WATER & SANITATION FOR THE URBAN POOR

DETAILED PROJECT REPORT OF SEWERAGE SYSTEM IN KAVERINAGAR

FINAL REPORT

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EXECUTIVE SUMMARY

Water and Sanitation for Urban Poor (WSUP) is an NGO known world over for its charity services. WSUP supports local service providers around the world to deliver affordable and sustainable water and sanitation services to poor people in urban communities. As part of their endeavours in India, WSUP intends to provide better and sustainable sanitation facility at Kaveri Nagar, a peri-urban settlement in Bangalore.

It is proposed to provide two Community Toilet Blocks with Decentralized Wastewater Treatment System (DEWATS) at two different locations in Kaveri Nagar. One location is inside the government primary school compound and the second location is opposite to Urdu primary school. The project aims to provide sanitation facility for 910 users.

This Detailed Project Report includes design of Toilet Blocks and DEWATS, Cost Estimates, Technical Specifications and Detailed Drawings.

Each Community Toilet Block is provided with five gents toilets, five ladies toilets, four child friendly toilets, six urinals and a caretaker room. A water sump and an over head tank are also provided. The source of water shall be a from the near by bore well.

Sewage from the toilet blocks is conveyed to and treated in the DEWATS.. DEWATS is a simple, efficient, no energy and low maintenance treatment technology suitable for small communities.

The DEWATS proposed for Kaveri Nagar consists of a Settler, Baffle walled Septic Tank with Clarifier and Horizontal Gravel filter. The Settler acts as sedimentation tank and sludge get stabilized an aerobically. The gases generated will be let out into the atmosphere. The supernatant from the Settler will be further treated in baffle walled septic tank. The Baffled Reactor shall have five compartments in series, with the last two compartments being provided with filter media to trap the suspended solids.

The effluent from the Baffled Reactor is discharged to a Horizontal Gravel Filter having Filter media followed by special plantation. Combination of straining and physical adsorption adds to the treatment in HGF. The treated effluent emerging from the filter shall have attained a standard suitable for discharging into a water way.

Capital Cost of the Project is as follows:

S. No.	Unit	Cost Rs. in Lakh
1	Community Toilet Block	10.96
2	Hybrid Baffled Tank with Clarifier and Settler	1.67
3	Horizontal Gravel Filter	10.37
4	Fencing	0.35
5	Formation of Ground level	0.06
6	**Total Capital Cost (one toilet block with DEWATS)**	**23.43**
7	**Total Capital Cost (Two toilet blocks with DEWATS)**	**46.86**

Operation and Maintenance cost of the project is worked out as 16000 rupees per annum.

S. No	Description	Cost in Rupees	Details
1	Annual Operation Cost	10,000	Man power, Electricity, Repairs
2	Annual Maintenance cost	6,000	De-summing, de-sludging.
3	**Total cost**	**16,000**	

The project is proposed to be executed within a period of six months.

Start up period for DEWATS is assumed as 3 months after the completion of Construction.

