos (1 No as standby)41 to 100 HP and all allied works,like panel board,starter,cable,capacitor for pf above .95, NRV, sluice valve,earthing ,pipe connections, foundations as per direction of departmental officers							
	95HP to Aluva OHSR, 14.27 mld flow, 30 m head	2	95.000				190.000	
							Total Quantity	190.000 Hp
							Total Deducted Quantity	0.000 Hp
							Net Total Quantity	190.000 Hp
							Say 190.000 Hp @ Rs 14202.76 / Hp	Rs 2698524.40
2	od369293/2021_2022 Design, Supply, erection, testing and commissioning of Submersible pump set- 2 Nos (1 No as standby)above 100 HP and all allied works,like panel board,starter,cable,capacitor for pf above .95, NRV, sluice valve,earthing , pipe connections, foundations as per direction of departmental officers							
	180 HP to Edathala GLSR- 18.75 mld flow, 44 m head	2	180.000				360.000	
	110 HP to Keezhmad GLSR, 11.35 mld flow, 42 m head	2	110.000				220.000	
							Total Quantity	580.000 Hp
							Total Deducted Quantity	0.000 Hp
							Net Total Quantity	580.000 Hp
							Say 580.000 Hp @ Rs 13022.11 / Hp	Rs 7552823.80
SI No	Description	No	L	B	D	CF	Quantity	Remark
2 Supply,erection and commissioning of 1000KVA-11KV/433V 2 No, 500 KVA 11/3.3KV-2 No Indoor type transformer,connected works and Building (Cost Index:35.59 %)								

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								
	Footing	18	1.700	1.700	2.000		104.040		
		Total Quantity						104.040 cum	
		Total Deducted Quantity						0.000 cum	
		Net Total Quantity						104.040 cum	
		Say 104.040 cum @ Rs 214.03 / cum						Rs 22267.68	
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)								
		18	1.700	1.700	0.100		5.202		
		Total Quantity						5.202 cum	
		Total Deducted Quantity						0.000 cum	
		Net Total Quantity						5.202 cum	
		Say 5.202 cum @ Rs 7990.86 / cum						Rs 41568.45	
3	5.33.1 Providing and laying in position machine batched and machine-mixed design mix M-25 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 upto plinth level								
	Footing	18	1.500	1.500	0.300		12.150		
		18	(1.5+.35)	(1.5+.35)	0.400	0.5	12.322		
	Column upto plinth beam	18	0.250	0.250	1.200		1.350		
	plinth beam long side	3*5	3.800	0.250	0.300		4.275		
	plinth beam short side	6*2	4.880	0.250	0.300		4.392		
		Total Quantity						34.489 cum	
		Total Deducted Quantity						0.000 cum	
		Net Total Quantity						34.489 cum	
		Say 34.489 cum @ Rs 9413.54 / cum						Rs 324663.58	

4	5.33.2 Providing and laying in position machine batched and machine mixed design mix M-25 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	18	0.250	0.250	4.000		4.500	
	lintel around	1	61.000	0.200	0.150		1.830	
	roof beam long	3	20.500	0.250	0.400		6.150	
	Short beams	6*2	4.630	0.250	0.400		5.556	
	Sunshade	1	62.400	0.600	0.080		2.996	
	Total Quantity						21.032 cum	
	Total Deducted Quantity						0.000 cum	
	Net Total Quantity						21.032 cum	
	Say 21.032 cum @ Rs 11065.64 / cum						Rs 232732.54	
5	50.4.1.1 Providing and laying in position cement concrete 1:2:4 (1 cement : 2 coarse sand : 4 graded stone aggregate 12.5 mm nominal size) up to floor five level excluding the cost of centering, shuttering, finishing for leveling coarse of floor and roof etc.							
	Floor	1	20.000	10.000	0.100		20.000	
	Total Quantity						20.000 cum	
	Total Deducted Quantity						0.000 cum	
	Net Total Quantity						20.000 cum	
	Say 20.000 cum @ Rs 7950.05 / cum						Rs 159001.00	
6	5.9.1 Centering and shuttering including strutting, etc. and removal of form for:Foundations, footings, bases of columns, etc for mass concrete							
		18	5.200		0.300		28.081	
	Total Quantity						28.081 sqm	
	Total Deducted Quantity						0.000 sqm	
	Net Total Quantity						28.081 sqm	
	Say 28.081 sqm @ Rs 335.31 / sqm						Rs 9415.84	
7	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	20.300	10.300			209.091	
	Sunshade	1	62.400	0.600			37.440	
	Total Quantity						246.531 sqm	
	Total Deducted Quantity						0.000 sqm	
	Net Total Quantity						246.531 sqm	
	Say 246.531 sqm @ Rs 815.78 / sqm						Rs 201115.06	
8	5.9.5 Centering and shuttering including strutting, etc. and removal of form for:Lintels, beams, plinth beams, girders bressumers and cantilevers							
	plith beam long	13*5	3.700	0.850			204.425	
	plith beam Short	6*2	4.630	0.850			47.226	
	lintel	1	59.200	0.200	0.200		2.369	
	roof beam	13*5	3.700	0.250	0.250		15.032	
		6*2	4.630	0.250	0.250		3.473	
	Total Quantity						272.525 sqm	
	Total Deducted Quantity						0.000 sqm	
	Net Total Quantity						272.525 sqm	
	Say 272.525 sqm @ Rs 649.82 / sqm						Rs 177092.20	
9	5.9.6 Centering and shuttering including strutting, etc. and removal of form for:Columns, Pillars, Piers, Abutments, Posts and Struts							
	column	18	0.250	0.250	5.200		5.851	
	Total Quantity						5.851 sqm	
	Total Deducted Quantity						0.000 sqm	
	Net Total Quantity						5.851 sqm	
	Say 5.851 sqm @ Rs 863.64 / sqm						Rs 5053.16	
10	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	60.723			100.0	6072.300	@100kg/ m3
	Total Quantity						6072.300 kilogram	
	Total Deducted Quantity						0.000 kilogram	
	Net Total Quantity						6072.300 kilogram	

	Say 6072.300 kilogram @ Rs 98.30 / kilogram						Rs 596907.09	
11	50.6.1.2 Solid block masonry using pre cast solid blocks (Factory made) of size 40x20x20cm or nearest available size confirming to IS 2185 part I of 1979 for super structure up to floor two level thickness 20cm and above in: CM 1:6 (1 cement: 6 coarse sand) etc complete.							
	wall	1	59.200	0.200	4.000		47.361	
	rolling shutter	1	3.000	0.200	2.500		-1.500	
	Windows	3	1.200	0.200	1.500		-1.080	
	Ventilators	9	1.200	0.200	0.500		-1.080	
	Total Quantity						47.361 cum	
	Total Deducted Quantity						-3.660 cum	
	Net Total Quantity						43.701 cum	
	Say 43.701 cum @ Rs 6602.09 / cum						Rs 288517.94	
12	13.1.1 12 mm cement plaster of mix:1:4 (1 cement : 4 fine sand)							
	inside	1	60.000	4.000			240.000	
	outside	1	61.600	4.000			246.400	
	pillar	4	1.000	4.000			16.000	
	rolling shutter	1	3.000		2.500		-7.500	
	Windows	3	1.200		1.500		-5.399	
	Ventilators	9	1.200		0.500		-5.399	
	Total Quantity						502.400 sqm	
	Total Deducted Quantity						-18.298 sqm	
	Net Total Quantity						484.102 sqm	
	Say 484.102 sqm @ Rs 314.09 / sqm						Rs 152051.60	
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)							
	Sunshade	1	62.400	0.600			37.440	
	Roof slab	1	20.000	10.000			200.000	
	Extra roof beam	4*2	10.000	0.250			20.000	
		1	20.000	0.250			5.000	
	Total Quantity						262.440 sqm	
	Total Deducted Quantity						0.000 sqm	
	Net Total Quantity						262.440 sqm	

		Say 262.440 sqm @ Rs 401.21 / sqm					Rs 105293.55	
14	13.9.1 Cement plaster 1:3 (1 cement : 3 coarse sand) finished with a floating coat of neat cement.12 mm cement plaster							
	Sunshade top	1	62.400	0.600			37.440	
	Roof slab top	1	20.600	11.250			231.751	
		Total Quantity					269.191 sqm	
		Total Deducted Quantity					0.000 sqm	
		Net Total Quantity					269.191 sqm	
		Say 269.191 sqm @ Rs 412.13 / sqm					Rs 110941.69	
15	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							
		1	3.000	2.500			7.500	
		Total Quantity					7.500 sqm	
		Total Deducted Quantity					0.000 sqm	
		Net Total Quantity					7.500 sqm	
		Say 7.500 sqm @ Rs 3300.13 / sqm					Rs 24750.98	
16	13.46.1 Finishing walls with Acrylic Smooth exterior paint of required shade:New work (Two or more coat applied @ 1.67 ltr/10 sqm over and including priming coat of exterior primer applied @ 2.20 kg/10 sqm)							
		1	761.280				761.280	
		Total Quantity					761.280 sqm	
		Total Deducted Quantity					0.000 sqm	
		Net Total Quantity					761.280 sqm	
		Say 761.280 sqm @ Rs 193.89 / sqm					Rs 147604.58	
17	21.1.1.2 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 portion Powder coated aluminium (minimum thickness of powder coating 50 micron)						
	windows horizontal	3*2	1.200			1.65	11.880
	windows vertical	3*3	1.200			1.65	17.820
	ventilator	9*2	(1.20+0.50)				30.600
	Total Quantity						60.300 kg
	Total Deducted Quantity						0.000 kg
	Net Total Quantity						60.300 kg
	Say 60.300 kg @ Rs 537.07 / kg						Rs 32385.32
18	21.3.2 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 5.50 mm thickness						
	Windows	3	1.200	1.500			5.400
	ventilators	9	1.200	0.500			5.400
	Total Quantity						10.800 sqm
	Total Deducted Quantity						0.000 sqm
	Net Total Quantity						10.800 sqm
	Say 10.800 sqm @ Rs 1526.00 / sqm						Rs 16480.80
19	od369311/2021_2022 1000 KVA Transformer- Supply, installation, testing and commissioning of one number 1000 kVA, DYn11, 3Ph, 50Hz, 11/0.433 kV,ONAN cooled, copper wound outdoor distribution transformer with tappings from +5% to -10% in steps of 2.5% with OFTC. The HT side & LT side shall have cable end box for XLPE cable. The transformer shall have suitable enclosure for The HT side & LT side. The transformer shall be complete with all standard accessories and fittings & conform to IS:2026. The rate shall be inclusive of all materials, lead,lift, first fill of oil, necessary civil works for mounting to the existing transformer foundation complete as per single line schematic diagram & particular specifications.						
	1000 KVA 11/.433 KV Transformer	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 1800000.00 / No						Rs 3600000.00
20	od369313/2021_2022 500 KVA Transformer - Supply, installation, testing and commissioning of one number 500 kVA, DYn11,						

	3Ph, 50Hz, 11/3.3 kV, ONAN cooled, copper wound outdoor distribution transformer with tappings from +5% to -10% in steps of 2.5% with OFTC. The HT side & LT side shall have cable end box for XLPE cable. The transformer shall have suitable enclosure for The HT side & LT side. The transformer shall be complete with all standard accessories and fittings & conform to IS:2026. The rate shall be inclusive of all materials, lead, lift, first fill of oil, necessary civil works for mounting to the existing transformer foundation complete as per single line schematic diagram & particular specifications.								
	500 KVA 11/3.3 kV, indoor Transformer	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 918604.00 / No							Rs 1837208.00	
21	<p>od369316/2021_2022</p> <p>PCC PANEL -Design ,approval, Supply, fabrication, erection, testing and commissioning of 3.3kv cubicle type fully compartmentalized, dust tight, vermin proof, water proof 3.3 kv , VCB panel set 200Amp or suitable rating - Main 3.3.KV Panel falling to IP54 category fabricated out of 16 SWG CRCA Sheet Steel painted as per standards with Aluminium Busbars of suitable size, earth bus of adequate capacity, double earth connection to all switches, internal rigid connection etc. including suitable chambers, front open, top cable entry with water proof shrouding, free standing panel consisting of the following as per standards (All switches shall confirm to conforming to IEC 60947-2 standards). Incommer - 200A FP Microprocessor based VCB - suitable MVA based on fault level-- 1 Nos. Restricted Earth Fault Relay - best conductivity Aluminium busbar with SMC supports, heat shrinkable sleeves etc. as per ISS - 1set RYB indicators (LED Pilot type) with 2A Control MCB and toggle switches - 4 Set Multifunction Digital Panel meter to read V, A, F, PF, kW, kVA, kVAR, kWh, kVAh, kVARh Class 1.0 - 1 Set 200/5A CL 1.0, 15VA Metering CTs -one VCB incomm 200 A or suitable size- 3 Sets Outgoings: 200A, VCB - 1 Nos. 100/50A VCB out going- .with isolation facility - Surge Protection Pluggable type surge arrester with potential free contact, thermal disconnecter & provision for inbuilt common remote indication for defective arresters to connect between Line and Neutral and one number Spark Gap type arrester to connect between Neutral and Earth of following ratings including base element & pluggable arresters. Nominal voltage 3.3KV, 50Hz, Nominal Discharge current 30 kA (8/20 sec) for Line to Neutral & 50 kA (8/20 sec) for Neutral to Earth, Maximum Discharge Current I_{max} 50 kA (8/20 sec) -1Set Supports The panel shall be supported to ground using framework fabricated out of MS Flats / Angles etc. painted with two coats of Zinc Chromate primer and two coats of enamel paint. The framework shall be firmly supported to ground using suitable cement concrete plinth. The Panel Board shall be provided with 25 x 3mm copper earth bus for the full length. Painting letters / identifications for the incoming and outgoing switches, cable, fuse sizes, etc., in white enamel paint. The board shall be fabricated in such a way that future extension be possible. Supply & Labour ,suitable battery and charger for the pannel,-complete as per CEA and kerala State Electrical Inspectrate relevant statutes, approval from inspectrate ,2.5 sq mm copper cable shall be used for all control circuits-</p>								

	Design ,approval, Supply, fabrication, erection, testing and commissioning of 3.3kv cubicle type fully compartmentalized, dust tight, vermin proof, water proof 3.3 kv	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 1806133.00 / set						Rs 1806133.00	
22	od369317/2021_2022 NEUTRAL CT - Supply & Providing 5P10 Protection Class 20/5A, 15VA Neutral CT in a suitable enclosure including giving connections to Transformer Neutral etc.complete - Labour							
	NEUTRAL CT - Supply & Providing 5P10 Protection Class 20/5A, 15VA Neutral C	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 625.00 / No						Rs 625.00	
23	od369319/2021_2022 NEUTRAL CT - Supply & Providing 5P10 Protection Class 20/5A, 15VA Neutral CT in a suitable enclosure including giving connections to Transformer Neutral etc.complete - Supply							
		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 4327.00 / No						Rs 4327.00	
24	od369320/2021_2022 Neutral Grounding Resistor - Supply & Providing 50A,3.3kV 40ohm 30sec NGR - Supply							
		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 155766.00 / No	Rs 155766.00
25	od369321/2021_2022 Supply and providing the following MCCB/ RCCB / MCB / MCB Isolators/COS etc. to the existing DBs / MCS / Junction Boxes etc. including giving proper termination using suitable Bananna copper lugs, sleeves, insulation etc. complete - 6A to 32A , 10kA SP MCB								
			24						24.000
								Total Quantity	24.000 No
								Total Deducted Quantity	0.000 No
								Net Total Quantity	24.000 No
								Say 24.000 No @ Rs 181.00 / No	Rs 4344.00
26	od369323/2021_2022 Supply and providing the following MCCB/ RCCB / MCB / MCB Isolators/COS etc. to the existing DBs / MCS / Junction Boxes etc. including giving proper termination using suitable Bananna copper lugs, sleeves, insulation etc. complete. 63A, 4P MCB Isolator								
			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 1050.00 / No	Rs 1050.00
27	od369324/2021_2022 Supply and providing the following MCCB/ RCCB / MCB / MCB Isolators/COS etc. to the existing DBs / MCS / Junction Boxes etc. including giving proper termination using suitable Bananna copper lugs, sleeves, insulation etc. complete - 63A, 100mA 3Ph RCCB								
			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 6640.00 / No	Rs 6640.00
28	od369326/2021_2022 Supply, installation, testing & commissioning of best quality sheet steel, phosphatised and painted, dust and vermin proof enclosure (IP43) Vertical TPN Double door DB including copper bus bar, neutral link, earth bus and DIN rail suitable for fixing RCCB + Isolator (8 module)as incommmer and SP/TP MCB as outgoing etc. on wall using suitable anchor bolts or fixed in recess including cutting hole on the wall , making good the damages, colour washing, dressing the DB including termination etc. as required. (Including closing vaccant slots using Dummy) - 12 Way								
			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 11136.00 / No					Rs 11136.00	
29	od369330/2021_2022 HT Equipment Pinth, Substation Yard Fencing & Levelling - Supplying and filling the substation yard with 40mm size blue jelly of 150mm thick including cost and conveyance of all materials, labour charges etc complete							
		1				5.0	5.000	
		Total Quantity					5.000 cum	
		Total Deducted Quantity					0.000 cum	
		Net Total Quantity					5.000 cum	
		Say 5.000 cum @ Rs 3017.00 / cum					Rs 15085.00	
30	od369331/2021_2022 HT Equipment Pinth, Substation Yard Fencing & Levelling - Providing, fabricating and fixing 2m high chainlink fencing over 4mm thick barbed wire with a framework of 50x50x6mm MS angle between vertical posts of ISMC 75 at 2400mm interval, Earthing as per KSEI/KSEB standards shall be done around the periphery of the fencing. The MS framework for chainlink fencing shall be Hot Dip Galvanised. The rate shall be inclusive of all materials, labour, lead, lift etc including escalation works and fabrication and assembly works including all nuts, bolts and other miscellaneous items etc complete as per drawing and as directed by the Engineer in Charge.							
		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 1298.00 / metre					Rs 25960.00	
31	od369332/2021_2022 HT Bidirectional TOD Meter - Supply & Providing 3 phase, 4wire, HT CT/PT operated, bi-directional with accuracy class 0.2S for both Active and Reactive energy, -/5A, HT static tri vector meter with TOD register, DLMS compliant & AMR compatible with optical port and RS232 port having ISI Marking, suitable for measurement of active kWh, reactive energy kVARh and apparent energy kVAh and kVA MD, kW MD at nominal frequency in the range of 47.5 Hz to 52.5 Hz in balanced as well as unbalanced load conditions in the existing outdoor Meter cubicle including testing & commissioning etc. complete.							
		1					1.000	
		Total Quantity					1.000 set	
		Total Deducted Quantity					0.000 set	
		Net Total Quantity					1.000 set	
		Say 1.000 set @ Rs 43954.00 / set					Rs 43954.00	

32	od369333/2021_2022						
	OUTDOOR HT BREAKER PANEL (LBS) - Supply, Installation, Testing & Commissioning of 11kV Outdoor HT Breaker Panel with the following components. 11kV Load Break Swich 11kV, 350 MVA, 630A, LBS unit - 1 set Voltmeter (0 - 11kV) - 3 Nos LED Pilot Indication - LBS ON / OFF - 1 Set Trip Push buttons - 1 set 2NO+2NC Aux contacts - 1 Set 230V AC Shunt Trip Coil - 1 No Aluminium Busbar - 1 Set Seal off Bushings - 3 Nos Space Heater Element with Thermostat & wiring - 1 Nos Inspection Lamp LED with switch & wiring - 1 set Metering Chamber PT - 100 VA, 11kV/110V, CL 0.2S - 1 No CT - */5A, 15VA, CL 0.2S - 3 Nos Provisions for mounting 3 phase, 4wire, HT CT/PT operated, bi-directional TOD meter with accuracy class 0.2S including wiring and test terminal block, site glass etc. - 1 set Voltage Circuit: The active & apparent power consumption of voltage circuit including power supply of meter at reference voltage, reference temperature & frequency shall not exceed 1.0 Watt & 4.0 VA per phase Current Circuit: The apparent power taken by current circuit at basic current, reference frequency & reference temperature shall not exceed 1.0 VA/phase. (The Quoted rate shall be inclusive of necessary control wiring, components working on LT supply should be prewired completely with necessary controls as specified till the connection point for feeding LT Supply from outside, Cable end box for receiving incoming and outgoing cables and suitable civil foundation etc as required.) - Supply & Labour						
		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 215359.00 / set						Rs 215359.00
33	od369334/2021_2022						
	Supplying and erection of three piece nonlinear resistor type lightning arrester suitable for 3 wire, 11 kV overhead lines with rated voltage 9 kV (rms) with a nominal discharge current rating of 5 kA and complete with galvanised clamping arrangement, G.I. bolts, nuts, washers etc. as required.						
		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 3601.00 / set						Rs 3601.00
34	od369335/2021_2022						
	Supplying and erection of 11 kV pin insulator complete with large steel head G.I. pin, nuts, washers etc. as required.						
		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 349.00 / set						Rs 349.00

35	od369337/2021_2022 Erection of double pole 3 wire cross arm for 11 KV/22 KV/33 KV over head lines as required.						
		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 1123.17 / No						Rs 3369.51
36	od369338/2021_2022 Supplying and erection of a set of cross bracing frame work for 11 KV over head line double pole structure having four members fabricated out of 50 mm X 50 mm X 6 mm angle iron to form a rectangle of minimum size 1400 mm width X 2500 mm height, complete with 50 mm X 6mm M.S. flat iron clamps, bolts and nuts including drilling holes for insulator pins, bolts and nuts etc. (as per drawing) and painting with primer and finish paint as required.						
		1					1.000
	Total Quantity						1.000 No
	Total Deducted Quantity						0.000 No
	Net Total Quantity						1.000 No
	Say 1.000 No @ Rs 6552.00 / No						Rs 6552.00
37	od369340/2021_2022 Erection of RCC/ PCC pole of following length in brick ballast and ramming the foundation, finishing with 150 mm thick cement concrete (1:3:6) layer on top with including excavation and refilling etc. as required.(rate as per vetted estimate)						
		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 4957.00 / No						Rs 9914.00
38	od369341/2021_2022 UG Cable Tamper Protection - Supply & laying the following size of B class GI Pipe for UG Cable tamper protection in the existing trench in position etc. complete. 75 mm						
		1	10.000				10.000
	Total Quantity						10.000 No
	Total Deducted Quantity						0.000 No
	Net Total Quantity						10.000 No
	Say 10.000 No @ Rs 485.00 / No						Rs 4850.00
39	od369342/2021_2022						

	UG Cable Tamper Protection - Supply & laying the following size of B class GI Pipe for UG Cable tamper protection in the existing trench in position etc. complete. 50 mm						
		1	10.000				10.000
	Total Quantity						10.000 No
	Total Deducted Quantity						0.000 No
	Net Total Quantity						10.000 No
	Say 10.000 No @ Rs 379.00 / No						Rs 3790.00
40	od369343/2021_2022 LT Power Cables - Supply & drawing the following size of FR Multi-core PVC Insulated and PVC sheathed Copper conductor round flexible wire manufactured with bright annealed bare copper conductor as per IS 8130/1984 Insulated and sheathed with electrical grade PVC compound as per IS 5831/1984 generally conforming to IS 694/1990 for working voltage up to and including 1100 V through existing PVC conduit / casing capping wall. 3C x 0.5 Sqmm						
		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 88.00 / metre						Rs 2200.00
41	od369345/2021_2022 LT Power Cables - Providing cable glanding, gland earthing & end termination of UG cables of the following sizes using Siemens type Brass compression gland & Copper lugs etc. complete. 4C x 2.5 Sqmm						
		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 217.00 / No						Rs 434.00
42	od369346/2021_2022 LT Power Cables - Providing cable glanding, gland earthing & end termination of UG cables of the following sizes using Siemens type Brass compression gland & Copper lugs etc. complete. 3.5C x 35 Sqmm (32mm)						
		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 437.00 / No						Rs 874.00

43	od369347/2021_2022 LT Power Cables - Providing cable glanding, gland earthing & end termination of UG cables of the following sizes using Siemens type Brass compression gland & Copper lugs etc. complete. 3.5C x 300 Sqmm (70mm)						
		8					8.000
	Total Quantity						8.000 No
	Total Deducted Quantity						0.000 No
	Net Total Quantity						8.000 No
	Say 8.000 No @ Rs 1713.00 / No						Rs 13704.00
44	od369348/2021_2022 LT Power Cables - Providing cable glanding, gland earthing & end termination of UG cables of the following sizes using Siemens type Brass compression gland & Copper lugs etc. complete. 3.5C x 400 Sqmm (82mm)						
		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 2499.55 / No						Rs 14997.30
45	od369349/2021_2022 LT Power Cables - Supply & laying UG 2XFY,PVC insulated and PVC sheathed Copper conductor armoured Power / Control cable of 1.1 KV grade of the following sizes through trench/wall/ ceiling - 4C x 2.5 Sqmm						
		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 308.00 / metre						Rs 15400.00
46	od369350/2021_2022 HT Cable Terminations - Supplying and making Outdoor cable end jointing with heat shrinkable jointing kit, including lugs and other jointing materials, for for following sizes, XLPE aluminium conductor cable of 11 KV grade as required. 1C x 50 Sqmm						
		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 14660.00 / set						Rs 29320.00

47	od369351/2021_2022 HT Cable Terminations - Supplying and making Outdoor cable end jointing with heat shrinkable jointing kit, including lugs and other jointing materials, for for following sizes, XLPE aluminium conductor cable of 11 KV grade as required. 3C x 150 Sqmm		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 12367.00 / set					Rs 24734.00	
48	od369352/2021_2022 HT Cable Terminations - Supplying and making indoor cable end termination with heat shrinkable jointing kit, including lugs and other jointing materials, for following sizes, XLPE aluminium conductor cable of 11 KV grade as required. 1C x 50 Sqmm		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 7664.00 / set					Rs 7664.00	
49	od369353/2021_2022 HT Cable Terminations - Supplying and making indoor cable end termination with heat shrinkable jointing kit, including lugs and other jointing materials, for following sizes, XLPE aluminium conductor cable of 11 KV grade as required. 3C x 50 Sqmm		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 7664.00 / set					Rs 61312.00	
50	od369354/2021_2022 HT Cable Terminations - Supplying and making indoor cable end termination with heat shrinkable jointing kit, including lugs and other jointing materials, for following sizes, XLPE aluminium conductor cable of 11 KV grade as required. 3C x 150 Sqmm		4				4.000	
		Total Quantity					4.000 set	
		Total Deducted Quantity					0.000 set	
		Net Total Quantity					4.000 set	
		Say 4.000 set @ Rs 10002.00 / set					Rs 40008.00	

51	od369355/2021_2022 HT Power Cables - Supply & laying 11KV stranded compact circular aluminium conductor, conductors screened with extruded semi conducting compound XLPE insulated, insulation screened with extruded semi conducting compound in combination with copper tape (0.3 kA for 1 sec.), cores laid up, inner sheath of PVC tape, galvanized steel flat strip armoured, and overall PVC sheathed cable of the following sizes in the existing cable trench conforming to IS: 7098 part II 1985 with latest amendments. 1C x 50 Sqmm	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 628.00 / metre				Rs 12560.00	
52	od369356/2021_2022 HT Power Cables - Supply & laying 11KV stranded compact circular aluminium conductor, conductors screened with extruded semi conducting compound XLPE insulated, insulation screened with extruded semi conducting compound in combination with copper tape (0.3 kA for 1 sec.), cores laid up, inner sheath of PVC tape, galvanized steel flat strip armoured, and overall PVC sheathed cable of the following sizes in the existing cable trench conforming to IS: 7098 part II 1985 with latest amendments. 3C x 50 Sqm	1	65.000			65.000	
		Total Quantity				65.000 metre	
		Total Deducted Quantity				0.000 metre	
		Net Total Quantity				65.000 metre	
		Say 65.000 metre @ Rs 1072.00 / metre				Rs 69680.00	
53	od369357/2021_2022 HT Power Cables - Supply & laying 11KV stranded compact circular aluminium conductor, conductors screened with extruded semi conducting compound XLPE insulated, insulation screened with extruded semi conducting compound in combination with copper tape (0.3 kA for 1 sec.), cores laid up, inner sheath of PVC tape, galvanized steel flat strip armoured, and overall PVC sheathed cable of the following sizes in the existing cable trench conforming to IS: 7098 part II 1985 with latest amendments. 3C x 150 Sqm	1	60.000			60.000	
		Total Quantity				60.000 metre	
		Total Deducted Quantity				0.000 metre	
		Net Total Quantity				60.000 metre	
		Say 60.000 metre @ Rs 2318.00 / metre				Rs 139080.00	
54	od369358/2021_2022 Supply, installation, testing & commissioning of best quality sheet steel, phosphatised and painted, dust and vermin proof enclosure (IP43) Vertical TPN Double door DB including copper bus bar, neutral link,						

	earth bus and DIN rail suitable for fixing RCCB + Isolator (8 module)as incommer and SP/TP MCB as outgoing etc. on wall using suitable anchor bolts or fixed in recess including cutting hole on the wall , making good the damages, colour washing, dressing the DB including termination etc. as required. (Including closing vaccant slots using Dummy) - 12 Way							
		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 11136.00 / No						Rs 11136.00
55	od369359/2021_2022 APFC PANEL -Automatic Power Factor Correction Panel of total 40 KVAR capacity with Auto / Manual mode operation to be fabricated out of 14 guage CRCA sheet steel Powder coated with provision for capacitor mounted inside the panel with adequate number of louvers and powder coated with approved shade and having following specific components(refer particular specification) with Alumimium Busbars of suitable size, earth bus of adequate capacity, double earth connection to all switches, internal rigid connection etc. including suitable chambers, front open, top cable entry , free standing panel consisting of the following as per standards. Incomer 100A TPN Isolator - 1 No. 100 A TPN best conductivity Aluminium busbar with SMC supports, heat shrinkable sleeves etc. as per ISS - 1set Multifunction Digital Panel meter to read V, A, F, PF, kW, kVA, kVAR, kWh, kVAh, kVARh Class 1.0 - 1 Set RYB indicators (LED Pilot type) with 2A Control MCB and toggle switches- 1 Set 100/5A 15VA CL 1.0 Metering CTs - 3 Sets Microprocessor based intelligent, 8 step IPFC relay with PF display - 1 No. Out goings 40A, 10kA C Curve TP MCB - 1 Nos 20A, 10kA C Curve TP MCB - 1 Nos 16A, 10kA C Curve TP MCB - 2 Nos 10A, 10kA C Curve TP MCB - 1 Nos 6A, 10kA C Curve TP MCB - 3 Nos Capacitor duty contactors working on 3 Phase 415V AC supply of the following ratings wired with Pilot LED indication for ON & OFF, Push Buttons for Manual ON & OFF operation using suitable NO / NC contacts for all the stages 15 kVAR - 1 Nos 10 kVAR- 3 Nos 7.5 kVAR- 4 Nos 480 V,50-Hz Double di-electric polypropylene (MPP heavy duty) Capacitors of the following ratings including fixed compensation for low load losses. 15 kVAR - 1 Nos 10 kVAR- 1 Nos 5 kVAR- 2 Nos 2 kVAR - 2 Nos 1 kVAR - 1 Nos The Panel Board shall be provided with 25 x 3mm copper earth bus for the full length. Painting letters / identifications for the incoming and outgoing switches, cable, fuse sizes, etc., in white enamel paint. Supply & Labour Supports The panel shall be supported to ground using framework fabricated out of MS Flats / Angles etc. painted with two coats of Zinc Chromate primer and two coats of enamel paint. The framework shall be firmly supported to ground using suitable cement concrete plinth.The Panel Board shall be provided with 25 x 3mm copper earth bus for the full length. Painting letters / identifications for the incoming and outgoing switches, cable, fuse sizes, etc., in white enamel paint. Supply & Labour							
		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 119898.00 / set						Rs 119898.00
56	od369360/2021_2022							