CHAPTER – 1

Introduction

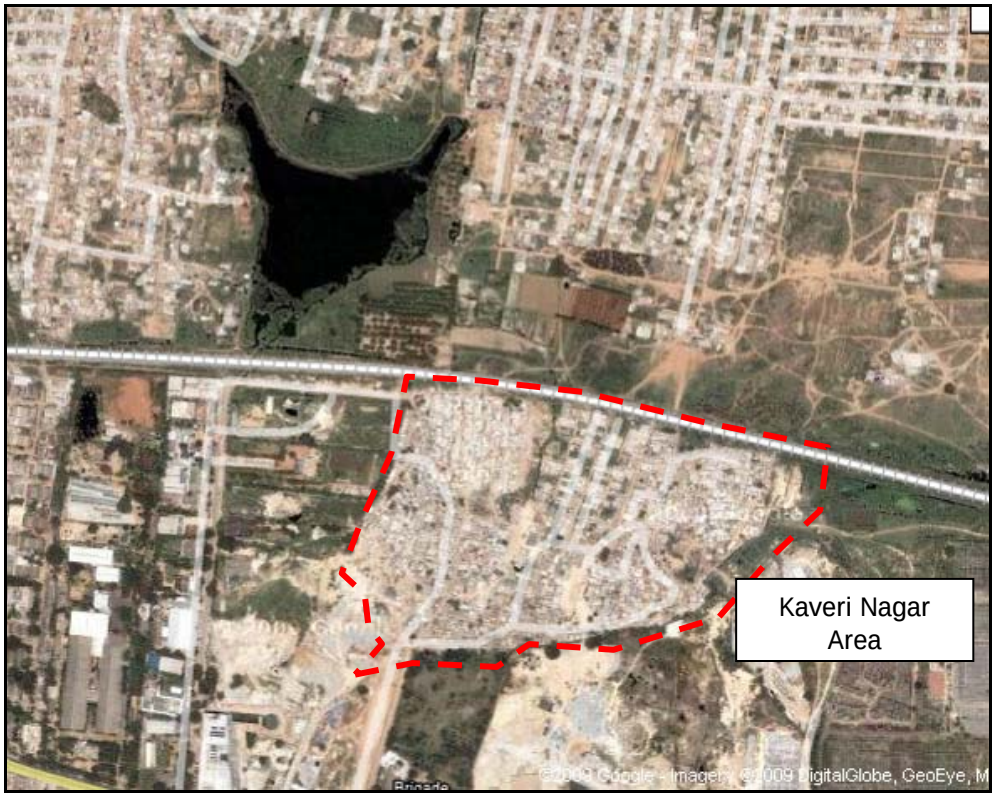
Chapter 1
Introduction

1.1 General

Kaveri Nagar is identified as an Urban Poor area in the Mahadevapura zone of Bhruhath Bangalore Mahanagara Palike. Kaveri Nagar settlement is located in Mahadevapura zone of BBMP towards Eastern side of the city. There are 4000 households with a total population of about 30,000. **Water and Sanitation for Urban Poor (WSUP) an esteemed NGO,** intends to provide the better and sustainable sanitation facility at Kaverinagar settlement

1.2 Location Map

The proposed project area location map is given below:



1.3 Objective of the Project

The objective of this Project is to provide design engineering consultancy services to the Kaveri Nagar area. The settlement shall be provided with conceptual design of sewage collection System, detailed engineering design of Community Toilet Blocks and DEWATS treatment and disposal based on environmentally sound practices.

1.4 Project Background:

TTI Consulting Engineers has been commissioned to provide Engineering and sustainable solution for providing sanitation facility with low cost wastewater treatment unit and safe disposal of treated wastewater from Kaveri Nagar settlement. The scope of work includes

- Topographical Survey & Geo-technical Investigation at two locations
- Preliminary Engineering Design Report
- Design of Two Community toilet blocks
- Design of DEWATS
- Detailed Designs and Drawings for Toilet Blocks and DEWATS
- Preparation of detailed cost estimates including Tender documents

1.5 Submission of Feasibility Report

Feasibility report was submitted in August, 2009.This Report covered the Topographical Survey, Site Visit, and feasibility of different options of sewer network, Community toilets, DEWATS, Treatment and Disposal

1.6 Detailed Project Report

The present report covers Detailed Design, Cost Estimates, Drawings and Technical Specifications for two community toilet blocks with DEWATS at Kaverinagar..