	<p>WTP - MCC PANEL- Supply, fabrication, erection, testing and commissioning of cubicle type fully compartmentalised, dust tight, vermin proof, water proof 200A MV Panel falling to IP54 category fabricated out of 16 SWG CRCA Sheet Steel painted as per standards with Alumimium Busbars of suitable size, earth bus of adequate capacity, double earth connection to all switches, internal rigid connection etc. including suitable chambers, front open, top cable entry with water proof shrouding, free standing panel consisting of the following as per standards (All switches shall confirm to conforming to IEC 60947-2 standards). Incoming : 200A TPN Isolator - 1 No. 200A TPN best conductivity Aluminium busbar with SMC supports, heat shrinkable sleeves etc. as per ISS - 1set Multifunction Digital Panel meter to read V, A, F, PF, kW, kVA, kVAR, kWh, kVAh, kVARh Class 1.0 - 1 Set RYB indicators (LED Pilot type) with 2A Control MCB and toggle switches - 1 Set 200/5A CL 1.0, 15VA Metering CTs - 1 Set Outgoings: 100A TPN SDFU (100kA) - 3 Nos. 32A TP D curve MCB (10kA) - 6 Nos. 25A TP D curve MCB (10kA) - 3 Nos. 10A TP D curve MCB (10kA) - 4 Nos. Supports The panel shall be supported to ground using framework fabricated out of MS Flats / Angles etc. painted with two coats of Zinc Chromate primer and two coats of enamel paint. The framework shall be firmly supported to ground using suitable cement concrete plinth. The Panel Board shall be provided with 25 x 3mm copper earth bus for the full length. Painting letters / identifications for the incoming and outgoing switches, cable, fuse sizes, etc., in white enamel paint. The board shall be fabricated in such a way that future extension be possible.</p> <p>Supply & Labour</p>						
		1					1.000
	Total Quantity						1.000 set
	Total Deducted Quantity						0.000 set
	Net Total Quantity						1.000 set
	Kerala Water Authority Say 1.000 set @ Rs 84484.00 / set						Rs 84484.00
57	<p>od369361/2021_2022 PCC PANEL - Supply, fabrication, erection, testing and commissioning of cubicle type fully compartmentalised, dust tight, vermin proof, water proof 800A LT- Main MV Panel falling to IP54 category fabricated out of 16 SWG CRCA Sheet Steel painted as per standards with Alumimium Busbars of suitable size, earth bus of adequate capacity, double earth connection to all switches, internal rigid connection etc. including suitable chambers, front open, top cable entry with water proof shrouding, free standing panel consisting of the following as per standards (All switches shall confirm to conforming to IEC 60947-2 standards). Incommer 800A FP Microprocessor based MDO ACB (35kA) - 1 Nos. Restricted Earth Fault Relay - 1 Set 800A TPN best conductivity Aluminium busbar with SMC supports, heat shrinkable sleeves etc. as per ISS - 1set RYB indicators (LED Pilot type) with 2A Control MCB and toggle switches - 4 Set Multifunction Digital Panel meter to read V, A, F, PF, kW, kVA, kVAR, kWh, kVAh, kVARh Class 1.0 - 1 Set 800/5A CL 1.0, 15VA Metering CTs - 1 Set Outgoings: 630A, 35kA 4P MCCB - 2 Nos. 200A FP SDFU (100kA) - 2 Nos. 63A FP SDFU (100kA) - 1 Nos. Surge Protection Pluggable type surge arrester with potential free contact, thermal disconnecter & provision for inbuilt common remote indication for defective arresters to connect between Line and Neutral and one number Spark Gap type arrester to connect between Neutral and Earth of following ratings including base element & pluggable arresters. Nominal voltage 230V, 50Hz, Nominal Discharge current 30 kA (8/20 sec) for Line to Neutral & 50 kA (8/20 sec) for Neutral to Earth, Maximum Discharge Current I_{max} 50 kA (8/20 sec) -1Set Supports The panel shall be supported to ground using framework fabricated out of MS Flats / Angles etc. painted with two coats of Zinc Chromate primer and two coats of enamel paint. The framework shall be firmly supported to ground using suitable cement concrete plinth. The Panel Board shall be provided with 25 x</p>						

	3mm copper earth bus for the full length. Painting letters / identifications for the incoming and outgoing switches, cable, fuse sizes, etc., in white enamel paint. The board shall be fabricated in such a way that future extension be possible. Supply & Labour						
		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 294498.00 / set						Rs 294498.00
58	od369362/2021_2022 Supply & providing Aluminium anodised Danger Notice Board of size 200 x 150 mm. with inscriptions (both in English and Malayalam) and conventional Skull and Bone in Red colour at locations as directed by the Engineer in Charge						
		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 267.00 / No						Rs 2670.00
59	od369363/2021_2022 Supply and providing Laminated Electrical Schematic diagram framed and placed in a conspicuous location for clear vision						
		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 226.00 / set						Rs 226.00
60	od369364/2021_2022 Supply and providing 9 Litre capacity GI Fire Bucket painted in post office red with primer coat of red oxide and written with white paint 'FIRE' mounted on MS angle frame work/ wall bracket filled with fine sand, painting the bracket/ floor stand including making good the damages, colour washing etc. as required.						
		5					5.000
	Total Quantity						5.000 set
	Total Deducted Quantity						0.000 set
	Net Total Quantity						5.000 set
	Say 5.000 set @ Rs 638.00 / set						Rs 3190.00
61	od369365/2021_2022						

	Supply and providing 5 Kg. Dry Chemical Powder type Fire Extinguisher with hose and clamps including fixing it to wall as required.							
		5					5.000	
	Total Quantity						5.000 set	
	Total Deducted Quantity						0.000 set	
	Net Total Quantity						5.000 set	
	Say 5.000 set @ Rs 2383.00 / set						Rs 11915.00	
62	od369366/2021_2022 Supply and providing 12 mm thick & 1 m wide electrical grade chequered type rubber mat to withstand 15 KV dielectric strength conforming to IS 5429/ 1969 in front of the HT Breaker Panel.							
		1				3.0	3.000	
	Total Quantity						3.000 sqm	
	Total Deducted Quantity						0.000 sqm	
	Net Total Quantity						3.000 sqm	
	Say 3.000 sqm @ Rs 1379.00 / sqm						Rs 4137.00	
63	od369367/2021_2022 Supply and providing 6 mm thick & 1 m wide electrical grade chequered type rubber mat to withstand 3.3 KV dielectric strength conforming to IS 5429/ 1969.							
		1				5.0	5.000	
	Total Quantity						5.000 sqm	
	Total Deducted Quantity						0.000 sqm	
	Net Total Quantity						5.000 sqm	
	Say 5.000 sqm @ Rs 773.00 / sqm						Rs 3865.00	
64	od369368/2021_2022 Supply and drawing bare earthing conductors of the following sizes along with wiring/ cables and giving earth connection as required. No.10 SWG Copper Conductor							
		1	500.000				500.000	
	Total Quantity						500.000 metre	
	Total Deducted Quantity						0.000 metre	
	Net Total Quantity						500.000 metre	
	Say 500.000 metre @ Rs 113.00 / metre						Rs 56500.00	
65	od369369/2021_2022 Supply and drawing bare earthing conductors of the following sizes along with wiring/ cables and giving earth connection as required. No.16 SWG Copper Conductor							
		1	150.000				150.000	
	Total Quantity						150.000 metre	

		Total Deducted Quantity					0.000 metre	
		Net Total Quantity					150.000 metre	
		Say 150.000 metre @ Rs 199.00 / metre					Rs 29850.00	
66	od369370/2021_2022 Supply & laying the following sizes of Earth Strip for earthing interconnection, termination and leads, for continuous earthing along with cables tinned at terminals etc. complete. 25 x 3 mm Copper strip							
		1	150.000				150.000	
		Total Quantity					150.000 metre	
		Total Deducted Quantity					0.000 metre	
		Net Total Quantity					150.000 metre	
		Say 150.000 metre @ Rs 797.00 / metre					Rs 119550.00	
67	od369371/2021_2022 Supply & laying the following sizes of Earth Strip for earthing interconnection, termination and leads, for continuous earthing along with cables tinned at terminals etc. complete. 25 x 6 mm Copper Strip							
		1	100.000				100.000	
		Total Quantity					100.000 metre	
		Total Deducted Quantity					0.000 metre	
		Net Total Quantity					100.000 metre	
		Say 100.000 metre @ Rs 1600.00 / metre					Rs 160000.00	
68	od369372/2021_2022 Supply and providing plate earthing as per IS 3043 with 1200x1200x12 mm GI/CI earth plate, 50 mm GI watering pipe fixed to the earth plate with 25 x 3mm GI clamps, GI funnel with weld mesh, filling required quantity of charcoal including construction of inspection chamber with a bed concrete of 1:4:8 PCC using 40 mm broken stone (10 cm thick), brick work in cement mortar 1:6, plastering the surface of brick masonry and the exposed surface of PCC bed with cement mortar 1:4, 12 mm thick, (the finished inside dimension shall be 450 x 450 x 450 mm) but excluding test joint, earth continuity conductor to the plate, and covering at the top.							
		1	8.000				8.000	
		Total Quantity					8.000 set	
		Total Deducted Quantity					0.000 set	
		Net Total Quantity					8.000 set	
		Say 8.000 set @ Rs 110.91 / set					Rs 887.28	
69	od369373/2021_2022 Cable Supports & Trenching - Supply route marker with 10cmx10cm GI plate 5mm thick with inscriptions there on bolted / welded to 35x35x6mm angle iron 60cm long and fixing the same in ground as required.							
		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 417.00 / No	Rs 10425.00
70	od369374/2021_2022 Charges for making cable trenches in all type of soil including providing country burnt bricks breadth wise above the cable, providing sand cushioning of 150mm refilling & restoring normal surface etc.complete as per standards of the following size. 35 cm Wide x 75 cm Deep (LT Cables)						
		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 604.00 / metre	Rs 30200.00
71	od369375/2021_2022 Charges for making cable trenches in all type of soil including providing country burnt bricks breadth wise above the cable, providing sand cushioning of 150mm refilling & restoring normal surface etc.complete as per standards of the following size. 35 cm Wide x 100 cm Deep (HT Cables)						
		1	100.000				100.000
						Total Quantity	100.000 metre
						Total Deducted Quantity	0.000 metre
						Net Total Quantity	100.000 metre
						Say 100.000 metre @ Rs 651.00 / metre	Rs 65100.00
72	od369376/2021_2022 Cable Supports & Trenching- Supply and providing 6mm MS chequered plate of suitable thickness including cutting, welding, painting etc. as required for the cable trench covering.						
		1				100.0	100.000
						Total Quantity	100.000 kg
						Total Deducted Quantity	0.000 kg
						Net Total Quantity	100.000 kg
						Say 100.000 kg @ Rs 121.00 / kg	Rs 12100.00
73	od369377/2021_2022 Cable Supports & Trenching- Supply and erection of Cable trays and cable supports fabricated out of MS angles 25x25x6mm (ISA) and 25x6mmMS flats with and 20cm spacing between successive cross members and supported using 25cm long 32x6mm MS flat at every 1m spacing. The cable trays and supports shall be painted with two coats of Zinc Chromate primer and two coats of enamel paint.						
		1	500.000				500.000

	Total Quantity						500.000 metre
	Total Deducted Quantity						0.000 metre
	Net Total Quantity						500.000 metre
	Say 500.000 metre @ Rs 149.00 / metre						Rs 74500.00
74	od369378/2021_2022 Circuit Mains- Supply and wiring the following size of PVC insulated copper wire manufactured with bright annealed bunched electrolytic copper conductor as per IS 8130/1984 insulated with di-electrical grade PVC compound per as IS 5831/1984 Generally Conforming to IS 694/1990 for working voltage up to and including 1100 V.through the existing PVC conduits / capping casing. 3 run x 1.5 sqmm - SPN + E						
		1	250.000				250.000
	Total Quantity						250.000 metre
	Total Deducted Quantity						0.000 metre
	Net Total Quantity						250.000 metre
	Say 250.000 metre @ Rs 118.00 / metre						Rs 29500.00
75	od369379/2021_2022 Circuit Mains - Supply and wiring the following size of PVC insulated copper wire manufactured with bright annealed bunched electrolytic copper conductor as per IS 8130/1984 insulated with di-electrical grade PVC compound per as IS 5831/1984 Generally Conforming to IS 694/1990 for working voltage up to and including 1100 V.through the existing PVC conduits / capping casing. 3 run x 2.5 Sqmm - SPN + E						
		1	200.000				200.000
	Total Quantity						200.000 metre
	Total Deducted Quantity						0.000 metre
	Net Total Quantity						200.000 metre
	Say 200.000 metre @ Rs 154.00 / metre						Rs 30800.00
76	od369380/2021_2022 Circuit Mains - Supply and wiring the following size of PVC insulated copper wire manufactured with bright annealed bunched electrolytic copper conductor as per IS 8130/1984 insulated with di-electrical grade PVC compound per as IS 5831/1984 Generally Conforming to IS 694/1990 for working voltage up to and including 1100 V.through the existing PVC conduits / capping casing. 3 run x 4.0 Sqmm - SPN + E						
		1	100.000				100.000
	Total Quantity						100.000 metre
	Total Deducted Quantity						0.000 metre
	Net Total Quantity						100.000 metre
	Say 100.000 metre @ Rs 199.00 / metre						Rs 19900.00
77	od369381/2021_2022 Supply and providing the following MCCB/ RCCB / MCB / MCB Isolators/COS etc. to the existing DBs / MCS / Junction Boxes etc. including giving proper termination using suitable Bananna copper lugs,						

	sleeves, insulation etc. complete. 6A to 32A , 10kA SP MCB						
		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 181.00 / No						Rs 4525.00
78	od369382/2021_2022 Supply and providing the following MCCB/ RCCB / MCB / MCB Isolators/COS etc. to the existing DBs / MCS / Junction Boxes etc. including giving proper termination using suitable Bananna copper lugs, sleeves, insulation etc. complete. 63A, 4P MCB Isolator						
		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 1050.00 / No						Rs 1050.00
79	od369383/2021_2022 Supply and providing the following MCCB/ RCCB / MCB / MCB Isolators/COS etc. to the existing DBs / MCS / Junction Boxes etc. including giving proper termination using suitable Bananna copper lugs, sleeves, insulation etc. complete. 63A, 100mA 3Ph RCCB						
		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 6640.00 / No						Rs 6640.00
80	od369384/2021_2022 Supply and providing First Aid Chart duly framed and placed in a conspicuous location for clear vision.						
		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 247.00 / set						Rs 247.00
81	od369385/2021_2022 Supply and fixing of M.S. angle cable tray for clamping the various sizes of cables in trenches, through walls, & trusses etc. as per KEI standards						
		1					1.000
	Total Quantity						1.000 MT

	Total Deducted Quantity						0.000 MT	
	Net Total Quantity						1.000 MT	
	Say 1.000 MT @ Rs 139221.88 / MT						Rs 139221.88	
82	od369386/2021_2022 Safety Items Supply and providing the following safety items approved by Kerala Electrical Inspectorate and relevant standards.							
		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 64083.75 / set						Rs 64083.75	
83	od369387/2021_2022 Amount for preparation of drawing and fees towards Electrical Inspectorate,obtaining necessary approval from Electrical Inspectorate etc and for misc items							
		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 100000.00 / L.S						Rs 100000.00	
SI No	Description	No	L	B	D	CF	Quantity	Remark
3SCADA and AUTOMATION (Cost Index:35.59 %)								
1	od369294/2021_2022 Providing SCADA ,Automation system to 143 MLD WTP with Graphical mimic of complete system with facility to monitor the field elements and control elements, Monitor the status of communications and media convertors, Control of all pump drives valves and related equipments, Information storage of operating parameters in data base, alarm log of all plant operations , warnings and errors to notify the operator,Trending of level flow PH turbidity rates and other operation parameters , General reports on daily monthly and yearly log of operational parameters etc complete as per standards and to the satisfaction of the KWA							
		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 41644521.05 / set						Rs 41644521.05	
SI No	Description	No	L	B	D	CF	Quantity	Remark
4UG CABLING AND POWER ALLOCATION (Cost Index:35.59 %)								

1	od369740/2021_2022 UG cable 3 x 300 mm XLPE or nearest suitable size including laying charges etc.						
		1	1800.000				1800.000
	Total Quantity						1800.000 metre
	Total Deducted Quantity						0.000 metre
	Net Total Quantity						1800.000 metre
	Say 1800.000 metre @ Rs 5000.00 / metre						Rs 9000000.00
	Total						73226791.02
	Centage @						0.0%
	Centage Amount						0.00
	Provision for GST payments (in %) @						18.0%
	Amount reserved for GST payments						13180822.38
	Total & Centage						86407613.40
	Lumpsum for round off						92386.60
	GRAND TOTAL Rs						86500000.00
	Rounded Grand Total Rs 8,65,00,000						
	Rupees Eight Crore Sixty Five Lakh Only						

Kerala Water Authority

PRICE

General Abstract

State Plan-Interim augmentation of water supply scheme to Kochi city and adjoining areas-supply,laying,testing and commissioning of 1626mm diameter MS pipe from Aluva HW to Nirmala school junction (For relaying existing 900mm&1050mm CI pumping main)

(Dsor year: 2018)

SI No	Heading Description	Amount
1	Part I : Cost of materials	145646241.55
2	Part II : Working Charges	41523306.44
3	Construction of Valve Chamber	2702247.60
4	Anchor Blocks	5437230.00
5	ROAD CROSSING PUSH THROUGH METHOD	10591275.21
6	INTERCONNECTION WORKS	962870.03
7	DUCT WORKS	919218.24
8	ROAD RESTORATION WORKS KWA ROAD	5298536.89
9	DRAINAGE WORKS	2884688.54
10	SECURITY ROOM	2120043.43
11	RESTORATION CHARGES AND PERMISSIONS FROM OTHER DEPARTMENTS	8143708.16
12	CATHODIC PROTECTION WORKS	1870688.00
Total		228100054.10
Centage @		0.0%
Centage Amount		0.00
Provision for GST payments (in %) @		18.0%
Amount reserved for GST payments		41058009.74
Total & Centage		269158063.84
Lumpsum for round off		41936.16
GRAND TOTAL Rs		269200000.00
Rounded Grand Total Rs 26,92,00,000		
Rupees Twenty Six Crore Ninety Two Lakh Only		

Detailed Estimate

State Plan-Interim augmentation of water supply scheme to Kochi city and adjoining areas-supply,laying,testing and commissioning of 1626mm diameter MS pipe from Aluva HW to Nirmala school junction (For relaying existing 900mm&1050mm CI pumping main)

(Dsor year: 2018)

Sl No	Description	No	L	B	D	CF	Quantity	Remark
1Part I : Cost of materials (Cost Index:35.59 %)								
1	od385981/2021_2022 Supplying, conveying and stacking 1016 mm OD m.s. pipe having 10 mm thickness as per IS 3589/2001 fabricated with Fe 410 grade steel conforming to IS-3589:2001 and allied codes , spirally welded mild steel pipe suitable for taper sleeve joint of outer diameter 1016 mm(shell OD)or nearest available size with internally lined with plant applied cement mortar lining 1:2 not less than 9mm thick and externally coated with plant applied cement mortar 1:3 ; 20mm thick minimum with wire mesh reinforcement as per clause A-9 of annex-A of IS :3589-2001. , including all labour charges, testing the spirally welded joint (DP test /) etc complete .	1	184.000				184.000	
							Total Quantity	184.000 metre
							Total Deducted Quantity	0.000 metre
							Net Total Quantity	184.000 metre
							Say 184.000 metre @ Rs 22096.38 / metre	Rs 4065733.92
2	od385984/2021_2022 Supplying, conveying and stacking 1016 mm OD m.s. pipe having 10 mm thickness as per IS 3589/2001 fabricated with Fe 410 grade steel conforming to IS-3589:2001 and allied codes , spirally welded mild steel pipe suitable for taper sleeve joint of outer diameter 1016 mm(shell OD)or nearest available size . , including all labour charges, testing the spirally welded joint (DP test /) etc complete .	1	6.000				6.000	
							Total Quantity	6.000 metre
							Total Deducted Quantity	0.000 metre
							Net Total Quantity	6.000 metre
							Say 6.000 metre @ Rs 1646310.10 / metre	Rs 9877860.60
3	od385993/2021_2022 Supplying, conveying and stacking 1219 mm OD m.s. pipe having 12.5 mm thickness as per IS 3589/2001 fabricated with Fe 410 grade steel conforming to IS-3589:2001 and allied codes , spirally welded mild steel pipe suitable for taper sleeve joint of outer diameter 1219 mm(shell OD)or nearest available size with internally lined with plant applied cement mortar lining 1:2 not less than 9mm thick and							

	externally coated with plant applied cement mortar 1:3 ; 20mm thick minimum with wire mesh reinforcement as per clause A-9 of annex-A of IS :3589-2001. , including all labour charges, testing the spirally welded joint (DP test /) etc complete .							
		1	49.000				49.000	
	Total Quantity						49.000 metre	
	Total Deducted Quantity						0.000 metre	
	Net Total Quantity						49.000 metre	
	Say 49.000 metre @ Rs 30632.24 / metre						Rs 1500979.76	
4	od385994/2021_2022 Supplying, conveying and stacking 1219 mm OD m.s. pipe having 12.5 mm thickness as per IS 3589/2001 fabricated with Fe 410 grade steel conforming to IS-3589:2001 and allied codes , spirally welded mild steel pipe suitable for taper sleeve joint of outer diameter 1219 mm(shell OD)or nearest available size with . , including all labour charges, testing the spirally welded joint (DP test /) etc complete .							
	For making bends	1	6.000				6.000	
	Total Quantity						6.000 metre	
	Total Deducted Quantity						0.000 metre	
	Net Total Quantity						6.000 metre	
	Say 6.000 metre @ Rs 24389.18 / metre						Rs 146335.08	
5	od386000/2021_2022 Supplying, conveying and stacking 1626 mm OD m.s. pipe having 14.20 mm thickness as per IS 3589/2001 fabricated with Fe 410 grade steel conforming to IS-3589:2001 and allied codes , spirally welded mild steel pipe suitable for taper sleeve joint of outer diameter 1626 mm(shell OD)or nearest available size with internally lined with plant applied cement mortar lining 1:2 not less than 12mm thick and externally coated with plant applied cement mortar 1:3 ; 20mm thick minimum with wire mesh reinforcement as per clause A-9 of annex-A of IS :3589-2001. , including all labour charges, testing the spirally welded joint (DP test /) etc complete .							
		1	2440.000				2440.000	
	Total Quantity						2440.000 metre	
	Total Deducted Quantity						0.000 metre	
	Net Total Quantity						2440.000 metre	
	Say 2440.000 metre @ Rs 45579.58 / metre						Rs 111214175.20	
6	od386001/2021_2022 Supplying, conveying and stacking 1626 mm OD m.s. pipe having 14.20 mm thickness as per IS 3589/2001 fabricated with Fe 410 grade steel conforming to IS-3589:2001 and allied codes , spirally welded mild steel pipe suitable for taper sleeve joint of outer diameter 1626 mm(shell OD)or nearest available size with , including all labour charges, testing the spirally welded joint (DP test /) etc complete .							

	For making specials like bends of required angles	1	55.000				55.000	15 bends @ 3.50/each bends+2.50m +55m +	
	Total Quantity						55.000 metre		
	Total Deducted Quantity						0.000 metre		
	Net Total Quantity						55.000 metre		
	Say 55.000 metre @ Rs 36705.72 / metre						Rs 2018814.60		
7	od386002/2021_2022 Supplying, conveying and stacking 2032 mm OD m.s. pipe having 16 mm thickness as per IS 3589/2001 fabricated with Fe 410 grade steel conforming to IS-3589:2001 and allied codes , spirally welded mild steel pipe suitable of outer diameter 2032 mm(shell OD)or nearest available size . , including all labour charges, testing the spirally welded joint (DP test /) etc complete .								
	Fabricating MS Pipe 2032 mm ID with 16 mm MS Plate								
	Crossing at Casino	1	64.000				64.000		
	Vetinary compound	1	40.000				40.000		
	Crossing near Power house	1	30.000				30.000		
	PVIP Canal Crossing	1	69.000				69.000		
	Total Quantity						203.000 metre		
	Total Deducted Quantity						0.000 metre		
	Net Total Quantity						203.000 metre		
	Say 203.000 metre @ Rs 52437.08 / metre						Rs 10644727.24		
8	od386003/2021_2022 Fabricating MS flanges of diameter 219 mm using 12 mm thick MS plate including cost and conveyance charges of MS plate, all fabrication charges, charges of painting the steel work with two or more coat deluxe multi surface paint to give an even shade over an under coat of primer etc. complete: For pipes fabricated with 6.3 mm thick MS plates.(data derived from 100.37.19.2)								
		8					8.000		
	Total Quantity						8.000 No		
	Total Deducted Quantity						0.000 No		
	Net Total Quantity						8.000 No		
	Say 8.000 No @ Rs 2554.49 / No						Rs 20435.92		
9	od386004/2021_2022 Fabricating MS flanges of diameter 610 mm using 16 mm thick MS plate including cost and conveyance charges of MS plate, all fabrication charges, charges of painting the steel work with two or more coat								

	deluxe multi surface paint to give an even shade over an under coat of primer etc. complete: For pipes fabricated with 6.3 mm thick MS plates.(data derived from 100.37.19.2)							
		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 8265.33 / No						Rs 49591.98	
10	od386009/2021_2022 Fabricating MS flanges of diameter 1016 mm using 16mm thick MS plate, width 120mm, including cost and conveyance charges of MS plate, all fabrication charges, charges of painting the steel work with two or more coat deluxe multi surface paint to give an even shade over an under coat of primer etc. complete: For pipes fabricated with 10 mm thick MS plates.(data derived from 100.37.19.2)							
		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 16910.90 / No						Rs 67643.60	
11	od386013/2021_2022 Fabricating MS flanges of diameter 1219 mm using 16 mm thick MS plate including cost and conveyance charges of MS plate, all fabrication charges, charges of painting the steel work with two or more coat deluxe multi surface paint to give an even shade over an under coat of primer etc. complete: For pipes fabricated with 11 mm thick MS plates.(data derived from 100.37.19.2)							
		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 21983.31 / No						Rs 87933.24	
12	od386016/2021_2022 Fabricating MS flanges of diameter 1626mm using 16 mm thick MS plate including cost and conveyance charges of MS plate, all fabrication charges, charges of painting the steel work with two or more coat deluxe multi surface paint to give an even shade over an under coat of primer etc. complete: For pipes fabricated with 12.5 mm thick MS plates.(data derived from 100.37.19.2)							
		12					12.000	For valve 2 Nos + Joints - 5x2 total 12 Nos.
	Total Quantity						12.000 No	

								Total Deducted Quantity	0.000 No
								Net Total Quantity	12.000 No
								Say 12.000 No @ Rs 34108.76 / No	Rs 409305.12
13	od386019/2021_2022 Supplying 1000 mm/ nearest CI D/F Sluice valve								
		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 619802.00 / No	Rs 1239604.00
14	od386020/2021_2022 Supplying 1200 mm/ nearest CI D/F Sluice valve								
		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 826804.50 / No	Rs 1653609.00
15	od386022/2021_2022 Supplying 1600 mm/Nearest size CI Sluice valve								
		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 1510392.50 / No	Rs 1510392.50
16	100.98.468 Supply of CI Double Flanged Sluice Valve Conforming to IS 14846 - 2000, Sluice Valve with Cap PN 1.6, Size 600mm.								
	600 mm Sluice valve foe scour	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 91285.40 / No	Rs 273856.20
17	od386034/2021_2022 Supplying, conveying and stacking 219 mm OD m.s. pipe having 6.30 mm thickness as per IS 3589/2001								

	fabricated with Fe 410 grade steel conforming to IS-3589:2001 and allied codes , spirally welded mild steel pipe suitable for taper sleeve joint of outer diameter 219 mm(shell OD)or nearest available size , including all labour charges, testing the spirally welded joint (DP test /) etc complete .						
	For Air valves 200 mm	8	0.600				4.800
	Total Quantity						4.800 metre
	Total Deducted Quantity						0.000 metre
	Net Total Quantity						4.800 metre
	Say 4.800 metre @ Rs 2090.70 / metre						Rs 10035.36
18	od386035/2021_2022 Supplying, conveying and stacking 610 mm OD m.s. pipe having 6.3 mm thickness as per IS 3589/2001 fabricated with Fe 410 grade steel conforming to IS-3589:2001 and allied codes , spirally welded mild steel pipe suitable for taper sleeve joint of outer diameter 610 mm(shell OD)or nearest available size . , including all labour charges, testing the spirally welded joint (DP test /) etc complete .						
	Fabricating MS pipes of size 600mm (ID) using 8 mm thick MS plate for scour pipe						
	Head works	1	15.000				15.000
	Near Seminary	1	5.000				5.000
	After PVIP crossing	1	3.000				3.000
	Total Quantity						23.000 metre
	Total Deducted Quantity						0.000 metre
	Net Total Quantity						23.000 metre
	Say 23.000 metre @ Rs 6097.88 / metre						Rs 140251.24
19	100.98.453 Supply of CI Air Valve with Flanges, Conforming to IS 14845 - 2000, Kinetic Air Valve Type DS1, Size 200mm.						
	Supply of CI Air Valve 200 mm	8					8.000
	Total Quantity						8.000 No
	Total Deducted Quantity						0.000 No
	Net Total Quantity						8.000 No
	Say 8.000 No @ Rs 18198.85 / No						Rs 145590.80
20	100.98.485 Supply of CI Double Flanged Sluice Valve Conforming to IS 14846 - 2000, Sluice Valve with Hand Wheel PN 1.6, Size 200mm.						
	For Air Valve 200 mm	8					8.000
	Total Quantity						8.000 No
	Total Deducted Quantity						0.000 No

	Net Total Quantity						8.000 No	
	Say 8.000 No @ Rs 11938.60 / No						Rs 95508.80	
21	100.98.213 Supply of uPVC Pipe, IS 4985: 2000 , 6kg/cm2, 90mm Dia.							
	For maintenace works	1	300.000				300.000	
	Total Quantity						300.000 metre	
	Total Deducted Quantity						0.000 metre	
	Net Total Quantity						300.000 metre	
	Say 300.000 metre @ Rs 202.30 / metre						Rs 60690.00	
22	100.98.214 Supply of uPVC Pipe, IS 4985: 2000 , 6kg/cm2, 110mm Dia.							
	Supply of PVC Pipe, 6kg/cm2, 110mm Dia.	1	140.000				140.000	
	Total Quantity						140.000 metre	
	Total Deducted Quantity						0.000 metre	
	Net Total Quantity						140.000 metre	
	Say 140.000 metre @ Rs 291.80 / metre						Rs 40852.00	
23	100.98.216 Supply of uPVC Pipe, IS 4985: 2000 , 6kg/cm2, 160mm Dia.							
	Supply of PVC Pipe, 6kg/cm2, 160mm Dia.	1	140.000				140.000	
	Total Quantity						140.000 metre	
	Total Deducted Quantity						0.000 metre	
	Net Total Quantity						140.000 metre	
	Say 140.000 metre @ Rs 621.60 / metre						Rs 87024.00	
24	od386041/2021_2022 Conveyance charge of Internal and External Lined MS Pipes							
	1626 mm Lined M.S pipe	1	2440.000			0.75	1830.000	
	1219 mm Lined MS pipe	1	49.000			0.5	24.500	
	1016 mm lLined MS pipe	1	184.000			0.43	79.120	
	1626 mm M.S pipe	1	55.000			0.49	26.950	
	1219 mm MS pipe	1	6.000			0.3	1.800	

	1016 mm MS pipe	1	6.000			0.25	1.500		
	Total Quantity						1963.870 tonne		
	Total Deducted Quantity						0.000 tonne		
	Net Total Quantity						1963.870 tonne		
	Say 1963.870 tonne @ Rs 145.27 / tonne						Rs 285291.39		
Sl No	Description	No	L	B	D	CF	Quantity	Remark	
2Part II : Working Charges (Cost Index:35.59 %)									
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.								
	Cutting the bituminous / concrete roads								
	Cutting bituminous road	1	70.000				70.000		
	Total Quantity						70.000 metre		
	Total Deducted Quantity						0.000 metre		
	Net Total Quantity						70.000 metre		
	Say 70.000 metre @ Rs 30.44 / metre						Rs 2130.80		
2	15.3 Demolishing R.C.C. work manually / by mechanical means including stacking of steel bars and disposal of unserviceable material with in 50 metres lead as per direction of Engineer -in-Charge.								
	DRAIN	1	16.000	2.100	0.150		5.040		
	Gokulam lane	1	40.000	2.500	0.100		10.000		
	Demolishing Security cabin at Head works	1	2.400	2.100	0.100		0.504		
	Total Quantity						15.544 cum		
	Total Deducted Quantity						0.000 cum		
	Net Total Quantity						15.544 cum		
	Say 15.544 cum @ Rs 2983.59 / cum						Rs 46376.92		
3	15.9.1 Demolishing stone rubble masonry manually / by mechanical means including stacking of serviceable material and disposal of unserviceable material within 50 metres lead as per direction of Engineer -in-Charges:In Lime Mortor								
	Kalathil road	2	2.500	0.900	2.500		11.250		

	Near seminary culvert	2	2.500	0.900	2.500		11.250	
	Compound wall Vetinary hospital	1	6.000	0.600	1.200		4.320	
	Security cabin basement	1	6.000	0.450	0.500		1.350	
	Total Quantity						28.170 cum	
	Total Deducted Quantity						0.000 cum	
	Net Total Quantity						28.170 cum	
	Say 28.170 cum @ Rs 972.79 / cum						Rs 27403.49	
4	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)							
	Kalathil road	2	2.500	0.900	2.500		11.250	
	Near seminary culvert	2	2.500	0.900	2.500		11.250	
	Compound wall Vetinary hospital	1	6.000	0.600	1.200		4.320	
	Total Quantity						26.820 cum	
	Total Deducted Quantity						0.000 cum	
	Net Total Quantity						26.820 cum	
	Say 26.820 cum @ Rs 7204.78 / cum						Rs 193232.20	
5	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)							
	Concrete road demolishing							
	1422 mm WTP to Nirmala school	1	32.000	3.000	0.100		9.601	
		1	40.000	5.300	0.100		21.201	
		1	52.000	3.000	0.100		15.601	
	1016 mm AT WTP	1	7.000	2.400	0.100		1.681	
	Total Quantity						48.084 cum	
	Total Deducted Quantity						0.000 cum	
	Net Total Quantity						48.084 cum	
	Say 48.084 cum @ Rs 2045.12 / cum						Rs 98337.55	
6	16.83							

	Taking out existing CC interlocking paver blocks from footpath/ central verge, including removal of rubbish etc., disposal of unserviceable material to the dumping ground, for which payment shall be made separately and stacking of serviceable material within 50 metre lead as per direction of Engineer-in-Charge.						
	Taking out inter-lock blocks	1	25.000	4.000			100.000
	Total Quantity						100.000 sqm
	Total Deducted Quantity						0.000 sqm
	Net Total Quantity						100.000 sqm
	Say 100.000 sqm @ Rs 110.71 / sqm						Rs 11071.00
7	16.84 Laying old cement concrete interlocking paver blocks of any design/ shape laid in required line, level, curvature, colour and pattern over and including 50 mm thick compacted bed of coarse sand, filling the joints with fine sand etc. all complete as per the direction of Engineer-in-charge. (Old CC paver blocks shall be supplied by the department free of cost.)						
	Layingt inter-lock blocks	1	25.000	4.000			100.000
	Total Quantity						100.000 sqm
	Total Deducted Quantity						0.000 sqm
	Net Total Quantity						100.000 sqm
	Say 100.000 sqm @ Rs 381.62 / sqm						Rs 38162.00
8	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)						
	1422 mm WTP to Nirmala school	1	2000.000				2000.000
	Total Quantity						2000.000 metre
	Total Deducted Quantity						0.000 metre
	Net Total Quantity						2000.000 metre
	Say 2000.000 metre @ Rs 96.33 / metre						Rs 192660.00
9	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)						
	Ribbon fencing	1	245.000				245.000
	Total Quantity						245.000 metre

		Total Deducted Quantity					0.000 metre	
		Net Total Quantity					245.000 metre	
		Say 245.000 metre @ Rs 28.01 / metre					Rs 6862.45	
10	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)							
	For 1626mm MS Pipe - 1 S T R e a c h - Chainage 0.00 -541	1	541.000	2.600	1.830		2574.079	
		1	732.000	2.600	1.100		2093.521	
		1	239.000	2.600	2.000		1242.800	
		1	122.000	2.600	1.500		475.800	
		1	162.000	2.600	1.400		589.680	
		1	496.000	2.600	1.750		2256.800	
	For 1219 mm MS Pipe	1	55.000	2.400	1.500		198.000	
	For 1016 mm MS Pipe	1	190.000	2.300	1.500		655.500	
	For relaying existing 160 mm PVC Pipes	1	140.000	0.300	1.200		50.400	
		1	140.000	0.300	1.150		48.300	
		1	300.000	0.300	1.100		99.001	
		Total Quantity					10283.881 cum	
		Total Deducted Quantity					0.000 cum	
		Net Total Quantity					10283.881 cum	
		Say 10283.881 cum @ Rs 555.51 / cum					Rs 5712798.73	
11	2.7.1 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. Ordinary rock							
	For 1626 mm MS Pipe 1ST Reach- Chainage 0.00 -541	1	541.000	2.600	0.500		703.301	
		1	732.000	2.600	1.000		1903.200	

		1	239.000	2.600	0.500		310.700		
		1	122.000	2.600	0.750		237.900		
		1	162.000	2.600	0.850		358.020		
		1	496.000	2.600	0.450		580.320		
	For 1219 mm MS Pipe	1	55.000	2.400	0.500		66.000		
	For 1016mm MS Pipe	1	190.000	2.300	0.500		218.500		
	1626 mm MS Extra depth for Drain crossing near Seminary	1	20.000	2.600	0.500		26.000		
		2	30.000	2.600	0.500		78.000		
	Extra for Joints - Reach -3	40	1.300	0.750	0.900		35.100	pipe length 6m reach 3rd-40nos.	
		Total Quantity						4517.041 cum	
		Total Deducted Quantity						0.000 cum	
		Net Total Quantity						4517.041 cum	
		Say 4517.041 cum @ Rs 414.84 / cum						Rs 1873849.29	
12	<p style="text-align: center;">Kerala Water Authority</p> <p>100.2.2 Excavation work by mechanical means (Hydraulic excavator) / manual means in foundation trenches or drains (not exceeding 1.5 m in width or 10 m² 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 soils as directed, within a lead of 50 m. Medium Rock (blasting prohibited) New Data derived from Item No.2.9.3</p>								
	1ST Reach- Chainage 0.00 -541	1	541.000	2.600	0.170		239.123		
	2nd Reach- Chainage 605 -1337	1	732.000	2.600	0.400		761.281		
	4th Reach- Chainage 1616-1738	1	122.000	2.600	0.250		79.300		
	5th Reach- Chainage 1337-1567	1	162.000	2.600	0.250		105.300		
	6th Reach- Chainage 1337-1567	1	496.000	2.600	0.300		386.881		

	Extra for joints in reach-1,2,4,5 and 6	342	1.300	0.750	0.900		300.105	90+122+20+27+83=342	
	Total Quantity						1871.990 cum		
	Total Deducted Quantity						0.000 cum		
	Net Total Quantity						1871.990 cum		
	Say 1871.990 cum @ Rs 1059.91 / cum						Rs 1984140.92		
13	2.26.1 Extra for every additional lift 1.5 m or part there of in excavation / banking excavated or stacked materials.All kinds of soil								
	1450mm MS Pipes								
	1st Reach- Chainage 0.00 -541	1	541.000	2.600	0.330		464.179		
	3rd Reach- Chainage 1337-1567	1	239.000	2.600	0.500		310.700		
	6th Reach- Chainage 1337-1567	1	496.000	2.600	0.250		322.401		
	Total Quantity						1097.280 cum		
	Total Deducted Quantity						0.000 cum		
	Net Total Quantity						1097.280 cum		
	Say 1097.280 cum @ Rs 106.37 / cum						Rs 116717.67		
14	2.26.2 Extra for every additional lift 1.5 m or part there of in excavation / banking excavated or stacked materials.Ordinary or hard rock								
	Additional lift 1.50 to 3.00 m								
	1ST Reach- Chainage 0.00 -541	1	541.000	2.600	0.670		942.423		
	2nd Reach- Chainage 605 -1337	1	732.000	2.600	1.000		1903.200		
	3rd Reach- Chainage 1337-1567	1	239.000	2.600	0.500		310.700		
	4th Reach- Chainage 1616-1738	1	122.000	2.600	1.000		317.200		
	5th Reach- Chainage 1337-1567	1	162.000	2.600	1.000		421.200		
	6th Reach- Chainage 1337-1567	1	496.000	2.600	0.750		967.200		

	Drain crossing Seminary	1	20.000	2.600	0.500		26.000	
	Head works pipeline crossing	2	30.000	2.600	0.500		78.000	
	For joints excavation	382	1.300	0.750	0.900		335.206	
	Total Quantity						5301.129 cum	
	Total Deducted Quantity						0.000 cum	
	Net Total Quantity						5301.129 cum	
	Say 5301.129 cum @ Rs 190.78 / cum						Rs 1011349.39	
15	2.16.2 Close timbering in trenches including strutting, shoring and packing cavities (wherever required) complete (Measurements to be taken of the face area timbered).Depth exceeding 1.5 m but not exceeding 3 m							
	shoring and packing cavities							
	1626 mm MS Pipes	1	60.000		2.500		150.000	
	1016 mm and 1219mm MS Pipes	1*2	30.000		2.000		120.000	
	Total Quantity						270.000 sqm	
	Total Deducted Quantity						0.000 sqm	
	Net Total Quantity						270.000 sqm	
	Say 270.000 sqm @ Rs 166.17 / sqm						Rs 44865.90	
16	od386007/2021_2022 Providing steel sheet shoring to the sides of the trenches to depths up to 3m 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.							
	For 1626 mm MS Pipe 2 sides	1*2	2292.000		2.500		11460.000	
	For 1219mm MS Pipe 2 sides	1*2	55.000		2.500		275.000	
	For 1016mm MS Pipe 2 sides	1*2	190.000		2.500		950.000	
	Total Quantity						12685.000 sqm	
	Total Deducted Quantity						0.000 sqm	
	Net Total Quantity						12685.000 sqm	

	Say 12685.000 sqm @ Rs 590.80 / sqm							Rs 7494298.00
17	od386008/2021_2022 Conveying excavated earth (All classes) up to 1 km and leveling as per the directions of departmental officers.							
	Conveying and stacking excess qty of excavated earth							
	1626mm WTP to Nirmala school	1	2292.000	1.462	1.462	0.79	3870.228	cf=3.14/4=0.785
	1016mm - MS	1	190.000	1.056	1.056	0.79	167.382	
	1219mm - MS	1	55.000	1.158	1.158	0.79	58.265	
	Push through pipe 2032 mm	1	203.000	1.832	1.832	0.79	538.238	
	Total Quantity							4634.113 cum
	Total Deducted Quantity							0.000 cum
	Net Total Quantity							4634.113 cum
	Say 4634.113 cum @ Rs 292.16 / cum							Rs 1353902.45
18	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)							
	Bailing out water with 5 HP engine and pumpset i	1	30000.000				30000.000	4x5hpx16 hx125day sx0.746 =29840 say30000
	Total Quantity							30000.000 Kwh
	Total Deducted Quantity							0.000 Kwh
	Net Total Quantity							30000.000 Kwh
	Say 30000.000 Kwh @ Rs 36.95 / Kwh							Rs 1108500.00
19	100.7.3 Bailing out water with engine and pumpset above 10 HP upto 20 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)							
	Bailing out water with engine and pumpset above 10 HP upto 20 HP							

	Bailing out water with 10HP Pump	1	9000.000				9000.000	10x75day sx16hours x0.746=89 52say - 9000
	Total Quantity						9000.000 Kwh	
	Total Deducted Quantity						0.000 Kwh	
	Net Total Quantity						9000.000 Kwh	
	Say 9000.000 Kwh @ Rs 9.22 / Kwh						Rs 82980.00	
20	od386010/2021_2022 Conveying and laying 1016 mm OD m.s. pipe having 10 mm thickness as per IS 3589/2001 fabricated with Fe 410 grade steel conforming to IS-3589:2001 and allied codes , spirally welded mild steel pipe suitable for taper sleeve joint of outer diameter 1016 mm(shell OD)or nearest available size with internally lined with plant applied cement mortar lining 1:2 not less than 9mm thick and externally coated with plant applied cement mortar 1:3 ; 20mm thick minimum with wire mesh reinforcement as per clause A-9 of annex-A of IS :3589-2001. , including all labour charges, DP test for the welded joints at site etc complete .							
		1	190.000				190.000	
	Total Quantity						190.000 metre	
	Total Deducted Quantity						0.000 metre	
	Net Total Quantity						190.000 metre	
	Say 190.000 metre @ Rs 1441.36 / metre						Rs 273858.40	
21	od392384/2021_2022 Conveying and laying 1219 mm OD m.s. pipe having 12.5 mm thickness as per IS 3589/2001 fabricated with Fe 410 grade steel conforming to IS-3589:2001 and allied codes , spirally welded mild steel pipe suitable for taper sleeve joint of outer diameter 1219 mm(shell OD)or nearest available size with internally lined with plant applied cement mortar lining 1:2 not less than 9mm thick and externally coated with plant applied cement mortar 1:3 ; 20mm thick minimum with wire mesh reinforcement as per clause A-9 of annex-A of IS :3589-2001. , including all labour charges, DP test for the welded joints at site etc complete .							
		1	55.000				55.000	
	Total Quantity						55.000 metre	
	Total Deducted Quantity						0.000 metre	
	Net Total Quantity						55.000 metre	
	Say 55.000 metre @ Rs 1607.34 / metre						Rs 88403.70	
22	od386011/2021_2022 Conveying and Laying 1626 mm OD m.s. pipe having 14.20 mm thickness as per IS 3589/2001 fabricated with Fe 410 grade steel conforming to IS-3589:2001 and allied codes , spirally welded mild steel pipe suitable for taper sleeve joint of outer diameter 1626 mm(shell OD)or nearest available size							

	with internally lined with plant applied cement mortar lining 1:2 not less than 9mm thick and externally coated with plant applied cement mortar 1:3 ; 20mm thick minimum with wire mesh reinforcement as per clause A-9 of annex-A of IS :3589-2001. , including all labour charges, DP test for the welded joints at site etc complete .							
		1	2495.000				2495.000	
	Total Quantity							2495.000 metre
	Total Deducted Quantity							0.000 metre
	Net Total Quantity							2495.000 metre
	Say 2495.000 metre @ Rs 2292.68 / metre							Rs 5720236.60
23	od386012/2021_2022 Conveying and Laying 1219 mm OD m.s. pipe having 12.5 mm thickness as per IS 3589/2001 fabricated with Fe 410 grade steel conforming to IS-3589:2001 and allied codes , spirally welded mild steel pipe suitable for taper sleeve joint of outer diameter 1219 mm(shell OD)or nearest available size with internally lined with plant applied cement mortar lining 1:2 not less than 9mm thick and externally coated with plant applied cement mortar 1:3 ; 20mm thick minimum with wire mesh reinforcement as per clause A-9 of annex-A of IS :3589-2001. , including all labour charges, DP test for the welded joints at site (/) etc complete .							
	1118 mm M.S Pipe	1	55.000				55.000	
	Total Quantity							55.000 metre
	Total Deducted Quantity							0.000 metre
	Net Total Quantity							55.000 metre
	Say 55.000 metre @ Rs 1675.03 / metre							Rs 92126.65
24	od386014/2021_2022 Grinding cut and weld edges of 1016mm (OD) MS pipes including all labour and hire charges of tools etc. complete: For pipes fabricated with 10mm thick MS plates.							
	For joints	2*32					64.000	For two bends (before 1 No before welding and after welding)
	For making bend	2*2*4					16.000	(2 bend , before welding 1 and after welding 1
	Total Quantity							80.000 No
	Total Deducted Quantity							0.000 No

	Net Total Quantity						80.000 No	
	Say 80.000 No @ Rs 713.73 / No							Rs 57098.40
25	od386015/2021_2022 Welding 1016 mm (OD) MS pipes by gas/electric welding machine including cost of gas and welding rods ,all labour and hire charges of tools etc. complete: For pipes fabricated with 12mm thick MS plates.							
	For joints	32*1					32.000	One outside
	For bends "	2*4					8.000	
	Total Quantity						40.000 No	
	Total Deducted Quantity						0.000 No	
	Net Total Quantity						40.000 No	
	Say 40.000 No @ Rs 3768.10 / No							Rs 150724.00
26	od386017/2021_2022 Cutting 1016 mm (OD) MS pipes for making bends and other specials by gas cutting including cost of gas, all labour and hire charges of tools etc. complete: For pipes fabricated with 10mm thick MS plates.							
	For bends "	2*4					8.000	
	For joints	2					2.000	
	Total Quantity						10.000 No	
	Total Deducted Quantity						0.000 No	
	Net Total Quantity						10.000 No	
	Say 10.000 No @ Rs 984.84 / No							Rs 9848.40
27	od386018/2021_2022 Grinding cut and weld edges of 1229 mm (OD) MS pipes including all labour and hire charges of tools etc. complete: For pipes fabricated with 12.50 mm thick MS plates.							
	For bends	2*2*4					16.000	1 before welding and i after welding
	For joints	2*10					20.000	1 before welding and i after welding
	Total Quantity						36.000 No	
	Total Deducted Quantity						0.000 No	
	Net Total Quantity						36.000 No	
	Say 36.000 No @ Rs 785.38 / No							Rs 28273.68
28	od386021/2021_2022							

	Welding 1219 mm (OD) MS pipes by gas/electric welding machine including cost of gas and welding rods ,all labour and hire charges of tools etc. complete: For pipes fabricated with 12.5mm thick MS plates.							
	For bends	2*4					8.000	
	For joints	1*10					10.000	Outside welding only
	Total Quantity						18.000 No	
	Total Deducted Quantity						0.000 No	
	Net Total Quantity						18.000 No	
	Say 18.000 No @ Rs 4188.70 / No						Rs 75396.60	
29	od386023/2021_2022 Cutting 1219 mm (OD) MS pipes for making bends and other specials by gas cutting including cost of gas, all labour and hire charges of tools etc. complete: For pipes fabricated with 12.50mm thick MS plates.							
	For bends	2*4					8.000	
	For joints at bend	2*1					2.000	
	Total Quantity						10.000 No	
	Total Deducted Quantity						0.000 No	
	Net Total Quantity						10.000 No	
	Say 10.000 No @ Rs 1084.01 / No						Rs 10840.10	
30	od386024/2021_2022 Cutting 1626mm (OD) MS pipes for making bends and other specials by gas cutting including cost of gas, all labour and hire charges of tools etc. complete: For pipes fabricated with 14.20mm thick MS plates.							
	For bends	15*4					60.000	
	For joints at bends	15*1					15.000	
	Total Quantity						75.000 No	
	Total Deducted Quantity						0.000 No	
	Net Total Quantity						75.000 No	
	Say 75.000 No @ Rs 17185.07 / No						Rs 128880.25	
31	od386025/2021_2022 Welding 1626 mm (OD) MS pipes by gas/electric welding machine including cost of gas and welding rods ,all labour and hire charges of tools etc. complete: For pipes fabricated with 14.20mm thick MS plates.							
	For joints outside and inside welding (spigot & socket welding)	312*2					624.000	2495/6= 416x(75%)=312

	For joints inside welding only(Butt welding)	104					104.000	2495/6=416x(25%)=104	
	For bends "	15*4					60.000		
	Total Quantity						788.000 No		
	Total Deducted Quantity						0.000 No		
	Net Total Quantity						788.000 No		
	Say 788.000 No @ Rs 6091.96 / No							Rs 4800464.48	
32	od386026/2021_2022 Grinding cut and weld edges of 1626mm (OD) MS pipes including all labour and hire charges of tools etc. complete: For pipes fabricated with 14.20 mm thick MS plates.								
	For joints outside and inside welding (spigot & socket welding)	312*2*2					1248.000	One before welding and 1 after welding	
	For joints inside welding only(Butt welding)	104*2					208.000	One before welding and 1 after welding	
	For bends "	15*4*2					120.000	One before welding and 1 after welding	
	Total Quantity						1576.000 No		
	Total Deducted Quantity						0.000 No		
	Net Total Quantity						1576.000 No		
	Say 1576.000 No @ Rs 1142.24 / No							Rs 1800170.24	
33	od386027/2021_2022 Grinding cut and weld edges of 219 mm (OD) MS pipes during fabrication work including all labour and hire charges of tools etc. complete: For pipes fabricated with 6.3 mm thick MS plates.								
	For Air valves 200 mm	8*2*2					32.000	1 before welding and 1 after welding	
	Total Quantity						32.000 No		
	Total Deducted Quantity						0.000 No		

	Net Total Quantity						32.000 No	
	Say 32.000 No @ Rs 153.84 / No						Rs 4922.88	
34	od386028/2021_2022 Welding 219 mm (ID) MS pipes for making bends and other specials by gas/electric welding machine including cost of gas and welding rods ,all labour and hire charges of tools etc. complete: For pipes fabricated with 6.30 mm thick MS plates.							
	For Air valves 200 mm	8*2					16.000	
	Total Quantity						16.000 No	
	Total Deducted Quantity						0.000 No	
	Net Total Quantity						16.000 No	
	Say 16.000 No @ Rs 820.51 / No						Rs 13128.16	
35	od386029/2021_2022 Cutting 219 mm (ID) MS pipes for making bends and other specials by gas cutting including cost of gas, all labour and hire charges of tools etc. complete: For pipes fabricated with 6.30mm thick MS plates.							
	For Air valves 200 mm	8					8.000	
	Total Quantity						8.000 No	
	Total Deducted Quantity						0.000 No	
	Net Total Quantity						8.000 No	
	Say 8.000 No @ Rs 214.45 / No						Rs 1715.60	
36	od386030/2021_2022 Welding 610 mm (ID) MS pipes for making bends and other specials by gas/electric welding machine including cost of gas and welding rods ,all labour and hire charges of tools etc. complete: For pipes fabricated with 6.30 mm thick MS plates.							
	Welding 610mm (ID) MS pipes for making bends	3*4					12.000	
	For flanges	3*2					6.000	
	Total Quantity						18.000 No	
	Total Deducted Quantity						0.000 No	
	Net Total Quantity						18.000 No	
	Say 18.000 No @ Rs 2284.96 / No						Rs 41129.28	
37	od386031/2021_2022 Grinding cut and weld edges of 610 mm (ID) MS pipes during fabrication work including all labour and hire charges of tools etc. complete: For pipes fabricated with 6.3mm thick MS plates.							
	Grinding cut and weld edges of 610 mm (OD) MS pipes							

	for bends	3*4*2					24.000	1 before welding and 1 after welding
	" for flanges	3*2*2					12.000	1 before welding and 1 after welding
	Total Quantity						36.000 No	
	Total Deducted Quantity						0.000 No	
	Net Total Quantity						36.000 No	
	Say 36.000 No @ Rs 428.52 / No						Rs 15426.72	
38	od386032/2021_2022 Cutting 610mm (OD) MS pipes for making bends and other specials by gas cutting including cost of gas, all labour and hire charges of tools etc. complete: For pipes fabricated with 6.3 mm thick MS plates.							
	Cutting 610mm (OD) MS pipes for making bends and other specials							
	for flanges	3*2*2					12.000	
	" for bends	3*4					12.000	
	Total Quantity						24.000 No	
	Total Deducted Quantity						0.000 No	
	Net Total Quantity						24.000 No	
	Say 24.000 No @ Rs 603.21 / No						Rs 14477.04	
39	100.98.1009 Engaging Fitter (grade 1)							
	Fitters for operating valves and Maintenance of leakages during excavation							
	For maintenance and connections	50					50.000	
	Total Quantity						50.000 Day	
	Total Deducted Quantity						0.000 Day	
	Net Total Quantity						50.000 Day	
	Say 50.000 Day @ Rs 1162.28 / Day						Rs 58114.00	
40	100.98.1008 Engaging Coolie							
	Fitters for operating valves and Maintenance of leakages during excavation							
	For maintenance and connections	50					50.000	

						Total Quantity	50.000 Day
						Total Deducted Quantity	0.000 Day
						Net Total Quantity	50.000 Day
						Say 50.000 Day @ Rs 878.76 / Day	Rs 43938.00
41	<p>od386033/2021_2022</p> <p>Providing and erecting 2.00 metre high temporary barricading at site as per drawing / direction of Engineer - in - Charge which includes writing and painting, arrangement for traffic diversion such as traffic signals during construction at site for day and night, glow lamps, reflective signs, marking, flags, caution tape as directed by the Engineer - in-Charge. The barricading provided shall be retained in position at site continuously i/c shifting of barricading from one location to another location as many times as required during the execution of the entire work till its completion. Rate include its maintenance for damages, painting, all incidentals, labour materials, equipments and works required to executed the job . The barricading shall not be removed without prior approval of Engineer-nin-Charge. (Note:- One time payment shall be made for providing barricading from star of work till completion of work i/c shifting. The barricading provided shall remain to be the property of the contractor on completion of the work).</p>						
	For PIPELINE ROAD	4	10.000				40.000
	Kalathil road	2	6.000				12.000
	PVIP Canal bund road	2	5.000				10.000
	Gokulam lane	2	5.000				10.000
						Total Quantity	72.000 metre
						Total Deducted Quantity	0.000 metre
						Net Total Quantity	72.000 metre
						Say 72.000 metre @ Rs 2689.92 / metre	Rs 193674.24
42	<p>100.32.7</p> <p>Conveying and fixing C I Single acting Air Valve of approved quality with bolts,nuts,rubber insertions etc . excluding the cost of air valve(the tail pieces if required will be paid seperately):</p> <p>200 mm Double acting Air Valve</p> <p>Observed Data derived from item no.18.59.of DAR</p>						
	200 mm Double acting Air Valve	8					8.000
						Total Quantity	8.000 Nos
						Total Deducted Quantity	0.000 Nos
						Net Total Quantity	8.000 Nos
						Say 8.000 Nos @ Rs 449.62 / Nos	Rs 3596.96
43	<p>100.31.1.5</p> <p>"Conveying and fixing C.I. sluice valves (with cap) by providing complete with bolts, nuts, rubber insertions etc. excluding the cost of valve (the tail pieces if required will be paid separately) : 200 mm diameter. Class I"</p>						

	Data derived from item no.18.31.4.1 of DAR							
	200 mm CI Sluice valve	8					8.000	
	Total Quantity						8.000 Nos	
	Total Deducted Quantity						0.000 Nos	
	Net Total Quantity						8.000 Nos	
	Say 8.000 Nos @ Rs 1557.66 / Nos						Rs 12461.28	
44	100.31.1.12 "Conveying and fixing C.I. sluice valves (with cap) by providing complete with bolts, nuts, rubber insertions etc. excluding the cost of valve (the tail pieces if required will be paid separately) : 600 mm diameter. Class I" Observed Data derived from item no.18.31.of DAR							
	600 mm CI D/F Sluice	1*3					3.000	
	Total Quantity						3.000 Nos	
	Total Deducted Quantity						0.000 Nos	
	Net Total Quantity						3.000 Nos	
	Say 3.000 Nos @ Rs 8700.67 / Nos						Rs 26102.01	
45	100.31.1.17 Conveying and fixing C.I. sluice valves (with cap) by providing complete with bolts, nuts, rubber insertions etc. excluding the cost of valve (the tail pieces if required will be paid separately) : 1000 mm diameter. Class I" Observed Data derived from item no.18.31.of DAR							
	Conveying and fixing C.I. D/F sluice valves 1000 mm diameter. Class I"							
	1000 mm diameter. Class I"	2					2.000	
	Total Quantity						2.000 Nos	
	Total Deducted Quantity						0.000 Nos	
	Net Total Quantity						2.000 Nos	
	Say 2.000 Nos @ Rs 22916.97 / Nos						Rs 45833.94	
46	od386036/2021_2022 Conveying and fixing C.I. sluice valves (with cap) by providing complete with bolts, nuts, rubber insertions etc. excluding the cost of valve (the tail pieces if required will be paid separately) :1600mm or nearest size . Class I"							
	sluice valves 1400 mm diameter.	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 37748.75 / No							Rs 37748.75
47	od386037/2021_2022 Conveying and fixing C.I. sluice valves (with cap) by providing complete with bolts, nuts, rubber insertions etc. excluding the cost of valve (the tail pieces if required will be paid separately) :1200 mm diameter. Class I"							
	Conveying and fixing C.I. sluice valves 1100 mm	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 21197.38 / No							Rs 42394.76
48	od386038/2021_2022 Providing Centrifugally cement lining for 1016mm MS pipe of 10mm thick with 1:2, 9 mm thick at 80% sand and 20% jelly of size less than 9mm for internal lining and for external lining with cement mortar 1:3, 20mm thick after bending wire mesh of size 50mmx50mmx3mm (10g)with IS specification on the pipe by spot welding providing a gap of 10mm between mesh and plate using space and as per the direction of dept. officers							
	For fabricated bends	1	6.000					6.000
	Kerala Water Authority Total Quantity							6.000 metre
	Total Deducted Quantity							0.000 metre
	Net Total Quantity							6.000 metre
	Say 6.000 metre @ Rs 22142.23 / metre							Rs 132853.38
49	od386039/2021_2022 Providing Centrifugally cement lining for 1219 mm MS pipe of 12.5mm thick with 1:2, 9 mm thick at 80% sand and 20% jelly of size less than 9mm for internal lining and for external lining with cement mortar 1:3, 20mm thick after bending wire mesh of size 50mmx50mmx3mm (10g)with IS specification on the pipe by spot welding providing a gap of 10mm between mesh and plate using space and as per the direction of dept. officers							
	For fabricated bends	1	6.000					6.000
	Total Quantity							6.000 metre
	Total Deducted Quantity							0.000 metre
	Net Total Quantity							6.000 metre
	Say 6.000 metre @ Rs 23356.02 / metre							Rs 140136.12
50	od386040/2021_2022 Providing Centrifugally cement lining for 1626 mm MS pipe of 14.2 mm thick with 1:2, 9 mm thick at 80% sand and 20% jelly of size less than 9mm for internal lining and for external lining with cement mortar							

	1:3, 20mm thick after bending wire mesh of size 50mmx50mmx3mm (10g)with IS specification on the pipe by spot welding providing a gap of 10mm between mesh and plate using space and as per the direction of dept. officers							
	For fabricated bends	1	55.000				55.000	
	Total Quantity						55.000 metre	
	Total Deducted Quantity						0.000 metre	
	Net Total Quantity						55.000 metre	
	Say 55.000 metre @ Rs 28884.18 / metre						Rs 1588629.90	
51	od385995/2021_2022 Providing flanged joints to double flanged MS pipes and specials, including testing of joints, 1016mm Diameter Pipe							
	Providing flanged joints to double flanged MS Pipes	2*2					4.000	start point -1, Endpoint -1No., Valve Joint-2Nos.
	Total Quantity						4.000 No	
	Total Deducted Quantity						0.000 No	
	Net Total Quantity						4.000 No	
	Say 4.000 No @ Rs 4493.47 / No						Rs 17973.88	
52	od385991/2021_2022 Providing flanged joints to double flanged CI/DI pipes and specials, including testing of joints, 1219mm Diameter Pipe							
	Providing flanged joints to double flanged MS Pipes	2*2					4.000	N= 300/6
	Total Quantity						4.000 No	
	Total Deducted Quantity						0.000 No	
	Net Total Quantity						4.000 No	
	Say 4.000 No @ Rs 4892.18 / No						Rs 19568.72	
53	od385992/2021_2022 Providing flanged joints to double flanged CI/DI pipes and specials, including testing of joints: 1626 mm Diameter Pipe							

	Providing flanged joints to double flanged MS pipes and specials	7					7.000	for valve 2Nos+ Joints -5 nos total-7 nos.
	Total Quantity						7.000 No	
	Total Deducted Quantity						0.000 No	
	Net Total Quantity						7.000 No	
	Say 7.000 No @ Rs 5873.43 / No						Rs 41114.01	
54	od386042/2021_2022 Testing 1626 mm MS pipeline with potable water to the required test pressure. 							
	Testing 1626 mm MS pipeline with potable water	1	2440+55				2495.000	55m for bend fabricated length
	Total Quantity						2495.000 metre	
	Total Deducted Quantity						0.000 metre	
	Net Total Quantity						2495.000 metre	
	Say 2495.000 metre @ Rs 375.42 / metre						Rs 936672.90	
55	od386043/2021_2022 Testing 1016 mm MS pipeline with potable water to the required test pressure.							
	Testing 1000 mm MS pipeline with potable water							
	Testing 1000 mm MS pipeline with potable water	1	184+6				190.000	6m for bend length
	Total Quantity						190.000 metre	
	Total Deducted Quantity						0.000 metre	
	Net Total Quantity						190.000 metre	
	Say 190.000 metre @ Rs 232.21 / metre						Rs 44119.90	
56	od386044/2021_2022 Testing 1219 mm MS pipeline with potable water to the required test pressure.							
	1219 mm MS Pipe	1	49+6				55.000	6 m bend length
	Total Quantity						55.000 metre	
	Total Deducted Quantity						0.000 metre	
	Net Total Quantity						55.000 metre	
	Say 55.000 metre @ Rs 258.91 / metre						Rs 14240.05	

57	100.46.1.4 Repairing leakage/breakage of 150 mm AC pipe line by cutting and dismantling the damaged pipe portion (Up to 1.5 m) including charges for earth work excavation in all kinds of soil including tar / concrete cutting for for exposing leak portion of the pipe, operating control valves if any, conveying to the site and cutting new AC pipe to the required length, rejoining the pipeline using CID Joints , testing the pipe line by operating the valves concerned, and rectifying the defects any noticed and without causing any damages to the existing utilities and refilling the trenches using excavated earth in layers not exceeding 20cm depth including consolidating each layers by ramming, watering, charges for removing surplus soil from work site, including hire for tools and plant, conveyance of tools and materials, bailing out water, providing caution boards, lighting, watching, ribbon fencing, traffic controlling etc.complete as per the direction of Departmental officers excluding the cost of pipe and CID Joints.						
	AM Road pwer house Location	1	5.000				5.000
		Total Quantity					5.000 Leak
		Total Deducted Quantity					0.000 Leak
		Net Total Quantity					5.000 Leak
		Say 5.000 Leak @ Rs 3850.94 / Leak					Rs 19254.70
58	100.46.1.2 Repairing leakage/breakage of 100 mm AC pipe line by cutting and dismantling the damaged pipe portion (Up to 1.5 m) including charges for earth work excavation in all kinds of soil including tar / concrete cutting for for exposing leak portion of the pipe, operating control valves if any, conveying to the site and cutting new AC pipe to the required length, rejoining the pipeline using CID Joints , testing the pipe line by operating the valves concerned, and rectifying the defects any noticed and without causing any damages to the existing utilities and refilling the trenches using excavated earth in layers not exceeding 20cm depth including consolidating each layers by ramming, watering, charges for removing surplus soil from work site, including hire for tools and plant, conveyance of tools and materials, bailing out water, providing caution boards, lighting, watching, ribbon fencing, traffic controlling etc.complete as per the direction of Departmental officers excluding the cost of pipe and CID Joints.						
	Near AM Road power house	1	5.000				5.000
		Total Quantity					5.000 Leak
		Total Deducted Quantity					0.000 Leak
		Net Total Quantity					5.000 Leak
		Say 5.000 Leak @ Rs 3220.98 / Leak					Rs 16104.90
59	100.9.9 Laying UPVC pipes of class 2 to class 6 and specials, lowering to the trenches already made, placing in position aligning the pipe line to the lines and levels and jointing the pipes and specials with solvent cement and testing the pipe line with water to the required test pressure (excluding cost of pipes and specials). 110 mm nominal outer dia pipes.						

	Near AM Road Power house Aluva	1	70.000				70.000	
	Temporory laying	1	70.000				70.000	
	Total Quantity						140.000 metre	
	Total Deducted Quantity						0.000 metre	
	Net Total Quantity						140.000 metre	
	Say 140.000 metre @ Rs 128.27 / metre						Rs 17957.80	
60	100.9.11 Laying UPVC pipes of class 2 to class 6 and specials, lowering to the trenches already made, placing in position aligning the pipe line to the lines and levels and jointing the pipes and specials with solvent cement and testing the pipe line with water to the required test pressure (excluding cost of pipes and specials).160 mm nominal outer dia pipes.							
	Near AM Road Power house area	1	70.000				70.000	
	Temporory laying	1	70.000				70.000	
	Total Quantity						140.000 metre	
	Total Deducted Quantity						0.000 metre	
	Net Total Quantity						140.000 metre	
	Say 140.000 metre @ Rs 202.77 / metre						Rs 28387.80	
61	100.9.8 Laying UPVC pipes of class 2 to class 6 and specials, lowering to the trenches already made, placing in position aligning the pipe line to the lines and levels and jointing the pipes and specials with solvent cement and testing the pipe line with water to the required test pressure (excluding cost of pipes and specials). 90 mm nominal outer dia pipes."							
	Temporory laying	1	150.000				150.000	
	Permanent laying	1	150.000				150.000	
	Total Quantity						300.000 metre	
	Total Deducted Quantity						0.000 metre	
	Net Total Quantity						300.000 metre	
	Say 300.000 metre @ Rs 87.05 / metre						Rs 26115.00	
62	od386045/2021_2022 Providing and fixing Pressure gauge (BIS Standard dial range minimum 0-10 kg/cm2 least coont 0.10kg/cm2 or nearest) in 1626 mm MS pipe line including making hole in 18 mm MS sheet and welding the connection bolt and accessories etc., including providing a standard metal box cover (3mm thick) to protect the gauge and with openable door so as to to suit the box and the display dial all cost and conveyance charges etc complete as per directions.							

		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 8255.48 / No						Rs 16510.96	
63	od386046/2021_2022 Supplying 900 mm Electro magnetic flow meter conforming to protection level of IP -68 for flow sensor and IP -67 for transmitter and having an accuracy level of 0.5% with LED/LCD Display unit . The flow meter should have the housing (flow sensor) to be made of SS 304/ Carbon steel with anti corrosive protection and inside liner to be made up of Hard rubber / neoprene all conforming to drinking water standards. The flow meter should be coupled with HART for data acquisition and transfer , with provision for wireless transfer through GSM. The manufacturer should have the calibration standards as per ISO 17025 and the product shall have sufficient warranty provisions etc complete . as per directions							
		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 539853.58 / No						Rs 539853.58	
64	od386047/2021_2022 Supplying 1000 mm Electro magnetic flow meter conforming to protection level of IP -68 for flow sensor and IP -67 for transmitter and having an accuracy level of 0.5% with LED/LCD Display unit . The flow meter should have the housing (flow sensor) to be made of SS 304/ Carbon steel with anti corrosive protection and inside liner to be made up of Hard rubber / neoprene all conforming to drinking water standards. The flow meter should be coupled with HART for data acquisition and transfer , with provision for wireless transfer through GSM. The manufacturer should have the calibration standards as per ISO 17025 and the product shall have sufficient warranty provisions etc complete . as per directions							
		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 626838.32 / No						Rs 626838.32	
65	16.78.3 Construction of granular sub- base by Providing close graded Material conforming to specifications, mixing in a mechanical mix plant at OMC, Carriage of mixed material by tippers to work site, for all leads & lifts, spreading in uniform layers of specified thickness with motor grader on prepared surface and compacting with vibratory power roller to achieve the desired density, complete as per specifications and directions of Engineer-in- Charge. With material conforming to Grade - III (size range 26.5 mm to 0.075 mm) having CBR Value - 20							
	For temporary road restoration works							

	P W D road /kwa/municipal roads	1	300.000	2.600	0.300		234.000		
	At interconnection Nirmala	1	5.000	4.000	0.300		6.000		
	Crossing Near Security cabin	1	6.000	2.600	0.300		4.681		
	Municipal road crossing near cassino	1	5.000	2.600	0.300		3.900		
	Total Quantity						248.581 cum		
	Total Deducted Quantity						0.000 cum		
	Net Total Quantity						248.581 cum		
	Say 248.581 cum @ Rs 2912.88 / cum							Rs 724086.62	
66	od386048/2021_2022 Providing temperory platform across the trench to access the near by houses including labour charges,hire charges,conveyance etc complete. and dismantling the platform after filling the trenches								
		80	3.000	1.200			288.000		
	Total Quantity						288.000 sqm		
	Total Deducted Quantity						0.000 sqm		
	Net Total Quantity						288.000 sqm		
	Say 288.000 sqm @ Rs 771.75 / sqm							Rs 222264.00	
SI No	Description	No	L	B	D	CF	Quantity	Remark	
3Construction of Valve Chamber (Cost Index:35.59 %)									
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								
	Earth work in excavation								
	Earth work in excavation 1016 mm &1219 mm	4	3.000	3.000	1.500		54.000		
		1	3.400	3.400	1.500		17.340		
	For scoure	3	2.100	2.100	1.500		19.845		
	Air valves	8	2.300	2.300	1.500		63.480		
	Total Quantity						154.665 cum		
	Total Deducted Quantity						0.000 cum		
	Net Total Quantity						154.665 cum		

	Say 154.665 cum @ Rs 296.94 / cum						Rs 45926.23	
2	<p>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)</p>							
	Earth work in excavation							
	Earth work excavation, 1016, 1219 & 1626	4	3.000	3.000	1.300		46.801	
		1	3.400	3.400	1.300		15.028	
	For scour valve	3	2.100	2.100	1.300		17.199	
	Air vaalves	8	2.300	2.300	1.300		55.016	
	Total Quantity						134.044 cum	
	Total Deducted Quantity						0.000 cum	
	Net Total Quantity						134.044 cum	
	Say 134.044 cum @ Rs 661.88 / cum						Rs 88721.04	
3	<p>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)</p>							
	Providing and laying in position cement concrete 1:3:6							
	For 1016mm & 1219 mm Valves	4	3.000	3.000	0.100		3.600	
	1626mm	1	3.400	3.400	0.100		1.156	
	Scour	3	2.100	2.100	0.100		1.324	
	Air valve	8	2.300	2.300	0.100		4.232	
	Total Quantity						10.312 cum	
	Total Deducted Quantity						0.000 cum	
	Net Total Quantity						10.312 cum	
	Say 10.312 cum @ Rs 7211.15 / cum						Rs 74361.38	
4	<p>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)</p>							

	280x280x270- bottom	4	2.800	2.800	0.200		6.272	
	" side walls	4*2	2.800	0.200	2.500		11.200	
	"	4*2	2.400	0.200	2.500		9.600	
	340x340x270 bottom	1	3.400	3.400	0.200		2.312	
	" side walls	1*2	3.000	0.200	2.500		3.001	
	Scoure valve 190x190x270- bottom	3	1.900	1.900	0.200		2.166	
	" sid walls	3*2	1.900	0.200	2.500		5.700	
	" side walls	3*2	1.900	0.200	2.500		5.700	
	Air valves - 170x170x270 bottom	8	1.700	1.700	0.200		4.624	
	" side walls	8*2	2.100	0.200	2.500		16.800	
	"	8*2	1.700	0.200	2.500		13.601	
	Cover slab	1	3.400	3.400	0.200		2.312	
	Cover slab 3.0x0.60 m	4	3.000	3.000	0.200		7.200	
	" 1.90x0.48 m	3	1.900	1.900	0.200		2.166	
	" 210x210	8	2.100	2.100	0.200		7.057	
	Deduction for Manhole cover	16	0.560	0.560	0.200	0.79	-0.787	
Total Quantity							99.711 cum	
Total Deducted Quantity							-0.787 cum	
Net Total Quantity							98.924 cum	
Say 98.924 cum @ Rs 8588.47 / cum							Rs 849605.81	
5	5.9.1 Centering and shuttering including strutting, etc. and removal of form for: Foundations, footings, bases of columns, etc for mass concrete							
Centering and shuttering for base slab								
	Valve chamber - 3.40x3.4x outer allaround	1	13.600		0.200		2.720	
	Valve chamber - 2.80x2.80x. outer side	4	11.200		0.200		8.960	
	scour-1.90x1.90x2.70 outer side	3	7.600		0.200		4.561	
	Air valve - 1.70x1.70	8	6.800		0.200		10.880	

						Total Quantity	27.121 sqm	
						Total Deducted Quantity	0.000 sqm	
						Net Total Quantity	27.121 sqm	
						Say 27.121 sqm @ Rs 335.31 / sqm	Rs 9093.94	
6	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.						
		Centering and shuttering for Walls						
	Valve chamber - 340x340x2.50 inside	1	11.200		2.500		28.000	
	" out side	1	12.000		2.500		30.000	
	Valve chamber - 2.80x2.80x2.50 inside	3	9.600		2.500		72.000	
	" out side	3	11.200		2.500		84.000	
	Scoure 190x190x250- -- inside	3	6.000		2.500		45.000	
	" outside	3	7.600		2.500		57.000	
	Air valves -- 170x170x270---inside	8	6.800		2.500		136.000	
	" out side	8	8.400		2.500		168.000	
						Total Quantity	620.000 sqm	
						Total Deducted Quantity	0.000 sqm	
						Net Total Quantity	620.000 sqm	
						Say 620.000 sqm @ Rs 717.20 / sqm	Rs 444664.00	
7	5.9.3	Centering and shuttering including strutting, etc. and removal of form for:Suspended floors, roofs, landings, balconies and access platform						
	C o v r s l a b 340x340x20-bottom	1	3.000	3.000			9.000	
	side	4	3.400		0.200		2.720	
	2800x280x20 bottom	4*4	2.400	2.400			92.160	
	sides	4*4	2.800		0.200		8.960	
	190x190x20 bottom	3	1.500	1.500			6.750	
	sides	3*4	1.900		0.200		4.561	
	210x210x20 bottom	8	1.700	1.700			23.120	

	sides	8*2	1.700		0.200		5.440	
	Total Quantity						152.711 sqm	
	Total Deducted Quantity						0.000 sqm	
	Net Total Quantity						152.711 sqm	
	Say 152.711 sqm @ Rs 815.78 / sqm						Rs 124578.58	
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							
	Steel reinforcement for R.C.C work							
	Qty as per item no-4	1	98.924		90.0	8903.160	Reinforce ment @90kg/m 3	
	Total Quantity						8903.160 kilogram	
	Total Deducted Quantity						0.000 kilogram	
	Net Total Quantity						8903.160 kilogram	
	Say 8903.160 kilogram @ Rs 98.30 / kilogram						Rs 875180.63	
9	2.16.2 Close timbering in trenches including strutting, shoring and packing cavities (wherever required) complete (Measurements to be taken of the face area timbered). Depth exceeding 1.5 m but not exceeding 3 m							
	280x280x270- Valve chamber	4*2	2.800		2.700	60.480	2 sides only	
	340x340x270 mm Valve chamber	1	3.400		2.700	9.180	2 sides only	
	190x190x270 --valve-scoure	3	1.900		2.700	15.390	2 sides only	
	210x210x210 -for Air valves	8	2.100		2.700	45.361	2 sides only	
	Total Quantity						130.411 sqm	
	Total Deducted Quantity						0.000 sqm	
	Net Total Quantity						130.411 sqm	
	Say 130.411 sqm @ Rs 166.17 / sqm						Rs 21670.40	
10	od385998/2021_2022 Supplying and fixing C.I frame for manholes: 560 mm diameter (heavy duty) the weight of the cover to be not less than 108 kg							
		16				16.000		
	Total Quantity						16.000 No	

							Total Deducted Quantity	0.000 No
							Net Total Quantity	16.000 No
							Say 16.000 No @ Rs 10527.85 / No	Rs 168445.60
Sl No	Description	No	L	B	D	CF	Quantity	Remark
4Anchor Blocks (Cost Index:35.59 %)								
1	2.2.1 Earth work in rough excavation, banking excavated earth in layers not exceeding 20 cm in depth, breaking clods, watering, rolling each layer with 1/2 tonne roller or wooden or steel rammers, and rolling every 3rd and top-most layer with power roller of minimum 8 tonnes and dressing up in embankments for roads, flood banks, marginal banks and guide banks or filling up ground depressions, lead up to 50 m and lift up to 1.5 m:All kinds of soil							
Earth work in rough excavation								
	Blocks-2300x2300mm for 1016 and 1219 mm MS	5	2.300	2.300	2.500		66.125	
	Blocks-2700x2700mm for 1626 mm MS	18	2.700	2.700	2.700		354.295	
Deduction for trench								
	Blocks-2300x2300mm	5	2.300	2.300	2.000		-52.899	
	Blocks-2700x2700mm	18	2.600	2.600	2.500		-304.200	
							Total Quantity	420.420 cum
							Total Deducted Quantity	-357.099 cum
							Net Total Quantity	63.321 cum
							Say 63.321 cum @ Rs 879.03 / cum	Rs 55661.06
2	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)							
	Blocks-2300x2300mm for 1016 and 1219 mm MS	5	2.300	2.300	2.450		64.803	
	Blocks-2700x2700mm for 1626 mm MS	18	2.700	2.700	2.700		354.295	
Deduct pipe volume								
	Blocks-2300x2300mm	5	2.300	1.118*1.1 18		0.79	-11.355	3.14/4=0.7 85 (0.79)
	Blocks-2700x2700mm	18	2.700	1.422*1.4 22		0.79	-77.635	

									Total Quantity	419.098 cum
									Total Deducted Quantity	-88.990 cum
									Net Total Quantity	330.108 cum
									Say 330.108 cum @ Rs 8588.47 / cum	Rs 2835122.65
3	5.9.1	Centering and shuttering including strutting, etc. and removal of form for:Foundations, footings, bases of columns, etc for mass concrete								
	Blocks-2300x2300mm	5*4	2.300		2.450				112.700	
	Blocks-2700x2700mm	18*4	2.700		2.700				524.881	
									Total Quantity	637.581 sqm
									Total Deducted Quantity	0.000 sqm
									Net Total Quantity	637.581 sqm
									Say 637.581 sqm @ Rs 335.31 / sqm	Rs 213787.29
4	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								
									Steel reinforcement for R.C.C work	
	Qty as per item-2	1	339.000		70.0				23730.000	339m3 @70kg/m 3
									Total Quantity	23730.000 kilogram
									Total Deducted Quantity	0.000 kilogram
									Net Total Quantity	23730.000 kilogram
									Say 23730.000 kilogram @ Rs 98.30 / kilogram	Rs 2332659.00
SI No	Description	No	L	B	D	CF	Quantity	Remark		
5ROAD CROSSING PUSH THROUGH METHOD (Cost Index:35.59 %)										
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								
	For Push pit	4	6.000	4.000	1.500		144.000			
	For target pit	4	5.000	5.000	1.500		150.000			
									Total Quantity	294.000 cum
									Total Deducted Quantity	0.000 cum
									Net Total Quantity	294.000 cum

	Say 294.000 cum @ Rs 214.03 / cum						Rs 62924.82	
2	2.7.1 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. Ordinary rock							
	For push pit	4	6.000	4.000	1.500		144.000	
	For target pit	4	5.000	4.000	1.500		120.000	
	Total Quantity						264.000 cum	
	Total Deducted Quantity						0.000 cum	
	Net Total Quantity						264.000 cum	
	Say 264.000 cum @ Rs 414.84 / cum						Rs 109517.76	
3	2.26.2 Extra for every additional lift 1.5 m or part there of in excavation / banking excavated or stacked materials. Ordinary or hard rock							
	2nd lift (1.50 to 3.00) For push pit	4	6.000	4.000	1.500		144.000	
	3rd lift (3.00 to 4.50) For push pit	4	6.000	4.000	1.500	2.0	288.000	rate increased 2 times
	4th lift 4.50 to 6.00) For push pit	4	6.000	4.000	0.500	3.0	144.000	rate increased 3 times
	2nd lift (1.50 to 3.00) For target pit	4	5.000	4.000	1.500		120.000	
	3rd lift (3.00 to 4.50) For target pit	4	5.000	4.000	1.500	2.0	240.000	rate increased 2 times
	4th lift (4.50 to 6.00) For target pit	4	5.000	4.000	0.500	3.0	120.000	rate increased 3 times
	Total Quantity						1056.000 cum	
	Total Deducted Quantity						0.000 cum	
	Net Total Quantity						1056.000 cum	
	Say 1056.000 cum @ Rs 190.78 / cum						Rs 201463.68	
4	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.							
	For Push pit	4	20.000		5.000		400.000	
	For target pit	4	18.000		5.000		360.000	
	Total Quantity						760.000 sqm	
	Total Deducted Quantity						0.000 sqm	
	Net Total Quantity						760.000 sqm	
	Say 760.000 sqm @ Rs 749.13 / sqm						Rs 569338.80	
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)							
	For Push pit	4	(6+4)*2				80.000	
	For target pit	4	(5+4)*2				72.000	
	Total Quantity						152.000 metre	
	Total Deducted Quantity						0.000 metre	
	Net Total Quantity						152.000 metre	
	Say 152.000 metre @ Rs 96.33 / metre						Rs 14642.16	
6	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)							
	Push pit concreting	4	6.000	4.000	0.250		24.000	Concreting for Target pit is not required.
	Total Quantity						24.000 cum	
	Total Deducted Quantity						0.000 cum	
	Net Total Quantity						24.000 cum	
	Say 24.000 cum @ Rs 7990.86 / cum						Rs 191780.64	
7	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)							
	For push pit and target pits	1	3500.000				3500.000	
	Total Quantity						3500.000 Kwh	
	Total Deducted Quantity						0.000 Kwh	
	Net Total Quantity						3500.000 Kwh	
	Say 3500.000 Kwh @ Rs 18.44 / Kwh						Rs 64540.00	
8	od385999/2021_2022 Providing 16mm thick 2032mm (OD) factory made MS casing pipe for crossing road / canal/culvert etc in different places of Pipeline road by Push through method after conveying the pipe from initial lead and insert through the bored holes below road surface through the alignment of the new pipe line without affecting the passage of traffic in the road by ramming the casing pipe , excavation of push pit and target pit concreting paid seperately, ,hire and labour for suitable capacity crane for handling the pipe , placing the pipe in the pushing pit , pushing the pipes by using hydraulic jack by one by one and welding the pipes in line and levels,cleaning inside the pipe after completion of the work by water jetting , compressed air, or the combination of both and manual labour etc. complete including conveyance of MS Pipe, hire and labour for all machinery and equipment, cost of fuel, lighting,watching,fencing, pay and allowance of all technical and non-technical hands involved in the work etc.complete as per the direction of departmental officers.							
	Casino Jn. AM Road crossing	1	64.000				64.000	
	Power house Jn Road crossing	1	30.000				30.000	
	Nethaji Road crossing	1	40.000				40.000	
	PVIP Canal crossing	1	69.000				69.000	
	Total Quantity						203.000 metre	
	Total Deducted Quantity						0.000 metre	
	Net Total Quantity						203.000 metre	
	Say 203.000 metre @ Rs 46192.45 / metre						Rs 9377067.35	
SI No	Description	No	L	B	D	CF	Quantity	Remark
6INTERCONNECTION WORKS (Cost Index:35.59 %)								

1	100.1.1 Excavating trenches of required width for pipes, cables, etc including excavation for sockets, and dressing of sides, ramming of bottoms, depth up to 1.5 m, including getting out the excavated soil, and then returning the soil as required, in layers not exceeding 20 cm in depth, including consolidating each deposited layer by ramming, watering, etc. and disposing of surplus excavated soil as directed, within a lead of 50 m : All kinds of soil (Ref. Item No. 2.10.1 of DSR)								
		2	5.000	4.000	1.500		60.000	1 at Plant site and 1 at Nirmala Jn.	
		Total Quantity					60.000 cum		
		Total Deducted Quantity					0.000 cum		
		Net Total Quantity					60.000 cum		
		Say 60.000 cum @ Rs 555.51 / cum					Rs 33330.60		
2	100.1.2 Excavating trenches of required width for pipes, cables, etc including excavation for sockets, and dressing of sides, ramming of bottoms, depth exceeding 1.5m but not exceeding 3 m, including getting out the excavated soil, and then returning the soil as required, in layers not exceeding 20 cm in depth, including consolidating each deposited layer by ramming, watering, etc. and disposing of surplus excavated soil as directed, within a lead of 50 m: 1.50m to 3.0m All kinds of soil (Ref. Item No. 2.11 of DSR)								
		2	5.000	4.000	1.500		60.000	1 at Plant site and 1 at Nirmala Jn.	
		Total Quantity					60.000 cum		
		Total Deducted Quantity					0.000 cum		
		Net Total Quantity					60.000 cum		
		Say 60.000 cum @ Rs 661.88 / cum					Rs 39712.80		
3	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)								
		2	14.000				28.000	3 sides only	
		Total Quantity					28.000 metre		
		Total Deducted Quantity					0.000 metre		

								Net Total Quantity	28.000 metre
								Say 28.000 metre @ Rs 96.33 / metre	Rs 2697.24
4	100.7.1	<p>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.</p> <p>NEW DATA (Prepared based on PHED SDB - Item No.1070)</p>							
		2	298.400					596.800	5HPX8Hourx10days x.746=298.40
		Total Quantity							596.800 Kwh
		Total Deducted Quantity							0.000 Kwh
		Net Total Quantity							596.800 Kwh
		Say 596.800 Kwh @ Rs 36.95 / Kwh							Rs 22051.76
5	od385982/2021_2022	<p>Providing steel sheet shoring to the sides of the trenches to depths up to 3.00 m 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.</p>							
		2	10.000		3.000			60.000	1 at Plant site and 1 at Nirmala Jn.
		Total Quantity							60.000 sqm
		Total Deducted Quantity							0.000 sqm
		Net Total Quantity							60.000 sqm
		Say 60.000 sqm @ Rs 377.24 / sqm							Rs 22634.40
6	od385985/2021_2022	<p>Fabricating MS special 'Y' using factory made supplied 1626 mm OD MS pipes cutting ,welding, grinding to make -"Y" including , fabrication charges, hire charges for generator, welding machine, cost of consumables , placing in position to the correct lines and levels to suit to joint with the already laid pipe and specials including all cost and conveyance etc complete as per directions.</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 168976.57 / No	Rs 337953.14
7	od385987/2021_2022 Fabricating MS reducer of size 1626 mm to 1072mm (od)to using 12.5mm thick MS plate including cost and conveyance charges of MS plate, all fabrication charges, cutting welding ,griding , internal and external lining as provided in the pipe line with standard specification etc. complete: For pipes fabricated with 12.5mm thick MS plates.								
		1							1.000
								Total Quantity	1.000 metre
								Total Deducted Quantity	0.000 metre
								Net Total Quantity	1.000 metre
								Say 1.000 metre @ Rs 109243.12 / metre	Rs 109243.12
8	od385988/2021_2022 Fabricating MS reducer of size 1626 mm to 924 mm (od)to using 12.5 mm thick MS plate including cost and conveyance charges of MS plate, all fabrication charges, cutting welding ,griding , internal and external lining as provided in the pipe line with standard specification etc. complete: For pipes fabricated with 12.5mm thick MS plates.								
		1							1.000
								Total Quantity	1.000 metre
								Total Deducted Quantity	0.000 metre
								Net Total Quantity	1.000 metre
								Say 1.000 metre @ Rs 108572.21 / metre	Rs 108572.21
9	od385989/2021_2022 Fabricating MS reducer of size 1626 mm (od)to 1016mm using 14.2 mm thick MS plate including cost and conveyance charges of MS plate, all fabrication charges, cutting welding ,griding , internal and external lining as provided in the pipe line with standard specification etc. complete: For pipes fabricated with 14.2 mm thick MS plates.								
		1							1.000
								Total Quantity	1.000 metre
								Total Deducted Quantity	0.000 metre
								Net Total Quantity	1.000 metre
								Say 1.000 metre @ Rs 116331.64 / metre	Rs 116331.64
10	od385990/2021_2022 Fabricating MS reducer of size 1626 mm to 1219 mm (od) using 14.2 mm thick MS plate including cost and conveyance charges of MS plate, all fabrication charges, cutting welding ,griding , internal and external lining as provided in the pipe line with standard specification etc. complete: For pipes fabricated with 14.2 mm thick MS plates.								

		1					1.000	
	Total Quantity						1.000 metre	
	Total Deducted Quantity						0.000 metre	
	Net Total Quantity						1.000 metre	
	Say 1.000 metre @ Rs 116490.73 / metre						Rs 116490.73	
11	od385991/2021_2022 Providing flanged joints to double flanged CI/DI pipes and specials, including testing of joints, 1219mm Diameter Pipe							
		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 4892.18 / No						Rs 4892.18	
12	od385992/2021_2022 Providing flanged joints to double flanged CI/DI pipes and specials, including testing of joints: 1626 mm Diameter Pipe							
		2*3					6.000	
	Total Quantity						6.000 No	
	Total Deducted Quantity						0.000 No	
	Net Total Quantity						6.000 No	
	Say 6.000 No @ Rs 5873.43 / No						Rs 35240.58	
13	od385995/2021_2022 Providing flanged joints to double flanged MS pipes and specials, including testing of joints, 1016mm Diameter Pipe							
		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 4493.47 / No						Rs 4493.47	
14	od385996/2021_2022 Providing flanged joints to double flanged CI/DI pipes and specials, including testing of joints:974 mm Diameter Pipe							
		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 4493.47 / No						Rs 4493.47	
15	od385997/2021_2022 Providing flanged joints to double flanged CI/DI pipes and specials, including testing of joints:1074 mm Diameter Pipe							
		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 4732.69 / No						Rs 4732.69	
SI No	Description	No	L	B	D	CF	Quantity	Remark
7DUCT WORKS (Cost Index:35.59 %)								
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							
	Earth work in excavation by mechanical means							
	Duct at road crossing-Head works 7.0m	1	7.000	2.400	1.500		25.201	
	Pipe crossing 2points	2	3.000	3.000	1.500		27.000	
	Road crossing inside Veterinary compound	1	3.000	3.000	1.500		13.500	
	Total Quantity						65.701 cum	
	Total Deducted Quantity						0.000 cum	
	Net Total Quantity						65.701 cum	
	Say 65.701 cum @ Rs 214.03 / cum						Rs 14061.99	
2	2.7.1 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.Ordinary rock							
	Earth work in excavation by mechanical means							
	Duct at road crossing-Head works 7.0m	1	7.000	2.400	1.000		16.800	
	Pipe crossing 2points	2	3.000	3.000	1.500		27.000	
	Road crossing inside Veterinary compound	1	3.000	3.000	1.500		13.500	

	Total Quantity						57.300 cum	
	Total Deducted Quantity						0.000 cum	
	Net Total Quantity						57.300 cum	
	Say 57.300 cum @ Rs 414.84 / cum						Rs 23770.33	
3	2.26.2 Extra for every additional lift 1.5 m or part there of in excavation / banking excavated or stacked materials. Ordinary or hard rock							
	Earth work in excavation by mechanical means							
	Duct at road crossing- Head works 7.0m	1	7.000	2.400	1.000		16.800	
	Pipe crossing 2points	2	3.000	3.000	1.500		27.000	
	Road crossing inside Veterinary compound	1	3.000	3.000	1.500		13.500	
	Total Quantity						57.300 cum	
	Total Deducted Quantity						0.000 cum	
	Net Total Quantity						57.300 cum	
	Say 57.300 cum @ Rs 190.78 / cum						Rs 10931.69	
4	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)							
	Earth work in excavation by mechanical means							
	fencing 2sides only	2	7+6+3				32.000	
	Total Quantity						32.000 metre	
	Total Deducted Quantity						0.000 metre	
	Net Total Quantity						32.000 metre	
	Say 32.000 metre @ Rs 96.33 / metre						Rs 3082.56	
5	od385982/2021_2022 Providing steel sheet shoring to the sides of the trenches to depths up to 3.00 m 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.							
	Shoring							

	Duct at road crossing- Head works 7.0m	1*2	7+2.40		2.500		47.000	
	Pipe crossing 2points	2*2	3.0+3.0		3.000		72.000	
	Road crossing inside Vetinary compound	1*2	3.000+3		3.000		36.000	
	Total Quantity						155.000 sqm	
	Total Deducted Quantity						0.000 sqm	
	Net Total Quantity						155.000 sqm	
	Say 155.000 sqm @ Rs 377.24 / sqm						Rs 58472.20	
6	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)							
	Providing and laying in position specified grade of reinforced cement concrete for bottom of ducts							
	Duct at road crossing- Head works 7.0m	1	7.000	2.400	0.100		1.681	
	Pipe crossing 2points	2	3.000	3.000	0.100		1.800	
	Road crossing inside Vetinary compound	1	3.000	3.000	0.100		0.900	
	Kerala Water Authority Total Quantity						4.381 cum	
	Total Deducted Quantity						0.000 cum	
	Net Total Quantity						4.381 cum	
	Say 4.381 cum @ Rs 7367.55 / cum						Rs 32277.24	
7	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)							
	R.C.C For ducts							
	Duct at road crossing- Head works Bottom	1	7.000	2.400	0.200		3.361	
	" side walls	2	7.000	0.200	2.000		5.601	
	C o v e r s l a b 2 . 4 0 x 0 . 6 0 x 0 . 2 0	12	2.400	0.600	0.200		3.456	
	Pipe crossing 2points bottom	2*1	3.000	2.400	0.200		2.880	
	" side walls	2*2	3.000	0.200	2.000		4.801	

	Cover slab 2.40x0.60x0.20	2*5	2.400	0.600	0.200		2.880		
	Road crossing inside Vetinary compound- bottom	1	3.000	2.400	0.200		1.440		
	" " side walls	1*2	3.000	0.200	2.000		2.401		
	Cover slab 2.40x0.60x0.20	1*5	3.000	0.600	0.200		1.800		
	Total Quantity						28.620 cum		
	Total Deducted Quantity						0.000 cum		
	Net Total Quantity						28.620 cum		
	Say 28.620 cum @ Rs 10954.04 / cum							Rs 313504.62	
8	5.9.2 Centering and shuttering including strutting, etc. and removal of form for:Walls (any thickness) including attached pilasters, buttersesses, plinth and string courses etc.								
	Centering and shuttering for RCC Works								
	Duct at road crossing- Head works 7.0m wall out side	1*2	7.000		2.200		30.801		
	Inside of walls	1*2	7.000		2.000		28.000		
	end faces vertical	1*4	0.200		2.000		1.600		
	" horizontal	1*2	2.400		0.200		0.960		
	for cover slab pre- cast	12	(2.4+0.60) *2		0.200		14.401		
	for 300x240 - 2 nos out side walls	2*2	3.000		2.200		26.401		
	" inside walls	2*2	3.000		2.000		24.000		
	end faces horizontal	2*4	2.400		0.200		3.840		
	" vertical	1*2	0.200		2.000		0.800		
	Cover slabs	2*5	(2.4+0.60) *2		0.200		12.001		
	Road crossing inside Vetinary compound Walls outside	2	3.000		2.200		13.201		
	" inside	2	3.000		2.000		12.000		
	Cover slab 3.0x0.60x0.20	1*5	(2.4+0.60) *2		0.200		6.001		

	end faces horizontal	1*2	2.240		0.200		0.897	
	" vertical	1*4	0.200		2.000		1.600	
	Total Quantity						176.503 sqm	
	Total Deducted Quantity						0.000 sqm	
	Net Total Quantity						176.503 sqm	
	Say 176.503 sqm @ Rs 717.20 / sqm						Rs 126587.95	
9	5.12 Providing, hoisting and fixing up to floor level precast reinforced cement concrete work in string courses, bands, copings, bed plates, anchor blocks, plain window sills and the like, including the cost of required centering, shuttering but excluding cost of reinforcement, with 1:1.5:3 (1 cement : 1.5 coarse sand (Zone - III) : 3 graded stone aggregate 20 mm nominal size)							
	Hoisting and fixing RCC cover slabs on ducts							
	Duct at road crossing- Head works 7.0m	1*12	2.400	0.600	0.200		3.456	
	Pipe crossing 2points	2*5	3.000	0.600	0.200		3.600	
	Road crossing inside Vetinary compound	1*5	3.000	0.600	0.200		1.800	
	Near Power house AM Road	1*5	3.000	0.600	0.200		1.800	
	Kerala Water Authority Total Quantity						10.656 cum	
	Total Deducted Quantity						0.000 cum	
	Net Total Quantity						10.656 cum	
	Say 10.656 cum @ Rs 10460.02 / cum						Rs 111461.97	
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							
	Steel reinforcement for R.C.C work							
	Steel reinforcement @ 80 kg/m ³ of concrete as per item Nos. 6 and 7r item Nos	1	28.620			80.0	2289.600	
	Total Quantity						2289.600 kilogram	
	Total Deducted Quantity						0.000 kilogram	
	Net Total Quantity						2289.600 kilogram	
	Say 2289.600 kilogram @ Rs 98.30 / kilogram						Rs 225067.68	
SI No	Description	No	L	B	D	CF	Quantity	Remark

8ROAD RESTORATION WORKS KWA ROAD (Cost Index:35.59 %)							
1	16.1	Preparation and consolidation of sub grade with power road roller of 8 to 12 tonne capacity after excavating earth to an average of 22.5 cm depth, dressing to camber and consolidating with road roller including making good the undulations etc. and re-rolling the sub grade and disposal of surplus earth with lead upto 50 metres.					
		Preparation and consolidation of sub grade with power road roller					
		1	1547.500	3.000			4642.500
		Total Quantity					4642.500 sqm
		Total Deducted Quantity					0.000 sqm
		Net Total Quantity					4642.500 sqm
		Say 4642.500 sqm @ Rs 184.54 / sqm					Rs 856726.95
2	16.78.2	Construction of granular sub- base by Providing close graded Material conforming to specifications, mixing in a mechanical mix plant at OMC, Carriage of mixed material by tippers to work site, for all leads & lifts, spreading in uniform layers of specified thickness with motor grader on prepared surface and compacting with vibratory power roller to achieve the desired density, complete as per specifications and directions of Engineer-in- Charge.With material conforming to Grade-II (size range 53 mm to 0.075 mm) having CBRValue-25					
		Construction of granular sub- base by Providing close graded Material conforming to specifications					
	GSB	1	1547.500	3.000	0.100		464.250
		Total Quantity					464.250 cum
		Total Deducted Quantity					0.000 cum
		Net Total Quantity					464.250 cum
		Say 464.250 cum @ Rs 3104.40 / cum					Rs 1441217.70
3	16.79	Providing , laying spreading and compacting graded stone aggregate (size range 53 mm to 0.075 mm) to wet mix macadam (WMM) specification including premixing the material with water at OMC in mechanical mix plant, carriage of mixed material by tipper to site, for all leads & lifts, laying in uniform layers with mechanical paver finisher in sub - base / base course on well prepared surface and compacting with vibratory roller of 8 to 10 tonne capacity to achieve the desired density, complete as per specifications and directions of Engineer - in- Charge.					
		Providing , laying spreading and compacting graded stone aggregate to wet mix macadam (WMM)					
		1	1547.500	3.000	0.100		464.250
		Total Quantity					464.250 cum
		Total Deducted Quantity					0.000 cum
		Net Total Quantity					464.250 cum
		Say 464.250 cum @ Rs 3109.15 / cum					Rs 1443422.89

4	16.33.3 2.5 cm premix carpet surfacing with 2.25 cum and 1.12 cum of stone chippings of 13.2 mm and 11.2 mm size respectively per 100 sqm and 52 kg and 56 kg of hot bitumen per cum of stone chippings of 13.2 mm and 11.2 mm size respectively, including a tack coat with hot straight run bitumen, including consolidation with road roller of 6 to 9 tonne capacity etc. complete (tack coat to be paid for separately):With Refinery Modified Bitumen CRMB 55 conforming to IRC:SP:53 - 1999							
2.5 cm premix carpet surfacing								
2.50 cm premix carpet surfacing	1	1547.500	3.000			4642.500		
Total Quantity						4642.500 sqm		
Total Deducted Quantity						0.000 sqm		
Net Total Quantity						4642.500 sqm		
Say 4642.500 sqm @ Rs 261.55 / sqm						Rs 1214245.88		
5	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)							
Nethaji road	2	2.500	0.925	2.500		11.563		
Near seminary culvert	2	2.500	0.925	2.500		11.563	B = Average(1 .25+0.6)/2	
Compound wall Vetinary hospital	1	10.000	0.600	1.200		7.200		
Compound wall KWA security cabin	1	6.000	0.600	0.750		2.700		
Total Quantity						33.026 cum		
Total Deducted Quantity						0.000 cum		
Net Total Quantity						33.026 cum		
Say 33.026 cum @ Rs 7204.78 / cum						Rs 237945.06		
6	50.6.1.4 Solid block masonry using pre cast solid blocks (Factory made) of size 30x20x20cm or nearest available size confirming to IS 2185 part I of 1979 for foundation and plinth with thickness 20cm and above in: CM 1:6 (1 cement : 6 coarse sand) etc complete							
Vetinary Hospital compound	1	15.000	0.200	1.400		4.200		
Drain Near plant road	1*2	3.000	0.200	1.000		1.201		
Near securit cabin	1	6.000	0.200	1.600		1.921		
Total Quantity						7.322 cum		

							Total Deducted Quantity	0.000 cum
							Net Total Quantity	7.322 cum
							Say 7.322 cum @ Rs 5950.30 / cum	Rs 43568.10
7	13.4.1 12 mm cement plaster of mix:1:4 (1 cement : 4 coarse sand)							
	Vetinary Hospital compound	1	15.000	3.000			45.000	
	Drain	1*2	3.000	2.200			13.201	
	Near security cabin	2	6.000		2.600		31.201	
	"	1	6.000	0.200			1.201	
							Total Quantity	90.603 sqm
							Total Deducted Quantity	0.000 sqm
							Net Total Quantity	90.603 sqm
							Say 90.603 sqm @ Rs 325.01 / sqm	Rs 29446.88
8	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)							
	Vetinary Hospital compound	1	8.000	2.500	0.200		4.000	
							Total Quantity	4.000 cum
							Total Deducted Quantity	0.000 cum
							Net Total Quantity	4.000 cum
							Say 4.000 cum @ Rs 7990.86 / cum	Rs 31963.44
SI No	Description	No	L	B	D	CF	Quantity	Remark
9DRAINAGE WORKS (Cost Index:35.59 %)								
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							
Earth work in excavation by mechanical means								
	Wet area	1	85.000	1.000	1.600		136.000	
	dry area	1	135.000	1.150	1.000		155.250	
							Total Quantity	291.250 cum
							Total Deducted Quantity	0.000 cum

	Net Total Quantity						291.250 cum	
	Say 291.250 cum @ Rs 214.03 / cum						Rs 62336.24	
2	od385978/2021_2022 Dry Rubble masonry with hard stone in foundation including cost of materials,all conveyances and labour charges.etc complete up to plinth level with: 							
	Dry Rubble Packing with hard stone in foundation							
	Wet area	1	85.000	1.100	0.600		56.101	
	Total Quantity						56.101 cum	
	Total Deducted Quantity						0.000 cum	
	Net Total Quantity						56.101 cum	
	Say 56.101 cum @ Rs 5010.46 / cum						Rs 281091.82	
3	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)							
	Providing and laying in position cement concrete 1:3:6							
	PCC FOR Foundation	1	220.000	1.300	0.100		28.600	
	Total Quantity						28.600 cum	
	Total Deducted Quantity						0.000 cum	
	Net Total Quantity						28.600 cum	
	Say 28.600 cum @ Rs 7367.55 / cum						Rs 210711.93	
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)							
	Providing and laying in position specified grade of reinforced cement concrete, 1:2:4							
	DRAIN Bottom	1	220.000	1.100	0.150		36.301	
	Side walls	2	220.000	0.150	0.900		59.400	
	Total Quantity						95.701 cum	
	Total Deducted Quantity						0.000 cum	
	Net Total Quantity						95.701 cum	
	Say 95.701 cum @ Rs 8588.47 / cum						Rs 821925.17	
5	5.22A.6 Steel reinforcement for R.C.C work including straightening, cutting, bending, placing in position and binding all complete above plinth level.Thermo - Mechanically Treated bars of grade Fe-500D or more							

	Qty as per item 4	1	95.701			80.0	7656.080	@ 80kg/m3 of concrete
	Total Quantity						7656.080 kg	
	Total Deducted Quantity						0.000 kg	
	Net Total Quantity						7656.080 kg	
	Say 7656.080 kg @ Rs 98.30 / kg						Rs 752592.66	
6	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.							
	Outerside	2	220.000			1.050	462.000	
	Ends	2*2	0.150			1.050	0.630	
	"	1*2	0.900			0.150	0.270	
	Total Quantity						462.900 sqm	
	Total Deducted Quantity						0.000 sqm	
	Net Total Quantity						462.900 sqm	
	Say 462.900 sqm @ Rs 717.20 / sqm						Rs 331991.88	
7	13.7.1 12 mm cement plaster finished with a floating coat of neat cement of mix:1:3 (1 cement : 3 fine sand)							
	Outerside	2	220.000			1.050	462.000	
	Ends	2*2	0.150			1.050	0.630	
	"	1*2	0.900			0.150	0.270	
	Inside bottom	1	220.000	0.900			198.000	
	Inside wall	1*2	220.000			0.900	396.000	
	Total Quantity						1056.900 sqm	
	Total Deducted Quantity						0.000 sqm	
	Net Total Quantity						1056.900 sqm	
	Say 1056.900 sqm @ Rs 401.21 / sqm						Rs 424038.85	
SI No	Description	No	L	B	D	CF	Quantity	Remark
10SECURITY ROOM (Cost Index:35.59 %)								
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							

	Long walls	2	3.350	0.750	0.750		3.769		
	short wall	2	1.250	0.750	0.750		1.407		
	Total Quantity						5.176 cum		
	Total Deducted Quantity						0.000 cum		
	Net Total Quantity						5.176 cum		
	Say 5.176 cum @ Rs 214.03 / cum						Rs 1107.82		
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)								
	Long walls	2	3.350	0.750	0.150		0.754		
	short wall	2	1.250	0.750	0.150		0.282		
	Total Quantity						1.036 cum		
	Total Deducted Quantity						0.000 cum		
	Net Total Quantity						1.036 cum		
	Say 1.036 cum @ Rs 7211.15 / cum						Rs 7470.75		
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)								
	Long walls (foundation)	2	3.200	0.500	0.600		1.920		
	short wall "	2	1.400	0.500	0.600		0.840		
	Long walls (basement)	2	3.050	0.450	0.450		1.236		
	short wall "	2	1.550	0.450	0.450		0.628		
	Total Quantity						4.624 cum		
	Total Deducted Quantity						0.000 cum		
	Net Total Quantity						4.624 cum		
	Say 4.624 cum @ Rs 7204.78 / cum						Rs 33314.90		
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)								
	Damp proofing course								
	Long walls	2	3.050	0.450	0.050		0.138		
	short wall	2	1.550	0.450	0.050		0.070		

						Total Quantity	0.208 cum	
						Total Deducted Quantity	0.000 cum	
						Net Total Quantity	0.208 cum	
						Say 0.208 cum @ Rs 8588.47 / cum	Rs 1786.40	
5	50.6.1.4 Solid block masonry using pre cast solid blocks (Factory made) of size 30x20x20cm or nearest available size confirming to IS 2185 part I of 1979 for foundation and plinth with thickness 20cm and above in: CM 1:6 (1 cement : 6 coarse sand) etc complete							
	Long walls	2	3.050	0.450	2.400		6.588	
	short wall	2	1.550	0.450	2.400		3.348	
	DOOR	1	0.900	0.200	2.100		-0.378	
	Windows	2	1.000	0.200	1.400		-0.559	
						Total Quantity	9.936 cum	
						Total Deducted Quantity	-0.937 cum	
						Net Total Quantity	8.999 cum	
						Say 8.999 cum @ Rs 5950.30 / cum	Rs 53546.75	
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)							
	Lintels -Door	1	1.200	0.200	0.150		0.036	
	" Windows	2	1.200	0.200	0.150		0.072	
	Roof slab	1	4.000	3.400	0.100		1.360	
	Kerb at roof slab end 5cm	1*2	7.200	0.100	0.050		0.073	
						Total Quantity	1.541 cum	
						Total Deducted Quantity	0.000 cum	
						Net Total Quantity	1.541 cum	
						Say 1.541 cum @ Rs 10954.04 / cum	Rs 16880.18	
7	5.9.5 Centering and shuttering including strutting, etc. and removal of form for:Lintels, beams, plinth beams, girders bressumers and cantilevers							
	Lintels - sides	3*2	1.200		0.200		1.440	
	Bottom	3	1.200	0.200			0.720	
						Total Quantity	2.160 sqm	

		Total Deducted Quantity					0.000 sqm	
		Net Total Quantity					2.160 sqm	
		Say 2.160 sqm @ Rs 649.82 / sqm					Rs 1403.61	
8	5.9.3 Centering and shuttering including strutting, etc. and removal of form for:Suspended floors, roofs, landings, balconies and access platform							
	Room inside	1	2.400	1.800			4.320	
	Outside allaround	2	4.000	0.600			4.800	
	"	2	2.200	0.600			2.640	
		Total Quantity					11.760 sqm	
		Total Deducted Quantity					0.000 sqm	
		Net Total Quantity					11.760 sqm	
		Say 11.760 sqm @ Rs 815.78 / sqm					Rs 9593.57	
9	13.1.1 12 mm cement plaster of mix:1:4 (1 cement : 4 fine sand)							
		Plastering inside and outside						
	Inside	2	2.400		2.400		11.520	
	"	2	1.800		2.400		8.640	
	Out side	2	2.800		2.400		13.440	
	"	2	2.200		2.400		10.560	
		Deduction for one side						
	DOOR	1	0.900		2.100		-1.890	
	Windows	2	1.000		1.400		-2.800	
		Total Quantity					44.160 sqm	
		Total Deducted Quantity					-4.690 sqm	
		Net Total Quantity					39.470 sqm	
		Say 39.470 sqm @ Rs 314.09 / sqm					Rs 12397.13	
10	13.7.1 12 mm cement plaster finished with a floating coat of neat cement of mix:1:3 (1 cement : 3 fine sand)							
		Plastering Ceiling and terrace area						
	Inside	1	2.400	1.800			4.320	
	Shde long side	2	4.000	0.700			5.600	
	" short side	2	1.800	0.700			2.520	
	Terrace area	1	4.000	3.400			13.600	

		Total Quantity					26.040 sqm	
		Total Deducted Quantity					0.000 sqm	
		Net Total Quantity					26.040 sqm	
		Say 26.040 sqm @ Rs 401.21 / sqm					Rs 10447.51	
11	5.22.6 Steel reinforcement for R.C.C work including straightening, cutting, bending, placing in position and binding all complete upto plinth levelThermo - Mechanically Treated bars of grade Fe-500D or more							
	Qty as per item No-6	1	1.543		90.0	138.870	@ 90kg/m3 of concrete	
		Total Quantity					138.870 kilogram	
		Total Deducted Quantity					0.000 kilogram	
		Net Total Quantity					138.870 kilogram	
		Say 138.870 kilogram @ Rs 98.30 / kilogram					Rs 13650.92	
12	50.9.2.3 Providing and fixing paneled or paneled and glazed shutters for doors, windows and clerestory windows, 35 mm thick shutters including ISI marked M.S pressed butt hinges bright finished of required size with necessary screws, excluding paneling which will be paid for separately, all complete as per direction of Engineer in -charge.using Vengai wood							
	Door shutter	1	0.900		2.100	1.891		
		Total Quantity					1.891 sqm	
		Total Deducted Quantity					0.000 sqm	
		Net Total Quantity					1.891 sqm	
		Say 1.891 sqm @ Rs 2606.49 / sqm					Rs 4928.87	
13	50.9.1.1 Providing wood work in frames of doors, windows, clerestory windows and other frames, wrought framed and fixed in position with hold fast lugs or with dash fasteners of required dia & length (hold fast lugs or dash fastener shall be paid for separately), using good quality Anjili wood /jack wood							
	Door frame- Vertical pieces	1*2	2.100	0.120	0.060	0.031		
	Door frame - Horizontal pieces	1*2	1.100	0.120	0.060	0.016		
	Window frame - Vertical pieces	2*3	1.400	0.120	0.060	0.061		
	" Horizontal pieces	2*2	1.300	0.120	0.060	0.038		
		Total Quantity					0.146 cum	

						Total Deducted Quantity	0.000 cum	
						Net Total Quantity	0.146 cum	
						Say 0.146 cum @ Rs 109862.80 / cum	Rs 16039.97	
14	10.1	Structural steel work in single section, fixed with or without connecting plate, including cutting, hoisting, fixing in position and applying a priming coat of approved steel primer all complete.						
		For grill work of windows						
	32x6 mm MS Flat	2*8	1.400			1.51	33.757	
	10 mm MS Rods	2*12	1.000			0.62	14.880	
						Total Quantity	48.637 kilogram	
						Total Deducted Quantity	0.000 kilogram	
						Net Total Quantity	48.637 kilogram	
						Say 48.637 kilogram @ Rs 101.29 / kilogram	Rs 4926.44	
15	21.1.1.2	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 portion Powder coated aluminium (minimum thickness of powder coating 50 micron)						
	For door frame - Verticals	1*2	2.100			1.65	6.930	@ 1.653 kg/m
	" Horizontals	1*2	0.900			1.65	2.970	@ 1.653 kg/m
	Window frames- Verticals	2*3	1.400			1.65	13.860	@ 1.653 kg/m
	" -Horizontals	2*2	1.000			1.65	6.600	@ 1.653 kg/m
						Total Quantity	30.360 kg	
						Total Deducted Quantity	0.000 kg	
						Net Total Quantity	30.360 kg	
						Say 30.360 kg @ Rs 537.07 / kg	Rs 16305.45	
16	21.1.2.2	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) Powder coated aluminium (minimum thickness of powder coating 50 micron)								
	Shutterframe windows - verticals	2*4	1.300			2.35	24.440	@2.35kg/m	
	Shutterframe windows - Horizontals	2*4	0.500			2.35	9.400	"	
	" Door- Horizontals	1*3	0.900			2.35	6.346	"	
	" Verticals	1*2	2.000			2.35	9.400	"	
	Total Quantity						49.586 kg		
	Total Deducted Quantity						0.000 kg		
	Net Total Quantity						49.586 kg		
	Say 49.586 kg @ Rs 643.10 / kg						Rs 31888.76		
17	<p>21.2.2 Providing and fixing 12 mm thick prelaminated particle board flat pressed three layer or graded wood particle board conforming to IS : 12823 Grade I Type II, in panelling fixed in aluminum doors, windows shutters and partition frames with C.P. brass / stainless steel screws etc. complete as per architectural drawings and directions of Engineer - in- Charge. Pre- laminated particle board with decorative lamination on both sides</p>								
	For door shutter	1	0.900		2.100	0.5	0.946	Half panned and Half glazed shutter	
	Total Quantity						0.946 sqm		
	Total Deducted Quantity						0.000 sqm		
	Net Total Quantity						0.946 sqm		
	Say 0.946 sqm @ Rs 1232.31 / sqm						Rs 1165.77		
18	<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>								
	Widows shuters	2	1.000		1.400		2.800		
	Total Quantity						2.800 sqm		
	Total Deducted Quantity						0.000 sqm		
	Net Total Quantity						2.800 sqm		
	Say 2.800 sqm @ Rs 1176.65 / sqm						Rs 3294.62		
19	21.3.2								

	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 5.50 mm thickness							
	Widows shuters	2	1.000		1.400		2.800	
	Total Quantity						2.800 sqm	
	Total Deducted Quantity						0.000 sqm	
	Net Total Quantity						2.800 sqm	
	Say 2.800 sqm @ Rs 1526.00 / sqm						Rs 4272.80	
20	13.43.1 Applying one coat of water thinnable cement primer of approved brand and manufacture on wall surface:Water thinnable cement primer							
	Qty as per item no -9 and 10	1	66.710				66.710	
	Total Quantity						66.710 sqm	
	Total Deducted Quantity						0.000 sqm	
	Net Total Quantity						66.710 sqm	
	Say 66.710 sqm @ Rs 70.64 / sqm						Rs 4712.39	
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							
	Qty same as item No-15	1	66.710				66.710	
	Total Quantity						66.710 sqm	
	Total Deducted Quantity						0.000 sqm	
	Net Total Quantity						66.710 sqm	
	Say 66.710 sqm @ Rs 125.76 / sqm						Rs 8389.45	
22	od386005/2021_2022 Painting with synthetic enamel paint, having VOC (Volatile Organic Compound) content less than 150 grams/ litre, of approved brand and manufacture, including applying additional coats wherever required to achieve even shade and colour. Two coats							
	Grill painting Windows	1*2	1.000		1.400		2.800	
	Gate painting	1	5.000	1.600		2.0	16.000	
	Total Quantity						18.800 sqm	
	Total Deducted Quantity						0.000 sqm	
	Net Total Quantity						18.800 sqm	

	Say 18.800 sqm @ Rs 112.00 / sqm						Rs 2105.60	
23	13.85.1 Applying priming coats with primer of approved brand and manufacture, having low VOC (Volatile Organic Compound) content.With ready mixed pink or grey primer on wood work (hard and soft wood) having VOC content less than 50 grams/ litre							
	Door painting Pannelled door	1	0.800	2.000		2.25	3.600	
	Total Quantity						3.600 sqm	
	Total Deducted Quantity						0.000 sqm	
	Net Total Quantity						3.600 sqm	
	Say 3.600 sqm @ Rs 67.18 / sqm						Rs 241.85	
24	13.33.1 Pointing on stone work with cement mortar 1:3 (1 cement : 3 fine sand):Flush/ Ruled pointing							
	Basement all around	1	11.000		0.400		4.400	
	Total Quantity						4.400 sqm	
	Total Deducted Quantity						0.000 sqm	
	Net Total Quantity						4.400 sqm	
	Say 4.400 sqm @ Rs 335.99 / sqm						Rs 1478.36	
25	od386006/2021_2022 Wiring for light point/ fan point/ exhaust fan point/ call bell point with 1.5 sq.mm FRLS PVC insulated copper conductor single core cable in surface / recessed steel conduit, with modular switch, modular plate, suitable GI box and earthing the point with 1.5 sq.mm FRLS PVC insulated copper conductor single core cable etc. as required.(As per DSRE-2016 Item No-3.1.1),							
	Wiring points	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 702.00 / No						Rs 4212.00	
26	16.78.2 Construction of granular sub- base by Providing close graded Material conforming to specifications, mixing in a mechanical mix plant at OMC, Carriage of mixed material by tippers to work site, for all leads & lifts, spreading in uniform layers of specified thickness with motor grader on prepared surface and compacting with vibratory power roller to achieve the desired density, complete as per specifications and directions of Engineer-in- Charge.With material conforming to Grade-II (size range 53 mm to 0.075 mm) having CBRValue-25							
	Road inside the Plant compound	1	275.000	4.000	0.150		165.000	
	Total Quantity						165.000 cum	

	Total Deducted Quantity							0.000 cum
	Net Total Quantity							165.000 cum
	Say 165.000 cum @ Rs 3104.40 / cum							Rs 512226.00
27	<p>16.91.2 Providing and laying factory made chamfered edge Cement Concrete paver blocks in footpath, parks, lawns, drive ways or light traffic parking etc, of required strength, thickness & size/ shape, made by table vibratory method using PU mould, laid in required colour & pattern over 50mm thick compacted bed of sand, compacting and proper embedding/laying of inter locking paver blocks into the sand bedding layer through vibratory compaction by using plate vibrator, filling the joints with sand and cutting of paver blocks as per required size and pattern, finishing and sweeping extra sand. complete all as per direction of Engineer-in-Charge. 80 mm thick C.C. paver block of M-30 grade with approved color design and pattern.</p>							
	Road inside the Plant compound	1	275.000	4.000			1100.000	
	Total Quantity							1100.000 sqm
	Total Deducted Quantity							0.000 sqm
	Net Total Quantity							1100.000 sqm
	Say 1100.000 sqm @ Rs 1121.80 / sqm							Rs 1233980.00
28	<p>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)</p>							
		2	275.000	0.250	0.150	0.5	10.313	
		2	4.000	0.250	0.150	0.5	0.150	
	Total Quantity							10.463 cum
	Total Deducted Quantity							0.000 cum
	Net Total Quantity							10.463 cum
	Say 10.463 cum @ Rs 7990.86 / cum							Rs 83608.37
29	<p>10.25.2 Item Shifted to Sub head 14 as item 14.73 Item Shifted to head 14 as item 14.74 Steel work welded in built up sections/framed work, including cutting, hoisting, fixing in position and applying a priming coat of approved steel primer using structural steel etc. as required. In gratings, frames, guard bar, ladder, railings, brackets, gates and similar works</p>							
	Gate Near Security cabin-5.0mx1.60m size	1	160.000				160.000	
	Total Quantity							160.000 kg
	Total Deducted Quantity							0.000 kg

SI No	Description	No	L	B	D	CF	Quantity	Remark
Net Total Quantity							160.000 kg	
Say 160.000 kg @ Rs 154.17 / kg								Rs 24667.20
11 RESTORATION CHARGES AND PERMISSIONS FROM OTHER DEPARTMENTS (Cost Index:35.59 %)								
1	od385977/2021_2022 PWD Road restoration - BM & BC Road surface (Approved rate of PWD)							
	At Power house Jn. Aluva	1	30.000	3.750			112.500	
Total Quantity							112.500 sqm	
Total Deducted Quantity							0.000 sqm	
Net Total Quantity							112.500 sqm	
Say 112.500 sqm @ Rs 3581.16 / sqm								Rs 402880.50
2	od385979/2021_2022 Municipal Road restoration - 20mm open graded chipping carpet surface (Manual means) PWD Approved rate							
	Nethaji road to Gokulam lane	1	110.000	3.750			412.500	
Total Quantity							412.500 sqm	
Total Deducted Quantity							0.000 sqm	
Net Total Quantity							412.500 sqm	
Say 412.500 sqm @ Rs 2797.56 / sqm								Rs 1153993.50
3	od385980/2021_2022 Municipal road restoration works for concrete roads							
Municipal Road-Concrete road restoration								
	Municipal Road Gokulam lane	1	40.000	3.000	0.150		18.000	
Total Quantity							18.000 cum	
Total Deducted Quantity							0.000 cum	
Net Total Quantity							18.000 cum	
Say 18.000 cum @ Rs 4824.12 / cum								Rs 86834.16
4	od385983/2021_2022 Permission from Irrigation Department for PVIP Canal Crossing by push through method							
		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					Rs 1500000.00	
5	od385986/2021_2022 Shifting of KSEB posts and cable lines etc - for 1450 mm MS pipe line							
		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 5000000.00 / L.S					Rs 5000000.00	
SI No	Description	No	L	B	D	CF	Quantity	Remark
12CATHODIC PROTECTION WORKS (Cost Index:35.59 %)								
1	od385976/2021_2022 Design,supply and installation of Sacrificial Anode Cathode Protection (SACP) for 1626 mm OD Pipes for design life of minimum 10 years Including Supply of Magnesium Anode for SACP using sacrificial anode Size 90 mm Dia.x900mm Long Net wt 10 kgwith .-115 Nos, cable 1CX10sq.mm XLPE/PVC Sheathed copper conductor un-armoured cable , Installation of pre-packed Magnesium Anode--115 Nos by augering to a depth of 2m, termination of anode tail cable to the nearest test lead post c/w shunt and rheostat for monitoring and a lockable hinged door suitable for use in corrosive environment, weather proof type gasket , 6Nos.excavation and and cable to pipeline connection-12 Nos. etc complete as standard specifications							
		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 1870688.00 / No					Rs 1870688.00	
Total							228100054.10	
Centage @							0.0%	
Centage Amount							0.00	
Provision for GST payments (in %) @							18.0%	
Amount reserved for GST payments							41058009.74	
Total & Centage							269158063.84	
Lumpsum for round off							41936.16	
GRAND TOTAL Rs							269200000.00	
Rounded Grand Total Rs 26,92,00,000								
Rupees Twenty Six Crore Ninety Two Lakh Only								

General Abstract

State Plan-Interim augmentation of water supply scheme to Kochi city and adjoining areas-Proposed WTP at Aluva-supply,laying,testing and commissioning of clear water pumping mains to Kalamassery and Choornikkara areas

(Dsr year: 2018)

SI No	Heading Description	Amount
1	Part I : Cost of materials	398455331.84
2	Part II : Working Charges	154110826.33
3	Construction of Valve Chamber	3017090.68
4	Anchor Blocks	4479474.89
5	ROAD CROSSING PUSH THROUGH METHOD	4361135.18
6	INTERCONNECTION WORKS	559717.52
7	RESTORATION CHARGES AND PERMISSIONS FROM OTHER DEPARTMENTS	124178685.60
8	CATHODIC PROTECTION WORKS	5612064.00
9	Utility Shifting Works	198059.00
10	Clear water pump sets to Kalamassery and Choornikkara	25820376.00
	Total	720792761.03
	Centage @	0.0%
	Centage Amount	0.00
	Provision for GST payments (in %) @	18.0%
	Amount reserved for GST payments	129742696.99
	Total & Centage	850535458.01
	Lumpsum for round off	4541.99
	GRAND TOTAL Rs	850540000.00
	Rounded Grand Total Rs	85,05,40,000
	Rupees Eighty Five Crore Five Lakh Forty Thousand Only	

Detailed Estimate

State Plan-Interim augmentation of water supply scheme to Kochi city and adjoining areas-Proposed WTP at Aluva-supply,laying,testing and commissioning of clear water pumping mains to Kalamassery and Choornikkara areas

(Dsor year: 2018)

Sl No	Description	No	L	B	D	CF	Quantity	Remark
1Part I : Cost of materials (Cost Index:35.59 %)								
1	od386068/2021_2022 Supplying, conveying and stacking 1118 mm OD m.s. pipe having 12.50 mm thickness as per IS 3589/2001 fabricated with Fe 410 grade steel conforming to IS-3589:2001 and allied codes , spirally welded mild steel pipe suitable for taper sleeve joint of outer diameter 1118 mm(shell OD)or nearest available size with internally lined with plant applied cement mortar lining 1:2 not less than 9mm thick and externally coated with plant applied cement mortar 1:3 ; 20mm thick minimum with wire mesh reinforcement as per clause A-9 of annex-A of IS :3589-2001. , including all labour charges, testing the spirally welded joint (DP test /) etc complete .							
	NAD to CUSAT- 1118mm Dia	1	2600.000				2600.000	
							Total Quantity	2600.000 metre
							Total Deducted Quantity	0.000 metre
							Net Total Quantity	2600.000 metre
							Say 2600.000 metre @ Rs 23520.96 / metre	Rs 61154496.00
2	od393072/2021_2022 Supplying 813 mm OD m.s. pipe having 8mm thickness as per IS 3589/2001 fabricated with Fe 410 grade steel conforming to IS-3589:2001 and allied codes , spirally welded mild steel pipe suitable for taper sleeve joint of outer diameter 829 mm(shell OD)or nearest available size with internally lined with plant applied cement mortar lining 1:2 not less than 9mm thick and externally coated with plant applied cement mortar 1:3 ; 20mm thick minimum with wire mesh reinforcement as per clause A-9 of annex-A of IS :3589-2001. , including all labour charges, DP test for the welded joints at site etc complete .							
	NAD to Kalamassery sump	1	2600.000				2600.000	
							Total Quantity	2600.000 metre
							Total Deducted Quantity	0.000 metre
							Net Total Quantity	2600.000 metre
							Say 2600.000 metre @ Rs 29815.24 / metre	Rs 77519624.00
3	od386069/2021_2022 Supplying, conveying and stacking 1118 mm OD m.s. pipe having 12.50 mm thickness as per IS 3589/2001 fabricated with Fe 410 grade steel conforming to IS-3589:2001 and allied codes , spirally							

	welded mild steel pipe suitable for taper sleeve joint of outer diameter 1118 mm(shell OD)or nearest available size with . , including all labour charges, testing the spirally welded joint (DP test /) etc complete .							
	For making bends	1	60.000				60.000	
	Total Quantity						60.000 metre	
	Total Deducted Quantity						0.000 metre	
	Net Total Quantity						60.000 metre	
	Say 60.000 metre @ Rs 17769.79 / metre						Rs 1066187.40	
4	od386070/2021_2022 Supplying, conveying and stacking 1422 mm OD m.s. pipe having 12.50 mm thickness as per IS 3589/2001 fabricated with Fe 410 grade steel conforming to IS-3589:2001 and allied codes , spirally welded mild steel pipe suitable for taper sleeve joint of outer diameter 1422 mm(shell OD)or nearest available size with internally lined with plant applied cement mortar lining 1:2 not less than 9mm thick and externally coated with plant applied cement mortar 1:3 ; 20mm thick minimum with wire mesh reinforcement as per clause A-9 of annex-A of IS :3589-2001. , including all labour charges, testing the spirally welded joint (DP test /) etc complete .							
		1	5600.000				5600.000	
	Total Quantity						5600.000 metre	
	Total Deducted Quantity						0.000 metre	
	Net Total Quantity						5600.000 metre	
	Say 5600.000 metre @ Rs 34162.04 / metre						Rs 191307424.00	
5	od386077/2021_2022 Fabricating MS flanges of diameter 219 mm using 12 mm thick MS plate including cost and conveyance charges of MS plate, all fabrication charges, charges of painting the steel work with two or more coat deluxe multi surface paint to give an even shade over an under coat of primer etc. complete: For pipes fabricated with 6.3 mm thick MS plates.(data derived from 100.37.19.2)							
		8					8.000	
	Total Quantity						8.000 No	
	Total Deducted Quantity						0.000 No	
	Net Total Quantity						8.000 No	
	Say 8.000 No @ Rs 2554.49 / No						Rs 20435.92	
6	od386078/2021_2022 Fabricating MS flanges of diameter 610 mm using 16 mm thick MS plate including cost and conveyance charges of MS plate, all fabrication charges, charges of painting the steel work with two or more coat deluxe multi surface paint to give an even shade over an under coat of primer etc. complete: For pipes fabricated with 6.3 mm thick MS plates.(data derived from 100.37.19.2)							
		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 8265.33 / No						Rs 49591.98	
7	od386081/2021_2022 Fabricating MS flanges of diameter 1118mm using 16 mm thick MS plate including cost and conveyance charges of MS plate, all fabrication charges, charges of painting the steel work with two or more coat deluxe multi surface paint to give an even shade over an under coat of primer etc. complete: For pipes fabricated with 11 mm thick MS plates.(data derived from 100.37.19.2)							
		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 19271.85 / No						Rs 77087.40	
8	od386087/2021_2022 Fabricating MS flanges of diameter 1422mm using 16 mm thick MS plate including cost and conveyance charges of MS plate, all fabrication charges, charges of painting the steel work with two or more coat deluxe multi surface paint to give an even shade over an under coat of primer etc. complete: For pipes fabricated with 12.5 mm thick MS plates.(data derived from 100.37.19.2)							
		12					12.000	For valve 2 Nos + Joints - 5x2 total 12 Nos.
	Total Quantity						12.000 No	
	Total Deducted Quantity						0.000 No	
	Net Total Quantity						12.000 No	
	Say 12.000 No @ Rs 27284.63 / No						Rs 327415.56	
9	100.98.120 Supply of DI K9 Pipe Conforming to IS 8329/2000, 350mm Dia.							
	Parallel line NAD to Thoshiba	1	2100.000				2100.000	
	Total Quantity						2100.000 metre	
	Total Deducted Quantity						0.000 metre	
	Net Total Quantity						2100.000 metre	
	Say 2100.000 metre @ Rs 4333.00 / metre						Rs 9099300.00	
10	100.98.121 Supply of DI K9 Pipe Conforming to IS 8329/2000, 400mm Dia.							

	W T P T O CHOORNIKKARA 400mm DI	1	1000.000				1000.000	
	Total Quantity						1000.000 metre	
	Total Deducted Quantity						0.000 metre	
	Net Total Quantity						1000.000 metre	
	Say 1000.000 metre @ Rs 5377.35 / metre						Rs 5377350.00	
11	100.98.123 Supply of DI K9 Pipe Conforming to IS 8329/2000, 500mm Dia.							
	500 mm DI CUSAT TO THOPPIL	1	3350.000				3350.000	
	Total Quantity						3350.000 metre	
	Total Deducted Quantity						0.000 metre	
	Net Total Quantity						3350.000 metre	
	Say 3350.000 metre @ Rs 7517.25 / metre						Rs 25182787.50	
12	od386090/2021_2022 Supplying 1000 mm/ nearest CI D/F Sluice valve							
		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 627785.00 / No						Rs 1255570.00	
13	od386091/2021_2022 Supplying 1200 mm/ nearest CI D/F Sluice valve							
		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 1015731.75 / No						Rs 1015731.75	
14	100.98.468 Supply of CI Double Flanged Sluice Valve Conforming to IS 14846 - 2000, Sluice Valve with Cap PN 1.6, Size 600mm.							
	600 mm Sluice valve foe scour	2					2.000	
	Line	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 91285.40 / No						Rs 273856.20
15	od386101/2021_2022 Supplying, conveying and stacking 219 mm OD m.s. pipe having 6.30 mm thickness as per IS 3589/2001 fabricated with Fe 410 grade steel conforming to IS-3589:2001 and allied codes , spirally welded mild steel pipe suitable for taper sleeve joint of outer diameter 219 mm(shell OD)or nearest available size , including all labour charges, testing the spirally welded joint (DP test /) etc complete .						
	For Air valves 200 mm	8	0.600				4.800
	Total Quantity						4.800 metre
	Total Deducted Quantity						0.000 metre
	Net Total Quantity						4.800 metre
	Say 4.800 metre @ Rs 2090.70 / metre						Rs 10035.36
16	od386102/2021_2022 Supplying, conveying and stacking 610 mm OD m.s. pipe having 6.3 mm thickness as per IS 3589/2001 fabricated with Fe 410 grade steel conforming to IS-3589:2001 and allied codes , spirally welded mild steel pipe suitable for taper sleeve joint of outer diameter 610 mm(shell OD)or nearest available size . , including all labour charges, testing the spirally welded joint (DP test /) etc complete .						
	For scour	1	60.000				60.000
	Kerala Water Authority Total Quantity						60.000 metre
	Total Deducted Quantity						0.000 metre
	Net Total Quantity						60.000 metre
	Say 60.000 metre @ Rs 6097.88 / metre						Rs 365872.80
17	od386103/2021_2022 Supply conveying and stacking 914 mm OD m.s. pipe having 10 mm thickness as per IS 3589/2001 fabricated with Fe 410 grade steel conforming to IS-3589:2001 and allied codes , spirally welded mild steel pipe . , Including all labour charges, etc complete .						
	For push-through casing pipe	1	30.000				30.000
	Total Quantity						30.000 metre
	Total Deducted Quantity						0.000 metre
	Net Total Quantity						30.000 metre
	Say 30.000 metre @ Rs 13762.61 / metre						Rs 412878.30
18	od386104/2021_2022 Supply conveying and stacking 1626 mm OD m.s. pipe having 14.2 mm thickness as per IS 3589/2001 fabricated with Fe 410 grade steel conforming to IS-3589:2001 and allied codes , spirally welded mild steel pipe . , including all labour charges, etc complete .						

	for push-through casing	1	130.000				130.000		
	Total Quantity						130.000 metre		
	Total Deducted Quantity						0.000 metre		
	Net Total Quantity						130.000 metre		
	Say 130.000 metre @ Rs 34957.67 / metre						Rs 4544497.10		
19	100.98.453 Supply of CI Air Valve with Flanges, Conforming to IS 14845 - 2000, Kinetic Air Valve Type DS1, Size 200mm.								
	Supply of CI Air Valve 200 mm	8					8.000		
	Total Quantity						8.000 No		
	Total Deducted Quantity						0.000 No		
	Net Total Quantity						8.000 No		
	Say 8.000 No @ Rs 18198.85 / No						Rs 145590.80		
20	100.98.449 Supply of CI Air Valve with Flanges, Conforming to IS 14845 - 2000, Kinetic Air Valve Type DS1, Size 50mm.								
		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 2913.15 / No						Rs 14565.75		
21	100.98.451 Supply of CI Air Valve with Flanges, Conforming to IS 14845 - 2000, Kinetic Air Valve Type DS1, Size 100mm.								
		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 4295.00 / No						Rs 21475.00		
22	100.98.482 Supply of CI Double Flanged Sluice Valve Conforming to IS 14846 - 2000, Sluice Valve with Hand Wheel PN 1.6, Size 100mm.								
		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 4368.05 / No	Rs 21840.25
23	100.98.485	Supply of CI Double Flanged Sluice Valve Conforming to IS 14846 - 2000, Sluice Valve with Hand Wheel PN 1.6, Size 200mm.							
	For Air Valve 200 mm	8						8.000	
								Total Quantity	8.000 No
								Total Deducted Quantity	0.000 No
								Net Total Quantity	8.000 No
								Say 8.000 No @ Rs 11938.60 / No	Rs 95508.80
24	100.98.464	Supply of CI Double Flanged Sluice Valve Conforming to IS 14846 - 2000, Sluice Valve with Cap PN 1.6, Size 350mm.							
								Size 350mm.	
		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 31667.35 / No	Rs 31667.35
25	100.98.465	Supply of CI Double Flanged Sluice Valve Conforming to IS 14846 - 2000, Sluice Valve with Cap PN 1.6, Size 400mm.							
	Size 400mm.	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 45862.05 / No	Rs 91724.10
26	100.98.467	Supply of CI Double Flanged Sluice Valve Conforming to IS 14846 - 2000, Sluice Valve with Cap PN 1.6, Size 500mm.							
	Size 500mm.	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 75707.05 / No						Rs 75707.05	
27	od386107/2021_2022 Conveyance charge of Internal and External Lined MS Pipes							
	1422 mm Lined M.S pipe	1	5600.000			0.77	4312.000	
	1118 mm Lined MS pipe	1	2600.000			0.6	1570.400	
	813mm Lined MS pipe	1	2600.000			0.36	936.000	
	Total Quantity						6818.400 tonne	
	Total Deducted Quantity						0.000 tonne	
	Net Total Quantity						6818.400 tonne	
	Say 6818.400 tonne @ Rs 145.27 / tonne						Rs 990508.97	
28	od386108/2021_2022 Supply of specials							
	Supply of specials	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 17906602.50 / set						Rs 17906602.50	
SI No	Description	No	L	B	D	CF	Quantity	Remark
2Part II : Working Charges (Cost Index:35.59 %)								
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.							
	Cutting the bituminous / concrete roads							
	Cutting bituminous road	1	1200.000				1200.000	
	Total Quantity						1200.000 metre	
	Total Deducted Quantity						0.000 metre	
	Net Total Quantity						1200.000 metre	
	Say 1200.000 metre @ Rs 30.44 / metre						Rs 36528.00	
2	15.3 Demolishing R.C.C. work manually / by mechanical means including stacking of steel bars and disposal							

	of unserviceable material with in 50 metres lead as per direction of Engineer -in-Charge.						
	1422 mm line	1	1200.000	2.500	0.200		600.000
	1118 mm line	1	1200.000	2.100	0.200		504.000
	500 mm DI	1	1200.000	1.200	0.200		288.000
	813 mm MS	1	850.000	1.800	0.200		306.000
	350 mm DI	1	400.000	1.200	0.200		96.000
	400 mm DI	1	200.000	1.200	0.200		48.000
	Total Quantity						1842.000 cum
	Total Deducted Quantity						0.000 cum
	Net Total Quantity						1842.000 cum
	Say 1842.000 cum @ Rs 2983.59 / cum						Rs 5495772.78
3	15.9.1 Demolishing stone rubble masonry manually / by mechanical means including stacking of serviceable material and disposal of unserviceable material within 50 metres lead as per direction of Engineer -in-Charges:In Lime Mortor						
	pipe line road	2	2.500	0.750	1.500		5.625
	to choornikkara	1	2.500	0.900	2.000		4.500
	350 mm line	1	6.000	0.600	1.200		4.320
	400 mm line	1	6.000	0.600	1.000		3.600
	Total Quantity						18.045 cum
	Total Deducted Quantity						0.000 cum
	Net Total Quantity						18.045 cum
	Say 18.045 cum @ Rs 972.79 / cum						Rs 17554.00
4	15.45.3 Dismantling C.I pipes including excavation and refilling trenches after taking out the pipes, manually / by mechanical means breaking lead caulked joints, melting of lead and making into blocks including stacking of pipes & lead at site within 50 metre lead as per direction of Engineer - in- Charge:Above 300 mm diameter						
	1050 mm pipes	1	1588.000				1588.000
	900 mm pipes	1	1588.000				1588.000
	Total Quantity						3176.000 metre
	Total Deducted Quantity						0.000 metre
	Net Total Quantity						3176.000 metre
	Say 3176.000 metre @ Rs 606.77 / metre						Rs 1927101.52
5	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)							
	Qty same as item-3 above	11	18.045				198.495	
	Total Quantity						198.495 cum	
	Total Deducted Quantity						0.000 cum	
	Net Total Quantity						198.495 cum	
	Say 198.495 cum @ Rs 7204.78 / cum						Rs 1430112.81	
6	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)							
	Concrete road demolishing							
		1	200.000	2.500	0.150		75.000	
	Total Quantity						75.000 cum	
	Total Deducted Quantity						0.000 cum	
	Net Total Quantity						75.000 cum	
	Say 75.000 cum @ Rs 2045.12 / cum						Rs 153384.00	
7	16.83 Taking out existing CC interlocking paver blocks from footpath/ central verge, including removal of rubbish etc., disposal of unserviceable material to the dumping ground, for which payment shall be made separately and stacking of serviceable material within 50 metre lead as per direction of Engineer-in-Charge.							
	Taking out inter-lock blocks	1	800.000	4.000			3200.000	
	Total Quantity						3200.000 sqm	
	Total Deducted Quantity						0.000 sqm	
	Net Total Quantity						3200.000 sqm	
	Say 3200.000 sqm @ Rs 110.71 / sqm						Rs 354272.00	
8	16.84 Laying old cement concrete interlocking paver blocks of any design/ shape laid in required line, level, curvature, colour and pattern over and including 50 mm thick compacted bed of coarse sand, filling the joints with fine sand etc. all complete as per the direction of Engineer-in-charge. (Old CC paver blocks shall be supplied by the department free of cost.)							
	Layingt inter-lock blocks	1	800.000	4.000			3200.000	
	Total Quantity						3200.000 sqm	

	Total Deducted Quantity							0.000 sqm
	Net Total Quantity							3200.000 sqm
	Say 3200.000 sqm @ Rs 381.62 / sqm							Rs 1221184.00
9	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)							
		1	5000.000				5000.000	
	Total Quantity							5000.000 metre
	Total Deducted Quantity							0.000 metre
	Net Total Quantity							5000.000 metre
	Say 5000.000 metre @ Rs 96.33 / metre							Rs 481650.00
10	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)							
	Ribbon fencing	1	8500.000				8500.000	
	Total Quantity							8500.000 metre
	Total Deducted Quantity							0.000 metre
	Net Total Quantity							8500.000 metre
	Say 8500.000 metre @ Rs 28.01 / metre							Rs 238085.00
11	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)							
	350mm DI pipe	1	2100.000	1.1000	1.300	0.7	2102.100	
	400mm DI pipe	1	1000.000	1.100	1.350	0.7	1039.500	
	500mm DI pipe	1	3350.000	1.600	1.450	0.7	5440.400	
	610mm MS pipe	3	12.000	1.700	1.500	0.7	64.260	scour
	813mm MS pipe	1	2600.000	1.850	1.500	0.7	5050.500	
	1118 mm MS pipe	1	2800.000	2.050	1.500	0.7	6027.000	
	1422 mm MS Pipe	1	5600.000	2.300	1.500	0.7	13524.000	

	Total Quantity							33247.760 cum
	Total Deducted Quantity							0.000 cum
	Net Total Quantity							33247.760 cum
	Say 33247.760 cum @ Rs 555.51 / cum							Rs 18469463.16
12	<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 :" Ordinary Rock. (Ref. Item No. 2.13.1 of DSR)</p>							
	350mm DI pipe	1	2100.000	1.1000	1.300	0.3	900.900	
	400mm DI pipe	1	500.000	1.100	1.350	0.3	222.750	
	500mm DI pipe	1	3350.000	1.600	1.450	0.3	2331.600	
	610mm MS pipe	3	12.000	1.700	1.500	0.3	27.540	scour
	813mm MS pipe	1	2600.000	1.850	1.500	0.3	2164.500	
	1118 mm MS pipe	1	2600.000	2.050	1.500	0.3	2398.500	
	1422 mm MS Pipe	1	5600.000	2.500	1.500	3.0	63000.000	
	Kerala Water Authority Total Quantity							71045.790 cum
	Total Deducted Quantity							0.000 cum
	Net Total Quantity							71045.790 cum
	Say 71045.790 cum @ Rs 806.76 / cum							Rs 57316901.54
13	<p>100.1.6 Excavating trenches of required width for pipes, cables, etc including excavation for sockets, and dressing of sides, ramming of bottoms, depth exceeding 1.5m but not exceeding 3 m, including getting out the excavated soil, and then returning the soil as required, in layers not exceeding 20 cm in depth, including consolidating each deposited layer by ramming, watering, etc. and disposing of surplus excavated soil as directed, within a lead of 50 m : 1.50m to 3.0m. Ordinary Rock. (Ref. Item No. 2.14 of DSR)</p>							
	610mm MS pipe Aluva-Edathala	3	12.000	1.700	0.050	0.6	1.836	scour
	813mm MS pipe NADjn -Kalamassey	1	2600.000	1.850	0.250	0.6	721.500	
	1118 mm MS pipe NADjn -Cusat	1	2600.000	2.050	0.450	0.6	1439.100	

	1422 mm MS Pipe Alluva-NAD	1	5600.000	2.300	0.850	0.6	6568.800	
	Total Quantity						8731.236 cum	
	Total Deducted Quantity						0.000 cum	
	Net Total Quantity						8731.236 cum	
	Say 8731.236 cum @ Rs 997.54 / cum						Rs 8709757.16	
14	<p>100.28 Excavating trenches of required width for pipes, cables, etc including excavation for sockets, and dressing of sides, ramming of bottoms, depth up to 1.5 m but not exceeding 3 m, including getting out the excavated soil, and then returning the soil as required, in layers not exceeding 20 cm in depth, including consolidating each deposited layer by ramming, watering, etc. and disposing of surplus excavated soil as directed, within a lead of 50 m : (Rate is over corresponding basic item for depth up to 1.5 metre) 1.5m to 3.0m Medium Rock (blasting prohibited) New Data derived from DAR</p>							
	610 mm MS pipe Aluva-Edathala	3	12.000	1.700	0.050	0.4	1.225	6000+60 scour =6060
	813mm MS pipe NADjn -Kalamassey	1	2600.000	1.850	0.250	0.4	481.000	
	1118 mm MS pipe NADjn -Cusat	1	2800.000	2.050	0.450	0.4	1033.200	
	1422 mm MS Pipe Alluva-NAD	1	5600.000	2.300	0.850	0.4	4379.200	
	Total Quantity						5894.625 cum	
	Total Deducted Quantity						0.000 cum	
	Net Total Quantity						5894.625 cum	
	Say 5894.625 cum @ Rs 1532.37 / cum						Rs 9032746.51	
15	<p>2.16.2 Close timbering in trenches including strutting, shoring and packing cavities (wherever required) complete (Measurements to be taken of the face area timbered).Depth exceeding 1.5 m but not exceeding 3 m shoring and packing cavities</p>							
		1*2	7000.000		2.000		28000.000	
	Total Quantity						28000.000 sqm	
	Total Deducted Quantity						0.000 sqm	
	Net Total Quantity						28000.000 sqm	
	Say 28000.000 sqm @ Rs 166.17 / sqm						Rs 4652760.00	
16	od386067/2021_2022							

	Providing steel sheet shoring to the sides of the trenches to depths up to 3.00 m 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*2	1500.000		2.150		6450.000		
	Total Quantity							6450.000 sqm	
	Total Deducted Quantity							0.000 sqm	
	Net Total Quantity							6450.000 sqm	
	Say 6450.000 sqm @ Rs 377.24 / sqm							Rs 2433198.00	
17	od386079/2021_2022 Conveying excavated earth (All classes) up to 1 km and leveling as per the directions of departmental officers.								
	Conveying and stacking excess qty of excavated earth								
	Excess excavated earth 1422mm	1	8889.000				8889.000		
	" 1118	1	2551.000				2551.000		
	" 813	1	1349.000				1349.000		
	" 500	1	657.000				657.000		
	Total Quantity							13446.000 cum	
	Total Deducted Quantity							0.000 cum	
	Net Total Quantity							13446.000 cum	
	Say 13446.000 cum @ Rs 292.16 / cum							Rs 3928383.36	
18	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								
	Bailing out water with 5 HP engine and pumpset i	1	7460.000				7460.000	2x5hpx16 hx125day sx6 =7460.74	
	Total Quantity							7460.000 Kwh	
	Total Deducted Quantity							0.000 Kwh	
	Net Total Quantity							7460.000 Kwh	

	Say 7460.000 Kwh @ Rs 36.95 / Kwh						Rs 275647.00	
19	<p>100.7.3</p> <p>Bailing out water with engine and pumpset above 10 HP upto 20 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.</p> <p>NEW DATA (Prepared based on PHED SDB - Item No.1070)</p>							
	Bailing out water with engine and pumpset above 10 HP upto 20 HP							
	Bailing out water with 10HP Pump	1	3580.000				3580.000	10x30day sx16hours x0.746=35 80
	Total Quantity						3580.000 Kwh	
	Total Deducted Quantity						0.000 Kwh	
	Net Total Quantity						3580.000 Kwh	
	Say 3580.000 Kwh @ Rs 9.22 / Kwh						Rs 33007.60	
20	<p>od386086/2021_2022</p> <p>Conveying and Laying 1422 mm OD m.s. pipe having 12.50 mm thickness as per IS 3589/2001 fabricated with Fe 410 grade steel conforming to IS-3589:2001 and allied codes , spirally welded mild steel pipe suitable for taper sleeve joint of outer diameter 1422 mm(shell OD)or nearest available size with internally lined with plant applied cement mortar lining 1:2 not less than 9mm thick and externally coated with plant applied cement mortar 1:3 ; 20mm thick minimum with wire mesh reinforcement as per clause A-9 of annex-A of IS :3589-2001. , including all labour charges, DP test for the welded joints at site etc complete .</p>							
		1	5600.000				5600.000	
	Total Quantity						5600.000 metre	
	Total Deducted Quantity						0.000 metre	
	Net Total Quantity						5600.000 metre	
	Say 5600.000 metre @ Rs 2292.68 / metre						Rs 12839008.00	
21	<p>od386088/2021_2022</p> <p>Conveying and Laying 1118 mm OD m.s. pipe having 11 mm thickness as per IS 3589/2001 fabricated with Fe 410 grade steel conforming to IS-3589:2001 and allied codes , spirally welded mild steel pipe suitable for taper sleeve joint of outer diameter 1016 mm(shell OD)or nearest available size with internally lined with plant applied cement mortar lining 1:2 not less than 9mm thick and externally coated with plant applied cement mortar 1:3 ; 20mm thick minimum with wire mesh reinforcement as per clause A-9 of annex-A of IS :3589-2001. , including all labour charges, DP test for the welded joints at site (/) etc complete .</p>							
		1	2600.000				2600.000	
	Total Quantity						2600.000 metre	
	Total Deducted Quantity						0.000 metre	

										Net Total Quantity	2600.000 metre
										Say 2600.000 metre @ Rs 1675.03 / metre	Rs 4355078.00
22	od386089/2021_2022 Conveying and laying 610 mm OD m.s. pipe having 6.3 mm thickness as per IS 3589/2001 fabricated with Fe 410 grade steel conforming to IS-3589:2001 and allied codes , spirally welded mild steel pipe suitable for taper sleeve joint of outer diameter 610 mm(shell OD)or nearest available size with internally lined with plant applied cement mortar lining 1:2 not less than 9mm thick and externally coated with plant applied cement mortar 1:3 ; 20mm thick minimum with wire mesh reinforcement as per clause A-9 of annex-A of IS :3589-2001. , including all labour charges, DP test for the welded joints at site etc complete .										
			3	12.000							36.000
										Total Quantity	36.000 metre
										Total Deducted Quantity	0.000 metre
										Net Total Quantity	36.000 metre
										Say 36.000 metre @ Rs 810.40 / metre	Rs 29174.40
23	100.14.6 Conveying and laying S&S Centrifugally Cast (Spun) / Ductile Iron Pipes conforming to IS: 8329 excluding cost of pipes and specials : 350 mm dia Ductile Iron Class K-9 Pipes Data derived from 18.72.20 in DAR										
										350 mm dia Ductile Iron Class K-9 Pipes	
	NAD -Thoshiba		1	2100.000							2100.000
										Total Quantity	2100.000 metre
										Total Deducted Quantity	0.000 metre
										Net Total Quantity	2100.000 metre
										Say 2100.000 metre @ Rs 271.79 / metre	Rs 570759.00
24	100.14.7 Conveying and laying S&S Centrifugally Cast (Spun) / Ductile Iron Pipes conforming to IS: 8329 excluding cost of pipes and specials : 400 mm dia Ductile Iron Class K-9 Pipes Data derived from 18.72.21 in DAR										
	do to choornikkara		1	1000.000							1000.000
										Total Quantity	1000.000 metre
										Total Deducted Quantity	0.000 metre
										Net Total Quantity	1000.000 metre
										Say 1000.000 metre @ Rs 327.31 / metre	Rs 327310.00
25	100.14.9 Conveying and laying S&S Centrifugally Cast (Spun) / Ductile Iron Pipes conforming to IS: 8329										

	excluding cost of pipes and specials : 500 mm dia Ductile Iron Class K-9 Pipes Data derived from 18.72.23 in DAR							
	500 mm dia Ductile Iron Class K-9 Pipes							
	Cusat-Thoppil	1	3350.000				3350.000	
	Total Quantity						3350.000 metre	
	Total Deducted Quantity						0.000 metre	
	Net Total Quantity						3350.000 metre	
	Say 3350.000 metre @ Rs 442.43 / metre						Rs 1482140.50	
26	18.70.6 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:350 mm dia pipes							
	350 mm dia	390					390.000	
	Total Quantity						390.000 joint	
	Total Deducted Quantity						0.000 joint	
	Net Total Quantity						390.000 joint	
	Say 390.000 joint @ Rs 437.75 / joint						Rs 170722.50	
27	18.70.7 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:400 mm dia pipes							
	400 mm dia	185					185.000	
	Total Quantity						185.000 joint	
	Total Deducted Quantity						0.000 joint	
	Net Total Quantity						185.000 joint	
	Say 185.000 joint @ Rs 681.34 / joint						Rs 126047.90	
28	18.70.9 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:500 mm dia pipes							
	500 mm DI	615					615.000	
	Total Quantity						615.000 joint	
	Total Deducted Quantity						0.000 joint	
	Net Total Quantity						615.000 joint	
	Say 615.000 joint @ Rs 835.71 / joint						Rs 513961.65	
29	100.35.6 Testing 350mm DI/CI pipeline with potable water to the required test pressure. 350 mm dia							

	Observed Data derived from item no.1024 of PHED DATA							
	Testing 350mm DI	1	2100.000				2100.000	
	Total Quantity						2100.000 metre	
	Total Deducted Quantity						0.000 metre	
	Net Total Quantity						2100.000 metre	
	Say 2100.000 metre @ Rs 67.85 / metre						Rs 142485.00	
30	100.35.7 Testing 400mm DI/CI pipeline with potable water to the required test pressure. 400 mm dia Observed Data derived from item no.1026 of PHED DATA							
	Testing 400mm DI	1	1000.000				1000.000	
	Total Quantity						1000.000 metre	
	Total Deducted Quantity						0.000 metre	
	Net Total Quantity						1000.000 metre	
	Say 1000.000 metre @ Rs 85.49 / metre						Rs 85490.00	
31	100.35.9 Testing 500mm DI/CI pipeline with potable water to the required test pressure. 500 mm dia Observed Data derived from item no.1028 of PHED DATA							
	Testing 500mm DI	1	3350.000				3350.000	
	Total Quantity						3350.000 metre	
	Total Deducted Quantity						0.000 metre	
	Net Total Quantity						3350.000 metre	
	Say 3350.000 metre @ Rs 109.29 / metre						Rs 366121.50	
32	od386071/2021_2022 Welding 813 mm (ID) MS pipes for making bends and other specials by gas/electric welding machine including cost of gas and welding rods ,all labour and hire charges of tools etc. complete: For pipes fabricated with 8.00 mm thick MS plates							
	For joints	433					433.000	For two bends (before 1 No before welding and after welding)

	For making bend	2*4*4					32.000	(2 bend , before welding 1 and after welding 1	
	Total Quantity						465.000 No		
	Total Deducted Quantity						0.000 No		
	Net Total Quantity						465.000 No		
	Say 465.000 No @ Rs 3017.46 / No							Rs 1403118.90	
33	od386074/2021_2022 Cutting 813mm (OD) MS pipes for making bends and other specials by gas cutting including cost of gas, all labour and hire charges of tools etc. complete: For pipes fabricated with 8 mm thick MS plates								
	For bends	4*4					16.000		
	For joints	2					2.000		
	Total Quantity						18.000 No		
	Total Deducted Quantity						0.000 No		
	Net Total Quantity						18.000 No		
	Say 18.000 No @ Rs 788.66 / No							Rs 14195.88	
34	od386075/2021_2022 Grinding cut and weld edges of 813 mm (ID) MS pipes during fabrication work including all labour and hire charges of tools etc. complete: For pipes fabricated with 8mm thick MS plates.								
	For joints	433					433.000	For two bends (before 1 No before welding and after welding)	
	For making bend	2*4*4					32.000	(2 bend , before welding 1 and after welding 1	
	Total Quantity						465.000 No		
	Total Deducted Quantity						0.000 No		
	Net Total Quantity						465.000 No		
	Say 465.000 No @ Rs 788.66 / No							Rs 366726.90	
35	od386092/2021_2022								

	Grinding cut and weld edges of 1016mm (OD) MS pipes including all labour and hire charges of tools etc. complete: For pipes fabricated with 10mm thick MS plates.								
	For joints	466					466.000	For two bends (before 1 No before welding and after welding)	
	For making bend	2*4*4					32.000	(2 bend , before welding 1 and after welding 1	
	Total Quantity						498.000	No	
	Total Deducted Quantity						0.000	No	
	Net Total Quantity						498.000	No	
	Say 498.000 No @ Rs 713.73 / No								Rs 355437.54
36	od386094/2021_2022 Cutting 1016 mm (OD) MS pipes for making bends and other specials by gas cutting including cost of gas, all labour and hire charges of tools etc. complete: For pipes fabricated with 10mm thick MS plates.								
	For bends	4*4					16.000		
	For joints	2					2.000		
	Total Quantity						18.000	No	
	Total Deducted Quantity						0.000	No	
	Net Total Quantity						18.000	No	
	Say 18.000 No @ Rs 984.84 / No								Rs 17727.12
37	od386095/2021_2022 Grinding cut and weld edges of 1118mm (OD) MS pipes including all labour and hire charges of tools etc. complete: For pipes fabricated with 11mm thick MS plates.								
	For bends	2*4*4					32.000	1 before welding and i after welding	
	For joints	933					933.000	1 before welding and i after welding	
	Total Quantity						965.000	No	

		Total Deducted Quantity					0.000 No	
		Net Total Quantity					965.000 No	
		Say 965.000 No @ Rs 785.38 / No					Rs 757891.70	
38	od386096/2021_2022 Welding 1118 mm (OD) MS pipes by gas/electric welding machine including cost of gas and welding rods ,all labour and hire charges of tools etc. complete: For pipes fabricated with 11mm thick MS plates.							
	For bends	4*4					16.000	
	For joints	933					933.000	
							Outside welding only	
		Total Quantity					949.000 No	
		Total Deducted Quantity					0.000 No	
		Net Total Quantity					949.000 No	
		Say 949.000 No @ Rs 4188.70 / No					Rs 3975076.30	
39	od386097/2021_2022 Cutting 1118mm (OD) MS pipes for making bends and other specials by gas cutting including cost of gas, all labour and hire charges of tools etc. complete: For pipes fabricated with 11mm thick MS plates.							
	For bends	2*4					8.000	
	For joints at bend	2*1					2.000	
		Total Quantity					10.000 No	
		Total Deducted Quantity					0.000 No	
		Net Total Quantity					10.000 No	
		Say 10.000 No @ Rs 1084.01 / No					Rs 10840.10	
40	od386098/2021_2022 Welding 610 mm (ID) MS pipes for making bends and other specials by gas/electric welding machine including cost of gas and welding rods ,all labour and hire charges of tools etc. complete: For pipes fabricated with 6.30 mm thick MS plates.							
	Welding 610mm (ID) MS pipes for making bends	3*4					12.000	
	For flanges	3					3.000	
	For joints	1000					1000.000	
		Total Quantity					1015.000 No	
		Total Deducted Quantity					0.000 No	
		Net Total Quantity					1015.000 No	
		Say 1015.000 No @ Rs 2284.96 / No					Rs 2319234.40	

41	od386099/2021_2022 Grinding cut and weld edges of 610 mm (ID) MS pipes during fabrication work including all labour and hire charges of tools etc. complete: For pipes fabricated with 6.3mm thick MS plates.							
	Grinding cut and weld edges of 610 mm (OD) MS pipes							
	for bends	3*4*2					24.000	1 before welding and 1 after welding
	flanges	3*2*2					12.000	1 before welding and 1 after welding
	For joints	1000					1000.000	
	Total Quantity						1036.000 No	
	Total Deducted Quantity						0.000 No	
	Net Total Quantity						1036.000 No	
	Say 1036.000 No @ Rs 428.52 / No						Rs 443946.72	
42	od386100/2021_2022 Cutting 610mm (OD) MS pipes for making bends and other specials by gas cutting including cost of gas, all labour and hire charges of tools etc. complete: For pipes fabricated with 6.3 mm thick MS plates.							
	Cutting 610mm (OD) MS pipes for making bends and other specials							
	for flanges	3*2*2					12.000	
	" for bends	3*4					12.000	
	Total Quantity						24.000 No	
	Total Deducted Quantity						0.000 No	
	Net Total Quantity						24.000 No	
	Say 24.000 No @ Rs 603.21 / No						Rs 14477.04	
43	100.98.1009 Engaging Fitter (grade 1)							
	Fitters for operating valves and Maintenance of leakages during excavation							
	For maintenance and connections	50					50.000	
	Total Quantity						50.000 Day	
	Total Deducted Quantity						0.000 Day	
	Net Total Quantity						50.000 Day	
	Say 50.000 Day @ Rs 1162.28 / Day						Rs 58114.00	

44	100.98.1008 Engaging Coolie							
	Fitters for operating valves and Maintenance of leakages during excavation							
	For maintenance and connections	50					50.000	
	Total Quantity						50.000 Day	
	Total Deducted Quantity						0.000 Day	
	Net Total Quantity						50.000 Day	
	Say 50.000 Day @ Rs 878.76 / Day						Rs 43938.00	
45	16.81 Providing and erecting 2.00 metre high temporary barricading at site as per drawing / direction of Engineer - in - Charge which includes writing and painting, arrangement for traffic diversion such as traffic signals during construction at site for day and night, glow lamps, reflective signs, marking, flags, caution tape as directed by the Engineer - in-Charge. The barricading provided shall be retained in position at site continuously i/c shifting of barricading from one location to another location as many times as required during the execution of the entire work till its completion. Rate include its maintenance for damages, painting, all incidentals, labour materials, equipments and works required to executed the job . The barricading shall not be removed without prior approval of Engineer-in-Charge. (Note:- One time payment shall be made for providing barricading from star of work till completion of work i/c shifting. The barricading provided shall remain to be the property of the contractor on completion of the work).							
	For PIPELINE ROAD	4	10.000				40.000	
	Kalathil road	2	6.000				12.000	
	PVIP Canal bund road	2	5.000				10.000	
	Gokulam lane	2	5.000				10.000	
	Total Quantity						72.000 metre	
	Total Deducted Quantity						0.000 metre	
	Net Total Quantity						72.000 metre	
	Say 72.000 metre @ Rs 3021.08 / metre						Rs 217517.76	
46	100.32.7 Conveying and fixing C I Single acting Air Valve of approved quality with bolts,nuts,rubber insertions etc . excluding the cost of air valve(the tail pieces if required will be paid seperately): 200 mm Double acting Air Valve Observed Data derived from item no.18.59.of DAR							
	200 mm Double acting Air Valve	8					8.000	
	Total Quantity						8.000 Nos	
	Total Deducted Quantity						0.000 Nos	
	Net Total Quantity						8.000 Nos	

	Say 8.000 Nos @ Rs 449.62 / Nos							Rs 3596.96
47	100.31.1.5 "Conveying and fixing C.I. sluice valves (with cap) by providing complete with bolts, nuts, rubber insertions etc. excluding the cost of valve (the tail pieces if required will be paid separately) : 200 mm diameter. Class I" Data derived from item no.18.31.4.1 of DAR							
	200 mm CI Sluice valve	8					8.000	
	Total Quantity							8.000 Nos
	Total Deducted Quantity							0.000 Nos
	Net Total Quantity							8.000 Nos
	Say 8.000 Nos @ Rs 1557.66 / Nos							Rs 12461.28
48	100.31.1.8 "Conveying and fixing C.I. sluice valves (with cap) by providing complete with bolts, nuts, rubber insertions etc. excluding the cost of valve (the tail pieces if required will be paid separately) : 350 mm diameter. Class I" Observed Data derived from item no.18.31.of DAR							
	350 mm							
		2					2.000	
	Total Quantity							2.000 Nos
	Total Deducted Quantity							0.000 Nos
	Net Total Quantity							2.000 Nos
	Say 2.000 Nos @ Rs 3464.53 / Nos							Rs 6929.06
49	100.31.1.9 "Conveying and fixing C.I. sluice valves (with cap) by providing complete with bolts, nuts, rubber insertions etc. excluding the cost of valve (the tail pieces if required will be paid separately) : 400 mm diameter. Class I" Observed Data derived from item no.18.31.of DAR							
	400 mm diameter. Class							
		2					2.000	
	Total Quantity							2.000 Nos
	Total Deducted Quantity							0.000 Nos
	Net Total Quantity							2.000 Nos
	Say 2.000 Nos @ Rs 4576.37 / Nos							Rs 9152.74
50	100.31.1.11 Conveying and fixing C.I. sluice valves (with cap) by providing complete with bolts, nuts, rubber insertions etc. excluding the cost of valve (the tail pieces if required will be paid separately) : 500 mm diameter. Class I"							

	Observed Data derived from item no.18.31.of DAR							
	500 mm diameter. Class I"							
		2					2.000	
	Total Quantity						2.000 Nos	
	Total Deducted Quantity						0.000 Nos	
	Net Total Quantity						2.000 Nos	
	Say 2.000 Nos @ Rs 6674.76 / Nos						Rs 13349.52	
51	100.31.1.13 Conveying and fixing C.I. sluice valves (with cap) by providing complete with bolts, nuts, rubber insertions etc. excluding the cost of valve (the tail pieces if required will be paid separately) : 700 mm diameter. Class I" Observed Data derived from item no.18.31.of DAR							
		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 11732.16 / Nos						Rs 11732.16	
52	100.31.1.14 Conveying and fixing C.I. sluice valves (with cap) by providing complete with bolts, nuts, rubber insertions etc. excluding the cost of valve (the tail pieces if required will be paid separately) : 750 mm diameter. Class I" Observed Data derived from item no.18.31.of DAR							
		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 12846.45 / Nos						Rs 12846.45	
53	100.31.1.12 "Conveying and fixing C.I. sluice valves (with cap) by providing complete with bolts, nuts, rubber insertions etc. excluding the cost of valve (the tail pieces if required will be paid separately) : 600 mm diameter. Class I" Observed Data derived from item no.18.31.of DAR							
	600 mm CI D/F Sluice	1*3					3.000	
	Total Quantity						3.000 Nos	
	Total Deducted Quantity						0.000 Nos	
	Net Total Quantity						3.000 Nos	

	Say 3.000 Nos @ Rs 8700.67 / Nos						Rs 26102.01	
54	100.31.1.17 Conveying and fixing C.I. sluice valves (with cap) by providing complete with bolts, nuts, rubber insertions etc. excluding the cost of valve (the tail pieces if required will be paid separately) : 1000 mm diameter. Class I" Observed Data derived from item no.18.31.of DAR							
	Conveying and fixing C.I. D/F sluice valves 1000 mm diameter. Class I"							
	1000 mm diameter. Class I"	2					2.000	
	Total Quantity						2.000 Nos	
	Total Deducted Quantity						0.000 Nos	
	Net Total Quantity						2.000 Nos	
	Say 2.000 Nos @ Rs 22916.97 / Nos						Rs 45833.94	
55	od386105/2021_2022 Conveying and fixing C.I. sluice valves (with cap) by providing complete with bolts, nuts, rubber insertions etc. excluding the cost of valve (the tail pieces if required will be paid separately) :1400 mm diameter. Class I"							
	sluice valves 1400 mm diameter.	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 28492.65 / No						Rs 28492.65	
56	od386106/2021_2022 Conveying and fixing C.I. sluice valves (with cap) by providing complete with bolts, nuts, rubber insertions etc. excluding the cost of valve (the tail pieces if required will be paid separately) :1100 mm diameter. Class I"							
	Conveying and fixing C.I. sluice valves 1100 mm	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 21197.38 / No						Rs 42394.76	
57	od386109/2021_2022 Providing flanged joints to double flanged MS pipes and specials, including testing of joints, 1016mm Diameter Pipe							

	Providing flanged joints to double flanged MS Pipes	2*2					4.000	start point -1, Endpoint -1No., Valve Joint-2Nos.
	Total Quantity						4.000 No	
	Total Deducted Quantity						0.000 No	
	Net Total Quantity						4.000 No	
	Say 4.000 No @ Rs 4493.47 / No						Rs 17973.88	
58	od386110/2021_2022 Providing flanged joints to double flanged CI/DI pipes and specials, including testing of joints, 1118mm Diameter Pipe							
	Providing flanged joints to double flanged MS Pipes	2*2					4.000	N= 300/6
	Total Quantity						4.000 No	
	Total Deducted Quantity						0.000 No	
	Net Total Quantity						4.000 No	
	Say 4.000 No @ Rs 4892.18 / No						Rs 19568.72	
59	od386111/2021_2022 Providing flanged joints to double flanged CI/DI pipes and specials, including testing of joints: 1422 mm Diameter Pipe							
	Providing flanged joints to double flanged MS pipes and specials	7					7.000	for valve 2Nos+ Joints -5 nos toatl-7 nos.
	Total Quantity						7.000 No	
	Total Deducted Quantity						0.000 No	
	Net Total Quantity						7.000 No	
	Say 7.000 No @ Rs 5873.43 / No						Rs 41114.01	
60	od386112/2021_2022 Testing 1400 mm MS pipeline with potable water to the required test pressure. 							
	Testing 1219 mm MS pipeline with potable water	1	5600.000				5600.000	55m for bend fabricated length

									Total Quantity	5600.000 metre
									Total Deducted Quantity	0.000 metre
									Net Total Quantity	5600.000 metre
									Say 5600.000 metre @ Rs 383.17 / metre	Rs 2145752.00
61	od386113/2021_2022 Testing 1050 mm MS pipeline with potable water to the required test pressure. 									
	Testing 1000 mm MS pipeline with potable water									
	Testing 1000 mm MS pipeline with potable water	1	2800.000						2800.000	6m for bend length
									Total Quantity	2800.000 metre
									Total Deducted Quantity	0.000 metre
									Net Total Quantity	2800.000 metre
									Say 2800.000 metre @ Rs 251.58 / metre	Rs 704424.00
62	od386114/2021_2022 Testing 1118 mm MS pipeline with potable water to the required test pressure.									
	813 mm MS Pipe	1	2600.000						2600.000	6 m bend length
									Total Quantity	2600.000 metre
									Total Deducted Quantity	0.000 metre
									Net Total Quantity	2600.000 metre
									Say 2600.000 metre @ Rs 258.91 / metre	Rs 673166.00
63	od386115/2021_2022 Providing and fixing Pressure gauge (BIS Standard dial range minimum 0-10 kg/cm2 least count 0.10kg/cm2 or nearest) in 1422 mm MS pipe line including making hole in 18 mm MS sheet and welding the connection bolt and accessories etc., including providing a standard metal box cover (3mm thick) to protect the gauge and with openable door so as to to suit the box and the display dial all cost and conveyance charges etc complete as per directions.									
		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 8255.48 / No	Rs 16510.96
64	od386116/2021_2022 Providing and fixing Pressure gauge (BIS Standard dial range minimum 0-10 kg/cm2 least count 0.10kg/cm2 or nearest) in 610 mm MS pipe line including making hole in 6.3 mm MS sheet and welding the connection bolt and accessories etc., including providing a standard metal box cover (3mm thick) to									

	protect the gauge and with openable door so as to to suit the box and the display dial all cost and conveyance charges etc. complete as per directions. 						
	610 mm MS pipe	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 7605.04 / set						Rs 7605.04
65	od386117/2021_2022 Providing and fixing Pressure gauge (BIS Standard dial range minimum 0-10 kg/cm2 least coont 0.10kg/cm2 or nearest) in 1016mm MS pipe line including making hole in 10 mm MS sheet and welding the connection bolt and accessories etc., including providing a standard metal box cover (3mm thick) to protect the gauge and with openable door so as to to suit the box and the display dial all cost and conveyance charges etc. complete as per directions.						
	1016mm MS pipe	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 8023.18 / set						Rs 8023.18
66	od386118/2021_2022 Supplying 900 mm Electro magnetic flow meter conforming to protection level of IP -68 for flow sensor and IP -67 for transmitter and having ab accuracy level of 0.5% with LED/LCD Display unit . The flow meter should have the housing (flow sensor) to made of SS 304/ Carbon steel with anti corrosive protection and inside liner to be made up of Hard rubber / neoprene all conforming to drinking water standards. The flow meter should be coupled with HART for data acquisition and transfer , with provision for wireless transfer through GSM. The manufactures should have the calibration standards as per ISO 17025 and the product shall have sufficient warranty provisions etc complete . as per directions						
		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 539853.58 / No						Rs 539853.58
67	od386119/2021_2022 Supplying 350 mm Electro magnetic flow meter conforming to protection level of IP -68 for flow sensor and IP -67 for transmitter and having ab accuracy level of 0.5% with LED/LCD Display unit . The flow meter should have the housing (flow sensor) to made of SS 304/ Carbon steel with anti corrosive protection and inside liner to be made up of Hard rubber / neoprene all conforming to drinking water standards. The flow meter should be coupled with HART for data acquisition and transfer , with provision for wireless transfer through GSM. The manufactures should have the calibration standards as per ISO 17025 and the product shall have sufficient warranty provisions etc complete . as per directions						

		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 333060.12 / No						Rs 333060.12	
68	od386120/2021_2022 Supplying 400 mm Electro magnetic flow meter conforming to protection level of IP -68 for flow sensor and IP -67 for transmitter and having an accuracy level of 0.5% with LED/LCD Display unit . The flow meter should have the housing (flow sensor) to be made of SS 304/ Carbon steel with anti corrosive protection and inside liner to be made up of Hard rubber / neoprene all conforming to drinking water standards. The flow meter should be coupled with HART for data acquisition and transfer , with provision for wireless transfer through GSM. The manufacturer should have the calibration standards as per ISO 17025 and the product shall have sufficient warranty provisions etc complete . as per directions							
		2					-2.000	
	Total Quantity						0.000 No	
	Total Deducted Quantity						-2.000 No	
	Net Total Quantity						-2.000 No	
	Say -2.000 No @ Rs 362794.53 / No						Rs -725589.06	
69	od386121/2021_2022 Supplying 500 mm Electro magnetic flow meter conforming to protection level of IP -68 for flow sensor and IP -67 for transmitter and having an accuracy level of 0.5% with LED/LCD Display unit . The flow meter should have the housing (flow sensor) to be made of SS 304/ Carbon steel with anti corrosive protection and inside liner to be made up of Hard rubber / neoprene all conforming to drinking water standards. The flow meter should be coupled with HART for data acquisition and transfer , with provision for wireless transfer through GSM. The manufacturer should have the calibration standards as per ISO 17025 and the product shall have sufficient warranty provisions etc complete . as per directions							
		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 426096.28 / No						Rs 426096.28	
70	od386122/2021_2022 Supplying 600 mm Electro magnetic flow meter conforming to protection level of IP -68 for flow sensor and IP -67 for transmitter and having an accuracy level of 0.5% with LED/LCD Display unit . The flow meter should have the housing (flow sensor) to be made of SS 304/ Carbon steel with anti corrosive protection and inside liner to be made up of Hard rubber / neoprene all conforming to drinking water standards. The flow meter should be coupled with HART for data acquisition and transfer , with provision for wireless transfer through GSM. The manufacturer should have the calibration standards as per ISO 17025 and the product shall have sufficient warranty provisions etc complete . as per directions							

		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 448757.14 / No						Rs 448757.14	
71	od386123/2021_2022 Supplying 1000 mm Electro magnetic flow meter conforming to protection leve of IP -68 for flow sensor and IP -67 for transmitter and having ab accuracy level of 0.5% with LED/LCD Display unit . The flow meter should have the housing (flow sensor) to made of SS 304/ Carbon steel with anti corrosive protection and inside liner to be made up of Hard rubber / neoprene all conforming to drinking water standards. The flow meter should be coupled with HART for data acquisition and transfer , with provision for wireless transfer through GSM. The manufactures should have the calibration standards as per ISO 17025 and the product shall have sufficient warranty provisions etc complete . as per directions							
		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 626838.32 / No						Rs 626838.32	
72	od386124/2021_2022 Supplying 1200 mm Electro magnetic flow meter conforming to protection level of IP -68 for flow sensor and IP -67 for transmitter and having ab accuracy level of 0.5% with LED/LCD Display unit . The flow meter should have the housing (flow sensor) to made of SS 304/ Carbon steel with anti corrosive protection and inside liner to be made up of Hard rubber / neoprene all conforming to drinking water standards. The flow meter should be coupled with HART for data acquisition and transfer , with provision for wireless transfer through GSM. The manufactures should have the calibration standards as per ISO 17025 and the product shall have sufficient warranty provisions etc complete . as per directions							
		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 714148.28 / No						Rs 714148.28	
73	od386125/2021_2022 Supplying 1100 mm Electro magnetic flow meter conforming to protection level of IP -68 for flow sensor and IP -67 for transmitter and having ab accuracy level of 0.5% with LED/LCD Display unit . The flow meter should have the housing (flow sensor) to made of SS 304/ Carbon steel with anti corrosive protection and inside liner to be made up of Hard rubber / neoprene all conforming to drinking water standards. The flow meter should be coupled with HART for data acquisition and transfer , with provision for wireless transfer through GSM. The manufactures should have the calibration standards as per ISO 17025 and the product shall have sufficient warranty provisions etc complete . as per directions							

		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 678780.60 / No						Rs 678780.60	
74	od386126/2021_2022 :Providing and fixing Pressure gauge (BIS Standard dial range minimum 0-10 kg/cm2 least count 0.10kg/cm2 or nearest) in 810 mm MS pipe line including making hole in 8 mm MS sheet and welding the connection bolt and accessories etc., including providing a standard metal box cover (3mm thick) to protect the gauge and with openable door so as to to suit the box and the display dial all cost and conveyance charges etc. complete as per directions.							
	810 mm MS pipe	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 7802.51 / set						Rs 7802.51	
Sl No	Description	No	L	B	D	CF	Quantity	Remark
3Construction of Valve Chamber (Cost Index:35.59 %)								
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							
	Earth work in excavation							
	Earth work in excavation for vane 1000 mm	2	3.200	3.200	1.600		32.769	2.4x2.4x2.5
	For 1200 mm	1	3.700	3.700	1.600		21.905	3x3x2.5
	600 mm	3	2.100	2.100	1.600		21.169	1.5x1.5x2.5
	750 mm	1	2.100	2.100	1.600		7.057	do
	500 mm	1	2.100	2.100	1.600		7.057	do
	400 mm	2	2.100	2.100	1.600		14.113	do
	350 MM	1	2.100	2.100	1.600		7.057	do
	200 mm Air valve	8	2.100	2.100	1.600		56.449	do
	Total Quantity						167.576 cum	
	Total Deducted Quantity						0.000 cum	

	Net Total Quantity						167.576 cum	
	Say 167.576 cum @ Rs 296.94 / cum						Rs 49760.02	
2	<p>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)</p>							
	Earth work in excavation							
	Earth work in excavation for vane 1000 mm	2	3.200	3.200	1.100		22.529	2.4x2.4x2.5
	For s1200 mm	1	3.700	3.700	1.100		15.060	3x3x2.5
	600 mm	3	2.100	2.100	1.100		14.554	1.5x1.5x2.5
	750 mm	1	2.100	2.100	1.100		4.852	do
	500 mm	1	2.100	2.100	1.100		4.852	do
	400 mm	2	2.100	2.100	1.100		9.703	do
	350 mm	1	2.100	2.100	1.100		4.852	do
	200 mm	8	2.100	2.100	1.100		38.809	do
	Total Quantity						115.211 cum	
	Total Deducted Quantity						0.000 cum	
	Net Total Quantity						115.211 cum	
	Say 115.211 cum @ Rs 661.88 / cum						Rs 76255.86	
3	<p>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)</p>							
	P C C1:3:6							
	P C C1:3:6 for vane 1000 mm	2	3.200	3.200	0.100		2.049	2.4x2.4x2.5
	For s1200 mm	1	3.700	3.700	0.100		1.370	3x3x2.5
	600 mm	3	2.100	2.100	0.100		1.324	1.5x1.5x2.5
	750 mm	1	2.100	2.100	0.100		0.442	do

	500 mm	1	2.100	2.100	0.100		0.442	do	
	400 mm	2	2.100	2.100	0.100		0.883	do	
	350	1	2.100	2.100	0.100		0.442	do	
	200 mm	8	2.100	2.100	0.100		3.529	do	
	Total Quantity						10.481 cum		
	Total Deducted Quantity						0.000 cum		
	Net Total Quantity						10.481 cum		
	Say 10.481 cum @ Rs 7211.15 / cum							Rs 75580.06	
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)								
	reinforced cement concrete bootom								
	reinforced cement concrete for bottom	2	2.800	3.200	0.200		3.584	2.4x2.4x2.5	
	For s1200 mm	1	3.400	3.700	0.200		2.516	3x3x2.5	
	600 mm	3	1.900	2.100	0.200		2.394	1.5x1.5x2.5	
	500 mm	1	1.900	2.100	0.200		0.798	do	
	400 mm	2	1.900	2.100	0.200		1.596	do	
	350 mm	1	1.900	2.100	0.200		0.798	do	
	200 mm	8	1.900	2.100	0.200		6.384	do	
	Total Quantity						18.070 cum		
	Total Deducted Quantity						0.000 cum		
	Net Total Quantity						18.070 cum		
	Say 18.070 cum @ Rs 8588.47 / cum							Rs 155193.65	
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)								
	reinforced cement concrete cover slab								
	reinforced cement concrete for ccover slab	2	2.800	3.200	0.200		3.584	2.4x2.4x2.5	
	For s1200 mm	1	3.400	3.700	0.200		2.516	3x3x2.5	

	600 mm	3	1.900	2.100	0.200		2.394	1.5x1.5x2.5	
	500 mm	1	1.900	2.100	0.200		0.798	do	
	450 mm	2	1.900	2.100	0.200		1.596	do	
	350	1	1.900	2.100	0.200		0.798	do	
	200 mm	8	1.900	2.100	0.200		6.384	do	
	Deductios								
		18*.25	3.140	.6*.6	0.200		-1.017		
	Total Quantity							18.070 cum	
	Total Deducted Quantity							-1.017 cum	
	Net Total Quantity							17.053 cum	
	Say 17.053 cum @ Rs 9085.14 / cum							Rs 154928.89	
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)								
	reinforced cement concrete								
	reinforced cement concrete for side walls	2*4	2.600	0.200	2.500		10.400	2.4x2.4x2.5	
	For s1200 mm	1*4	3.200	0.200	2.500		6.401	3x3x2.5	
	600 mm	3*4	3.200	0.200	2.500		19.201	1.5x1.5x2.5	
	500 mm	1*4	1.700	0.200	2.500		3.401	do	
	400 mm	2*4	1.700	0.200	2.500		6.801	do	
	350 mm	1*4	1.700	0.200	2.500		3.401	do	
	200 mm	8*4	1.700	0.200	2.500		27.201	do	
	For pipes 1200 mm	2*2	1.25*1.28	3.141	0.200	0.25	-1.005		
	do 1000 mm	1*2	1.2*1.2	3.141	0.200	0.25	-0.452		
	do 600 mm	3*2	.6*.6	3.141	0.200	0.25	-0.339		
	Total Quantity							76.806 cum	
	Total Deducted Quantity							-1.796 cum	
	Net Total Quantity							75.010 cum	
	Say 75.010 cum @ Rs 10954.04 / cum							Rs 821662.54	
7	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.							
	reinforced cement concrete							
	reinforced cement concrete for side walls out side	2*4	2.825		2.700		61.021	2.4x2.4x2.5
	do inside walls	2*4	2.375		2.500		47.500	2.4x2.4x2.5
	For s1200 mm out side	1*4	3.425		2.700		36.990	3x3x2.5
	do inside walls	1*4	2.975		2.500		29.750	1.5x1.5x2.5
	600 mm out side	3*4	1.925		2.700		62.371	1.5x1.5x2.5
	do inside walls	3*4	1.475		2.500		44.250	do
	500 mm out side	1*4	1.525		2.700		16.470	do
	do inside walls	1*4	1.525		2.500		15.250	do
	400 mm out side	2*4	1.525		2.700		32.940	do
	do inside walls	2*4	1.525		2.500		30.500	do
	350 mm out side	1*4	1.525		2.700		16.470	do
	do inside walls	1*4	1.525		2.500		15.250	do
	200 mm out side	5*4	1.525		2.700		82.350	do
	do inside walls	5*4	1.475		2.500		73.750	
	Total Quantity						564.862 sqm	
	Total Deducted Quantity						0.000 sqm	
	Net Total Quantity						564.862 sqm	
	Say 564.862 sqm @ Rs 717.20 / sqm						Rs 405119.03	
8	5.9.3 Centering and shuttering including strutting, etc. and removal of form for:Suspended floors, roofs, landings, balconies and access platform							
	reinforced cement concrete cover slab bottom							
	reinforced cement concrete for ccover slab	2	2.400	2.400			11.520	2.4x2.4x2.5
	For 1200 mm	1	3.000	3.000			9.000	3x3x2.5

	For 600 mm	3	1.900	1.500			8.550	1.5x1.5x2.5	
	For 500 mm	1	1.900	1.500			2.850	do	
	For 400 mm	2	1.900	1.500			5.700	do	
	For 350 mm	1	1.900	1.500			2.850	do	
	200 mm	8	1.900	1.500			22.800	do	
	Total Quantity						63.270 sqm		
	Total Deducted Quantity						0.000 sqm		
	Net Total Quantity						63.270 sqm		
	Say 63.270 sqm @ Rs 815.78 / sqm						Rs 51614.40		
9	5.9.16.1 Centering and shuttering including strutting, etc. and removal of form for:Edges of slabs and breaks in floors and wallsUnder 20 cm wide								
	cover slab								
	Edges for 1000 mm	2*4	2.825				22.600	2.4x2.4x2.5	
	For s1200 mm	1*4	3.425				13.700	3x3x2.5	
	600 mm	3*4	1.925				23.100	1.5x1.5x2.5	
	500 mm	1*4	1.925				7.700	do	
	400 mm	2*4	1.925				15.400	do	
	350 mm	1*4	1.925				7.700	do	
	200 mm	8*4	1.925				61.600	do	
	Total Quantity						151.800 metre		
	Total Deducted Quantity						0.000 metre		
	Net Total Quantity						151.800 metre		
	Say 151.800 metre @ Rs 203.93 / metre						Rs 30956.57		
10	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								
	Steel reinforcement for R.C.C work								
	Qty as per item no-4,5&6	1	110.130			90.0	9911.700	Reinforcement @90kg/m ³	
	Total Quantity						9911.700 kilogram		

							Total Deducted Quantity	0.000 kilogram
							Net Total Quantity	9911.700 kilogram
							Say 9911.700 kilogram @ Rs 98.30 / kilogram	Rs 974320.11
11	2.16.2 Close timbering in trenches including strutting, shoring and packing cavities (wherever required) complete (Measurements to be taken of the face area timbered).Depth exceeding 1.5 m but not exceeding 3 m							
	280x280x270- Valve chamber	4*2	2.800		2.700		60.480	2 sides only
	340x340x270 mm Valve chamber	1	3.400		2.700		9.180	2 sides only
	190x190x270 --valve-scoure	3	1.900		2.700		15.390	2 sides only
	210x210x210 -for Air valves	8	2.100		2.700		45.361	2 sides only
							Total Quantity	130.411 sqm
							Total Deducted Quantity	0.000 sqm
							Net Total Quantity	130.411 sqm
							Say 130.411 sqm @ Rs 166.17 / sqm	Rs 21670.40
12	od386076/2021_2022 Supplying and fixing C.I frame for manholes: 560 mm diameter (heavy duty) the weight of the cover to be not less than 108 kg							
		19					19.000	
							Total Quantity	19.000 No
							Total Deducted Quantity	0.000 No
							Net Total Quantity	19.000 No
							Say 19.000 No @ Rs 10527.85 / No	Rs 200029.15
SI No	Description	No	L	B	D	CF	Quantity	Remark
4Anchor Blocks (Cost Index:35.59 %)								
1	2.2.1 Earth work in rough excavation, banking excavated earth in layers not exceeding 20 cm in depth, breaking clods, watering, rolling each layer with 1/2 tonne roller or wooden or steel rammers, and rolling every 3rd and top-most layer with power roller of minimum 8 tonnes and dressing up in embankments for roads, flood banks, marginal banks and guide banks or filling up ground depressions, lead up to 50 m and lift up to 1.5 m:All kinds of soil							
Earth work in rough excavation								

	Blocks-2300x2300mm for 1016 and 1118 mm MS	5	2.300	2.300	2.500		66.125	
	Blocks-2700x2700mm for 1422 mm MS	18	2.700	2.700	2.700		354.295	
	Blocks-1350x1350mm for 600 mm MS	12	1.350	1.350	1.350		29.525	
	Blocks-1250x1250mm for 500 mm DI	6	1.250	1.250	1.250		11.719	
	Blocks-1050x1050mm for 400 mm DI	3	1.050	1.050	1.050		3.473	
	Blocks-1050x1050mm for 350 mm DI	4	0.900	0.900	0.900		2.917	
Deduction for trench								
	Blocks-2300x2300mm	5	2.300	2.300	2.000		-52.899	
	Blocks-2700x2700mm	18	2.600	2.600	2.500		-304.200	
	600 mm	8	.6*.6	3.141	1.550	0.25	-3.505	
	500 mm	4	.5*.5	3.141	1.450	0.25	-1.138	
	400 mm	3	.4*.4	3.141	1.350	0.25	-0.508	
	350 mm	4	.3*.3	3.141	1.300	0.25	-0.367	
Total Quantity							468.054 cum	
Total Deducted Quantity							-362.617 cum	
Net Total Quantity							105.437 cum	
Say 105.437 cum @ Rs 879.03 / cum							Rs 92682.29	
2	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)							
	Blocks-2300x2300mm for 1000 and 1100 mm MS	5	2.300	2.300	2.450		64.803	
	Blocks-2700x2700mm for 1450 mm MS	18	2.700	2.700	2.700		354.295	
Deduct pipe volume								
	Blocks-2300x2300mm	5	2.300	1.118*1.1 18		0.79	-11.355	3.14/4=0.7 85 (0.79)

	Blocks-2700x2700mm	18	2.700	1.422*1.4 22		0.79	-77.635	
	Total Quantity						419.098 cum	
	Total Deducted Quantity						-88.990 cum	
	Net Total Quantity						330.108 cum	
	Say 330.108 cum @ Rs 8588.47 / cum						Rs 2835122.65	
3	5.9.1 Centering and shuttering including strutting, etc. and removal of form for:Foundations, footings, bases of columns, etc for mass concrete							
	Blocks-2300x2300mm	5*4	2.300		2.450		112.700	
	Blocks-2700x2700mm	18*4	2.700		2.700		524.881	
	Total Quantity						637.581 sqm	
	Total Deducted Quantity						0.000 sqm	
	Net Total Quantity						637.581 sqm	
	Say 637.581 sqm @ Rs 335.31 / sqm						Rs 213787.29	
4	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							
	Steel reinforcement for R.C.C work							
	Qty as per item	1	136.102		100.0	13610.200	339m3 @70kg/m 3	
	Total Quantity						13610.200 kilogram	
	Total Deducted Quantity						0.000 kilogram	
	Net Total Quantity						13610.200 kilogram	
	Say 13610.200 kilogram @ Rs 98.30 / kilogram						Rs 1337882.66	
SI No	Description	No	L	B	D	CF	Quantity	Remark
5ROAD CROSSING PUSH THROUGH METHOD (Cost Index:35.59 %)								
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							
	For Push pit - 1626mm Casin pipe -4 Crossings	4	6.000	4.000	1.500		144.000	
	For target pit "	4	4.000	4.000	1.500		96.000	

	For Push pit - 914mm Casin pipe -1Crossing	1	5.000	3.000	1.500		22.500		
	For target pit "	1	4.000	3.000	1.500		18.000		
	Total Quantity						280.500 cum		
	Total Deducted Quantity						0.000 cum		
	Net Total Quantity						280.500 cum		
	Say 280.500 cum @ Rs 214.03 / cum						Rs 60035.42		
2	2.7.1 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. Ordinary rock								
	For Push pit - 1626mm Casin pipe -4 Crossings	4	6.000	4.000	2.100		201.601		
	For target pit "	4	4.000	4.000	2.100		134.400		
	For Push pit - 914mm Casin pipe -1Crossing	1	5.000	3.000	1.200		18.000		
	For target pit "	1	4.000	3.000	1.200		14.400		
	Total Quantity						368.401 cum		
	Total Deducted Quantity						0.000 cum		
	Net Total Quantity						368.401 cum		
	Say 368.401 cum @ Rs 414.84 / cum						Rs 152827.47		
3	2.26.2 Extra for every additional lift 1.5 m or part there of in excavation / banking excavated or stacked materials. Ordinary or hard rock								
	2nd lift (1.50 to 3.00) For push pit (1626mm)	4	6.000	4.000	1.500		144.000		
	3rd lift (3.00 to 4.50) For push pit "	4	6.000	4.000	0.600	2.0	115.200	rate increased 2 times	
	2nd lift (1.50 to 3.00) For target pit "	4	5.000	4.000	1.500		120.000		
	3rd lift (3.00 to 4.50) For target pit "	4	5.000	4.000	0.600	2.0	96.000	rate increased 2 times	

	2nd lift (1.50 to 3.00) For push pit (914 mm)	4	5.000	3.000	1.200		72.000	rate increased 3 times	
	2nd Lift (4.50 to 6.00) For target pit "	4	5.000	3.000	1.200		72.000	rate increased 3 times	
	Total Quantity						619.200 cum		
	Total Deducted Quantity						0.000 cum		
	Net Total Quantity						619.200 cum		
	Say 619.200 cum @ Rs 190.78 / cum							Rs 118130.98	
4	<p>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.</p>								
	For Push pit - 1626mm Casin pipe -4 Crossings	4	16.000		3.600		230.400		
	For target pit "	4	12.000		3.600		172.800		
	For Push pit - 914mm Casin pipe -1Crossing	1	13.000		2.700		35.100		
	For target pit "	1	11.000		2.700		29.701		
	Total Quantity						468.001 sqm		
	Total Deducted Quantity						0.000 sqm		
	Net Total Quantity						468.001 sqm		
	Say 468.001 sqm @ Rs 749.13 / sqm							Rs 350593.59	
5	<p>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</p>								
	For Push pit - 1626mm Casin pipe -4 Crossings	4	16.000				64.000		
	For target pit "	4	12.000				48.000		

	For Push pit - 914mm Casin pipe -1Crossing	1	13.000				13.000	
	For target pit "	1	11.000				11.000	
	Total Quantity						136.000 metre	
	Total Deducted Quantity						0.000 metre	
	Net Total Quantity						136.000 metre	
	Say 136.000 metre @ Rs 96.33 / metre						Rs 13100.88	
6	<p>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)</p>							
	For Push pit - 1626mm Casin pipe -4 Crossings	4	6.000	4.000	0.200		19.201	
	For target pit "	4	4.000	4.000	0.200		12.800	
	For Push pit - 914mm Casin pipe -1Crossing	1	5.000	3.000	0.200		3.000	
	For target pit "	1	4.000	3.000	0.200		2.401	
	Total Quantity						37.402 cum	
	Total Deducted Quantity						0.000 cum	
	Net Total Quantity						37.402 cum	
	Say 37.402 cum @ Rs 7990.86 / cum						Rs 298874.15	
7	<p>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)</p>							
	For push pit and target pits	5	597.000				2985.000	20days x8x5*.746 =596.80 say 597
	Total Quantity						2985.000 Kwh	
	Total Deducted Quantity						0.000 Kwh	
	Net Total Quantity						2985.000 Kwh	
	Say 2985.000 Kwh @ Rs 18.44 / Kwh						Rs 55043.40	
8	<p>od386072/2021_2022 Providing 1626mm (OD) 16 mm thick factory made MS casing pipe for crossing road / canal/culvert etc in different places of Pipeline road by Push through method after conveying the pipe from initial lead and</p>							

	insert through the bored holes below road surface through the alignment of the new pipe line without affecting the passage of traffic in the road by ramming the casing pipe , excavation of push pit and target pit concreting paid seperately, ,hire and labour for suitable capacity crane for handling the pipe , placing the pipe in the pushing pit , pushing the pipes by using hydraulic jack by one by one and welding the pipes in line and levels,cleaning inside the pipe after completion of the work by water jetting , compressed air, or the combination of both and manual labour etc. complete including conveyance of MS Pipe, hire and labour for all machinery and equipment, cost of fuel, lighting,watching,fencing, pay and allowance of all technical and non-technical hands involved in the work etc.complete as per the direction of departmental officers								
	Crossing at St: Marys HS Jn.	1	35.000					35.000	
	" SH 16 At Aluva Press Jn.	1	35.000					35.000	
	NAD Road Crossing	1	30.000					30.000	
	HMT .Road Crossing Near Thoshiba Jn.	1	30.000					30.000	
	Total Quantity							130.000 metre	
	Total Deducted Quantity							0.000 metre	
	Net Total Quantity							130.000 metre	
	Say 130.000 metre @ Rs 21784.81 / metre							Rs 2832025.30	
9	od386073/2021_2022 Providing 914 mm (OD) 10 mm thick factory made MS casing pipe for crossing road / canal/culvert etc in different places of Pipeline road by Push through method after conveying the pipe from initial lead and insert through the bored holes below road surface through the alignment of the new pipe line without affecting the passage of traffic in the road by ramming the casing pipe , excavation of push pit and target pit concreting paid seperately, ,hire and labour for suitable capacity crane for handling the pipe , placing the pipe in the pushing pit , pushing the pipes by using hydraulic jack by one by one and welding the pipes in line and levels,cleaning inside the pipe after completion of the work by water jetting , compressed air, or the combination of both and manual labour etc. complete including conveyance of MS Pipe, hire and labour for all machinery and equipment, cost of fuel, lighting,watching,fencing, pay and allowance of all technical and non-technical hands involved in the work etc.complete as per the direction of departmental officers								
	Crossing in Pookattupady Road	1	30.000					30.000	
	Total Quantity							30.000 metre	
	Total Deducted Quantity							0.000 metre	
	Net Total Quantity							30.000 metre	
	Say 30.000 metre @ Rs 16016.80 / metre							Rs 480504.00	
SI No	Description	No	L	B	D	CF	Quantity	Remark	
6INTERCONNECTION WORKS (Cost Index:35.59 %)									

1	<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>							
	At plant- 400 mm DI	2	2.500	1.500	1.500		11.250	1 at Plant site and 1 at Nirmala Jn.
		1	3.000	1.800	1.700		9.180	
		1	3.000	2.500	2.300		17.250	
	AT NAD Junction	1	3.500	3.500	2.300		28.175	
	AT CUSAT Tank 500 mm DI	1	2.500	1.800	1.600		7.200	
	Total Quantity						73.055 cum	
	Total Deducted Quantity						0.000 cum	
	Net Total Quantity						73.055 cum	
	Say 73.055 cum @ Rs 555.51 / cum						Rs 40582.78	
2	<p>2.26.1 Extra for every additional lift 1.5 m or part there of in excavation / banking excavated or stacked materials. All kinds of soil</p>							
	" 600 mm MS	1	3.000	1.800	0.200		1.080	
	" 1219 mm MS	1	3.000	2.500	0.800		6.000	
	AT NAD Junction	1	3.500	3.500	0.800		9.800	
	AT CUSAT Tank 500 mm DI	1	2.500	1.800	0.100		0.450	
	Total Quantity						17.330 cum	
	Total Deducted Quantity						0.000 cum	
	Net Total Quantity						17.330 cum	
	Say 17.330 cum @ Rs 106.37 / cum						Rs 1843.39	
3	<p>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)</p>							

	At plant- 400 mm DI	2	6.500			13.000	1 at Plant site and 1 at Nirmala Jn.	
	" 600 mm MS	1	7.800			7.800		
	" 1219 mm MS	1	8.500			8.500		
	AT NAD Junction	1	10.500			10.500		
	AT CUSAT Tank 500 mm DI	1	6.800			6.800		
	Total Quantity					46.600 metre		
	Total Deducted Quantity					0.000 metre		
	Net Total Quantity					46.600 metre		
	Say 46.600 metre @ Rs 96.33 / metre					Rs 4488.98		
4	<p>100.7.1 Bailing out water with 5 HP engine and pumpset including conveyance to the site, erection, dismantling and taking back of engine and pump, cost of fuel lubricating oil and other stores pay of staff etc. complete. NEW DATA (Prepared based on PHED SDB - Item No.1070)</p>							
		1	2450.000			2450.000		
	Total Quantity					2450.000 Kwh		
	Total Deducted Quantity					0.000 Kwh		
	Net Total Quantity					2450.000 Kwh		
	Say 2450.000 Kwh @ Rs 36.95 / Kwh					Rs 90527.50		
5	<p>od386067/2021_2022 Providing steel sheet shoring to the sides of the trenches to depths up to 3.00 m 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.</p>							
	At plant- 400 mm DI	2	5.000		1.500	15.000	2 sides of trench	
	" 600 mm MS	1	6.000		1.700	10.200		
	" 1219 mm MS	1	6.000		2.300	13.800		
	AT NAD Junction	1	7.000		2.300	16.100		

	AT CUSAT Tank 500 mm DI	1	5.000		1.600		8.000	
	Total Quantity						63.100 sqm	
	Total Deducted Quantity						0.000 sqm	
	Net Total Quantity						63.100 sqm	
	Say 63.100 sqm @ Rs 377.24 / sqm						Rs 23803.84	
6	od386071/2021_2022 Welding 813 mm (ID) MS pipes for making bends and other specials by gas/electric welding machine including cost of gas and welding rods ,all labour and hire charges of tools etc. complete: For pipes fabricated with 8.00 mm thick MS plates							
	For making specials	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 3017.46 / No						Rs 12069.84	
7	od386074/2021_2022 Cutting 813mm (OD) MS pipes for making bends and other specials by gas cutting including cost of gas, all labour and hire charges of tools etc. complete: For pipes fabricated with 8 mm thick MS plates							
	For making specials	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 788.66 / No						Rs 3154.64	
8	od386075/2021_2022 Grinding cut and weld edges of 813 mm (ID) MS pipes during fabrication work including all labour and hire charges of tools etc. complete: For pipes fabricated with 8mm thick MS plates.							
	For making specials	4*2					8.000	
	Total Quantity						8.000 No	
	Total Deducted Quantity						0.000 No	
	Net Total Quantity						8.000 No	
	Say 8.000 No @ Rs 788.66 / No						Rs 6309.28	
9	100.37.10.1 Fabricating MS pipes of size 350mm (ID) using 8 mm thick MS plate including cost and conveyance charges of MS plate, all fabrication charges, charges of painting the steel work with two or more coat deluxe multi surface paint to give an even shade over an under coat of primer etc. complete: For pipes fabricated with 8mm thick MS plates.							

	NAD Jn.	2					2.000	
	Total Quantity						2.000 metre	
	Total Deducted Quantity						0.000 metre	
	Net Total Quantity						2.000 metre	
	Say 2.000 metre @ Rs 8762.10 / metre						Rs 17524.20	
10	100.37.10.2 Fabricating MS flanges of diameter 350 mm using 12 mm thick MS plate including cost and conveyance charges of MS plate, all fabrication charges, charges of painting the steel work with two or more coat deluxe multi surface paint to give an even shade over an under coat of primer etc. complete: For pipes fabricated with 8mm thick MS plates.							
		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 3563.07 / No						Rs 14252.28	
11	100.37.10.3 Cutting 350 mm (ID) MS pipes for making bends and other specials by gas cutting including cost of gas, all labour and hire charges of tools etc. complete: For pipes fabricated with 8mm thick MS plates.							
		1*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 358.57 / No						Rs 717.14	
12	100.37.10.4 Welding 350 mm (ID) MS pipes for making bends and other specials by gas/electric welding machine including cost of gas and welding rods ,all labour and hire charges of tools etc. complete: For pipes fabricated with 8mm thick MS plates.							
		1*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 1371.97 / No						Rs 2743.94	
13	100.37.10.5 Grinding cut and weld edges of 350 mm (ID) MS pipes during fabrication work including all labour and hire charges of tools etc. complete: For pipes fabricated with 8mm thick MS plates.							
		2*2					4.000	

							Total Quantity	4.000 No
							Total Deducted Quantity	0.000 No
							Net Total Quantity	4.000 No
							Say 4.000 No @ Rs 257.21 / No	Rs 1028.84
14	100.37.11.1	Fabricating MS pipes of size 400mm (ID) using 8 mm thick MS plate including cost and conveyance charges of MS plate, all fabrication charges, charges of painting the steel work with two or more coat deluxe multi surface paint to give an even shade over an under coat of primer etc. complete: For pipes fabricated with 8mm thick MS plates.						
		2	2.000				4.000	
							Total Quantity	4.000 metre
							Total Deducted Quantity	0.000 metre
							Net Total Quantity	4.000 metre
							Say 4.000 metre @ Rs 9712.58 / metre	Rs 38850.32
15	100.37.11.2	Fabricating MS flanges of diameter 400 mm using 12 mm thick MS plate including cost and conveyance charges of MS plate, all fabrication charges, charges of painting the steel work with two or more coat deluxe multi surface paint to give an even shade over an under coat of primer etc. complete: For pipes fabricated with 8mm thick MS plates.						
		2*4					8.000	
							Total Quantity	8.000 No
							Total Deducted Quantity	0.000 No
							Net Total Quantity	8.000 No
							Say 8.000 No @ Rs 4116.68 / No	Rs 32933.44
16	100.37.11.3	Cutting 400 mm (ID) MS pipes for making bends and other specials by gas cutting including cost of gas, all labour and hire charges of tools etc. complete: For pipes fabricated with 8mm thick MS plates.						
		2*4					8.000	
							Total Quantity	8.000 No
							Total Deducted Quantity	0.000 No
							Net Total Quantity	8.000 No
							Say 8.000 No @ Rs 407.58 / No	Rs 3260.64
17	100.37.11.4	Welding 400 mm (ID) MS pipes for making bends and other specials by gas/electric welding machine including cost of gas and welding rods ,all labour and hire charges of tools etc. complete: For pipes fabricated with 8mm thick MS plates.						
		2*4					8.000	

		Total Quantity						8.000 No
		Total Deducted Quantity						0.000 No
		Net Total Quantity						8.000 No
		Say 8.000 No @ Rs 1559.35 / No						Rs 12474.80
18	100.37.11.5 Grinding cut and weld edges of 400 mm (ID) MS pipes during fabrication work including all labour and hire charges of tools etc. complete: For pipes fabricated with 8mm thick MS plates.							
		2*2*4					16.000	
		Total Quantity						16.000 No
		Total Deducted Quantity						0.000 No
		Net Total Quantity						16.000 No
		Say 16.000 No @ Rs 292.40 / No						Rs 4678.40
19	100.37.13.1 Fabricating MS pipes of size 500mm (ID) using 8 mm thick MS plate including cost and conveyance charges of MS plate, all fabrication charges, charges of painting the steel work with two or more coat deluxe multi surface paint to give an even shade over an under coat of primer etc. complete: For pipes fabricated with 8mm thick MS plates.							
	Cusat tank	1	2.000				2.000	
		Total Quantity						2.000 metre
		Total Deducted Quantity						0.000 metre
		Net Total Quantity						2.000 metre
		Say 2.000 metre @ Rs 11611.79 / metre						Rs 23223.58
20	100.37.13.2 Fabricating MS flanges of diameter 500 mm using 16 mm thick MS plate including cost and conveyance charges of MS plate, all fabrication charges, charges of painting the steel work with two or more coat deluxe multi surface paint to give an even shade over an under coat of primer etc. complete: For pipes fabricated with 8mm thick MS plates.							
		1*4					4.000	
		Total Quantity						4.000 Nos
		Total Deducted Quantity						0.000 Nos
		Net Total Quantity						4.000 Nos
		Say 4.000 Nos @ Rs 6390.31 / Nos						Rs 25561.24
21	100.37.13.3 Cutting 500 mm (ID) MS pipes for making bends and other specials by gas cutting including cost of gas, all labour and hire charges of tools etc. complete: For pipes fabricated with 8mm thick MS plates.							
		1*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 505.55 / No	Rs 2022.20
22	100.37.13.4	Welding 500 mm (ID) MS pipes for making bends and other specials by gas/electric welding machine including cost of gas and welding rods ,all labour and hire charges of tools etc. complete: For pipes fabricated with 8mm thick MS plates.						
		1*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 1934.26 / No	Rs 7737.04
23	100.37.13.5	Grinding cut and weld edges of 500 mm (ID) MS pipes during fabrication work including all labour and hire charges of tools etc. complete: For pipes fabricated with 8mm thick MS plates.						
		2*1*4					8.000	
							Total Quantity	8.000 No
							Total Deducted Quantity	0.000 No
							Net Total Quantity	8.000 No
							Say 8.000 No @ Rs 362.64 / No	Rs 2901.12
24	100.37.14.2	Fabricating MS flanges of diameter 600 mm using 16 mm thick MS plate including cost and conveyance charges of MS plate, all fabrication charges, charges of painting the steel work with two or more coat deluxe multi surface paint to give an even shade over an under coat of primer etc. complete: For pipes fabricated with 8mm thick MS plates.						
		1*4					4.000	
							Total Quantity	4.000 Nos
							Total Deducted Quantity	0.000 Nos
							Net Total Quantity	4.000 Nos
							Say 4.000 Nos @ Rs 7891.43 / Nos	Rs 31565.72
25	100.37.14.5	Grinding cut and weld edges of 600 mm (ID) MS pipes during fabrication work including all labour and hire charges of tools etc. complete: For pipes fabricated with 8mm thick MS plates.						
		1*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 432.94 / No	Rs 1731.76
26	100.37.21.1	Fabricating MS pipes of size 600 mm (ID) using 10 mm thick MS plate including cost and conveyance charges of MS plate, all fabrication charges, charges of painting the steel work with two or more coat deluxe multi surface paint to give an even shade over an under coat of primer etc. complete: For pipes fabricated with 10mm thick MS plates.						
		1	2.000					2.000
							Total Quantity	2.000 per metre
							Total Deducted Quantity	0.000 per metre
							Net Total Quantity	2.000 per metre
							Say 2.000 per metre @ Rs 16376.09 / per metre	Rs 32752.18
27	100.37.21.2	Fabricating MS flanges of diameter 600 mm using 16 mm thick MS plate including cost and conveyance charges of MS plate, all fabrication charges, charges of painting the steel work with two or more coat deluxe multi surface paint to give an even shade over an under coat of primer etc. complete: For pipes fabricated with 10mm thick MS plates.						
		1*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 7956.19 / No	Rs 31824.76
28	100.37.21.3	Cutting 600 mm (ID) MS pipes for making bends and other specials by gas cutting including cost of gas, all labour and hire charges of tools etc. complete: For pipes fabricated with 10mm thick MS plates.						
		1*4						4.000
							Total Quantity	4.000 metre
							Total Deducted Quantity	0.000 metre
							Net Total Quantity	4.000 metre
							Say 4.000 metre @ Rs 607.44 / metre	Rs 2429.76
29	100.37.21.4	Welding 600 mm (ID) MS pipes for making bends and other specials by gas/electric welding machine including cost of gas and welding rods ,all labour and hire charges of tools etc. complete: For pipes fabricated with 10mm thick MS plates.						
		1*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 2324.08 / No	Rs 9296.32
30	100.37.21.5 Grinding cut and weld edges of 600 mm (ID) MS pipes during fabrication work including all labour and hire charges of tools etc. complete: For pipes fabricated with 10mm thick MS plates.						
		1*4*2					8.000
						Total Quantity	8.000 No
						Total Deducted Quantity	0.000 No
						Net Total Quantity	8.000 No
						Say 8.000 No @ Rs 435.79 / No	Rs 3486.32
31	od386082/2021_2022 Fabricating MS dummy plates of diameter 520 mm using 12 mm thick MS plate including cost and conveyance charges of MS plate, all fabrication charges, charges of painting the steel work with two or more coat deluxe multi surface paint to give an even shade over an under coat of primer etc. complete: For pipes fabricated with 8mm thick MS plates.						
		8					8.000
						Total Quantity	8.000 No
						Total Deducted Quantity	0.000 No
						Net Total Quantity	8.000 No
						Say 8.000 No @ Rs 3888.73 / No	Rs 31109.84
32	od386084/2021_2022 Cutting and plugging in 350/300 mm DI Pipe (cutting, removing a length of 1.0m from one end of the pipe) including earth work excavation in all kinds of soil ,including tar cutting / concrete cutting, by cutting and removing a portion of pipe from the pipe without causing any damages to the remaining portion of the line and specials and plugging one end of the pipe with 10mm Dummy plate with flanged end joint after cleaning the ends, centering the pipe, providing the joints, testing the line to the required test pressure, rectifying any defects noticed and refilling the trenches using excavated earth in layers not exceeding 20cm depth including consolidating each layers by ramming, watering, removing the surplus soil from the work site, without causing any damages to any other utilities, including the charges of hire and conveyance of tools, plants and materials to the leak site, bailing out water, lighting, watching, ribbon fencing, caution boards, traffic diversion but excluding cost of mechanical joint and as per the direction of departmental officers etc. complete.						
		2					2.000
						Total Quantity	2.000 Leak
						Total Deducted Quantity	0.000 Leak
						Net Total Quantity	2.000 Leak
						Say 2.000 Leak @ Rs 11557.54 / Leak	Rs 23115.08

33	od386085/2021_2022 Inter connecting 300/350mm DI Pipe with newly laid 1219mm MS Pipe including earth work excavation in all kinds of soil including tar cutting / concrete cutting, without causing any damages to the remaining portion of the line and specials and one side with mechanical and other end faknged joint after cleaning the ends, centering the pipe, providing the joints, testing the line to the required test pressure, rectifying any defects noticed and refilling the trenches using excavated earth in layers not exceeding 20cm depth including consolidating each layers by ramming, watering, removing the surplus soil from the work site, without causing any damages to any other utilities, including the charges of hire and conveyance of tools, plants and materials to the leak site, bailing out water, lighting, watching, ribbon fencing, caution boards, traffic diversion including cost of mechanical joint and as per the direction of departmental officers etc. 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 9858.17 / No	Rs 19716.34
SI No	Description	No	L	B	D	CF	Quantity	Remark
7RESTORATION CHARGES AND PERMISSIONS FROM OTHER DEPARTMENTS								(Cost Index:35.59 %)
1	od386065/2021_2022 PWD Road restoration - BM & BC Road surface (Approved rate of PWD)							
	Aluva to NAD	1	4500.000	3.600			16200.000	
	NAD to CUSAT	1	2000.000	3.600			7200.000	
	CUSAT to THOPPIL	1	2600.000	3.600			9360.000	
	Churnikkaraline	1	500.000	2.000			1000.000	
							Total Quantity	33760.000 sqm
							Total Deducted Quantity	0.000 sqm
							Net Total Quantity	33760.000 sqm
							Say 33760.000 sqm @ Rs 3581.16 / sqm	Rs 120899961.60
2	16.91.2 Providing and laying factory made chamfered edge Cement Concrete paver blocksin footpath, parks, lawns, drive ways or light traffic parking etc, of required strength,thickness & size/ shape, made by table vibratory method using PU mould, laid inrequired colour & pattern over 50mm thick compacted bed of sand, compacting andproper embedding/laying of inter locking paver blocks into the sand bedding layerthrough vibratory compaction by using plate vibrator, filling the joints with sand andcutting of paver blocks as per required size and pattern, finishing and sweepingextra sand. complete all as per direction of Engineer-in-Charge.80 mm thick C.C. paver block of M-30 grade with approved color design and pattern.							
	Pipe line road	1	600.000	2.000			1200.000	
							Total Quantity	1200.000 sqm

Total Deducted Quantity							0.000 sqm	
Net Total Quantity							1200.000 sqm	
Say 1200.000 sqm @ Rs 1121.80 / sqm							Rs 1346160.00	
3	16.42	Cement concrete 1:2:4 (1 cement : 2 coarse sand : 4 graded stone aggregate 40 mm nominal size) in pavements, laid to required slope and camber in panels as required including consolidation finishing and tamping complete						
	Pipeline road	1	800.000	2.000	0.150		240.000	
Total Quantity							240.000 cum	
Total Deducted Quantity							0.000 cum	
Net Total Quantity							240.000 cum	
Say 240.000 cum @ Rs 8052.35 / cum							Rs 1932564.00	
SI No	Description	No	L	B	D	CF	Quantity	Remark
8CATHODIC PROTECTION WORKS (Cost Index:35.59 %)								
1	od386064/2021_2022	Design,supply and installation of Sacrificial Anode Cathode Protection (SACP) for 1422 mm OD Pipes for design life of minimum 10 years Including Supply of Magnesium Anode for SACP using sacrificial anode Size 90 mm Dia.x900mm Long Net wt 10 kgwith .-115 Nos, cable 1CX10sq.mm XLPE/PVC Sheathed copper conductor un-armoured cable , Installation of pre-packed Magnesium Anode--115 Nos by augering to a depth of 2m, termination of anode tail cable to the nearest test lead post c/w shunt and rheostat for monitoring and a lockable hinged door suitable for use in corrosive environment, weather proof type gasket , 6Nos.excavation and and cable to pipeline connection-12 Nos. etc complete as standard specifications						
	For 1422mm Pipe	1					1.000	
	For 1118 mm Pipe	1					1.000	
	For 813 mm Pipe	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 1870688.00 / No							Rs 5612064.00	
SI No	Description	No	L	B	D	CF	Quantity	Remark
9Utility Shifting Works (Cost Index:35.59 %)								
1	100.98.213	Supply of uPVC Pipe, IS 4985: 2000 , 6kg/cm2, 90mm Dia.						
	90mm	1	200.000				200.000	
Total Quantity							200.000 metre	
Total Deducted Quantity							0.000 metre	

		Net Total Quantity					200.000 metre	
		Say 200.000 metre @ Rs 202.30 / metre					Rs 40460.00	
2	100.98.214 Supply of uPVC Pipe, IS 4985: 2000 , 6kg/cm2, 110mm Dia.							
		1	110.000				110.000	
		Total Quantity					110.000 metre	
		Total Deducted Quantity					0.000 metre	
		Net Total Quantity					110.000 metre	
		Say 110.000 metre @ Rs 291.80 / metre					Rs 32098.00	
3	100.98.216 Supply of uPVC Pipe, IS 4985: 2000 , 6kg/cm2, 160mm Dia.							
		1	100.000				100.000	
		Total Quantity					100.000 metre	
		Total Deducted Quantity					0.000 metre	
		Net Total Quantity					100.000 metre	
		Say 100.000 metre @ Rs 621.60 / metre					Rs 62160.00	
4	100.9.8 Laying UPVC pipes of class 2 to class 6 and specials, lowering to the trenches already made, placing in position aligning the pipe line to the lines and levels and jointing the pipes and specials with solvent cement and testing the pipe line with water to the required test pressure (excluding cost of pipes and specials). 90 mm nominal outer dia pipes."							
	90mm	1	200.000				200.000	
		Total Quantity					200.000 metre	
		Total Deducted Quantity					0.000 metre	
		Net Total Quantity					200.000 metre	
		Say 200.000 metre @ Rs 87.05 / metre					Rs 17410.00	
5	100.9.9 Laying UPVC pipes of class 2 to class 6 and specials, lowering to the trenches already made, placing in position aligning the pipe line to the lines and levels and jointing the pipes and specials with solvent cement and testing the pipe line with water to the required test pressure (excluding cost of pipes and specials). 110 mm nominal outer dia pipes.							
	90mm	1	200.000				200.000	
		Total Quantity					200.000 metre	
		Total Deducted Quantity					0.000 metre	

	Net Total Quantity						200.000 metre		
	Say 200.000 metre @ Rs 128.27 / metre						Rs 25654.00		
6	100.9.11 Laying UPVC pipes of class 2 to class 6 and specials, lowering to the trenches already made, placing in position aligning the pipe line to the lines and levels and jointing the pipes and specials with solvent cement and testing the pipe line with water to the required test pressure (excluding cost of pipes and specials).160 mm nominal outer dia pipes.								
		1	100.000				100.000		
	Total Quantity						100.000 metre		
	Total Deducted Quantity						0.000 metre		
	Net Total Quantity						100.000 metre		
	Say 100.000 metre @ Rs 202.77 / metre						Rs 20277.00		
SI No	Description	No	L	B	D	CF	Quantity	Remark	
10Clear water pump sets to Kalamassery and Choornikkara (Cost Index:35.59 %)									
1	od392954/2021_2022 Supply,erection,testing and commissioning of pump sets having discharge of 1.25 mld against the head 42m. with all accessories								
	To Pallikkunnu Choornikkara one stand by	2	20.000				40.000		
	Total Quantity						40.000 Hp		
	Total Deducted Quantity						0.000 Hp		
	Net Total Quantity						40.000 Hp		
	Say 40.000 Hp @ Rs 23125.47 / Hp						Rs 925018.80		
2	od392955/2021_2022 Supply,erection and commiissioning of pump sets having discharge of 12.8 MLD against the head 75 m. with all necessary accessories								
	To Choornikkara Panchayath	2	210.000				420.000		
	Total Quantity						420.000 Hp		
	Total Deducted Quantity						0.000 Hp		
	Net Total Quantity						420.000 Hp		
	Say 420.000 Hp @ Rs 27690.16 / Hp						Rs 11629867.20		
3	od392956/2021_2022 Supply,erection and commiissioning of pump sets having discharge of 96.72 MLD against the head 12 m								
	To Kalamassery area with one standby	2	300.000				600.000		

	Total Quantity	600.000 Hp
	Total Deducted Quantity	0.000 Hp
	Net Total Quantity	600.000 Hp
	Say 600.000 Hp @ Rs 22109.15 / Hp	Rs 13265490.00
	Total	720792761.03
	Centage @	0.0%
	Centage Amount	0.00
	Provision for GST payments (in %) @	18.0%
	Amount reserved for GST payments	129742696.99
	Total & Centage	850535458.01
	Lumpsum for round off	4541.99
	GRAND TOTAL Rs	850540000.00
	Rounded Grand Total Rs	85,05,40,000
	Rupees Eighty Five Crore Five Lakh Forty Thousand Only	


 Kerala Water Authority
PRICE