The above details are described in the following chapters:

Chapter 1: Introduction

Chapter 2: Community Toilet Blocks

Chapter 3: DEWATS

Chapter 4: Cost Estimates

Chapter 5: Project Execution Plan

CHAPTER – 2

Community Toilet Blocks

Chapter 2

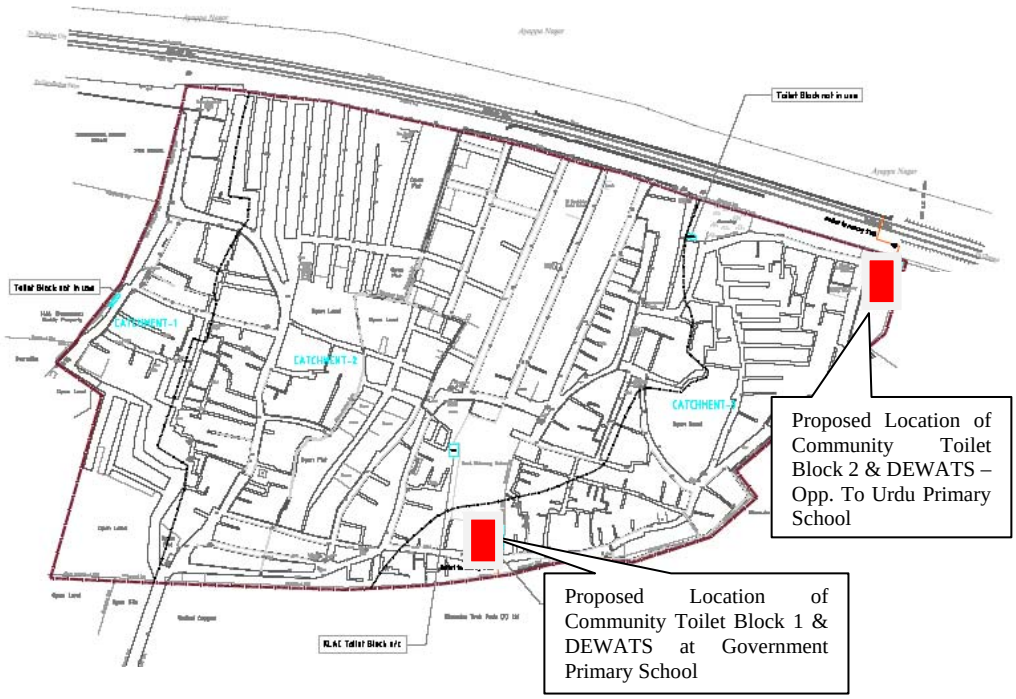
Community Toilet Blocks

2.1 Location of the Community Toilet Blocks and DEWATS

Community Toilet Block and DEWATS for the Kaveri Nagar are proposed at 2 locations.

The first Community Toilet block and DEWATS shall be located in the land belonging to the Government Primary School. This will serve approximately 450 persons

The second Community Toilet block shall be located near K.V. Receiving Station compound (Opposite to Govt. Urdu Primary School).This block shall serve approximately 460 persons.



2.2 Salient Features of the Proposed Community Toilet Block

1. The Community Toilet Block is basically separated into two blocks (i) Gents Block and (ii) Ladies Block With a common Care Taker Room.

2. Gents Block shall have 6 nos of Indian Water closet out of which 2 nos shall be child friendly toilets, 1 no European Water Closet and 6 nos of Urinal basins

3. Ladies block shall have 6 nos of Indian Water closets out of which 2 nos is child friendly toilet, and also 1 no European Water Closet

4. The structure is designed with load bearing walls

5. Size Stone Masonry shall be used for foundation and Solid Block Masonry for construction of walls

6. The flooring shall be with Antiskid vitrified tiles

7. All-round daddoing is done inside and outside in order to keep the block clean and hygienic.

8. Plastic doors have been used for toilets since they are durable and non corrosive.

9. 10 mm square rods have been placed and welded above lintel through out as shown in the figure in order to provide light and ventilation and also for safety purpose.

10. Wash basins and Mirrors shall be provided in both the toilet blocks.

11. A sump of Water tank of 7.8 cum (7800 litres) shall be provided.

12. Collapsible doors with locking facility shall be provided at the entrance of the Toilet blocks

13. Cistern capacity of 10 liters shall be fitted in the toilets

14. The floor level of the building shall be raised well above the formation Ground level in order to avoid flooding into the building.

15. The roofing is of combination of tubular frame and Meta sheet with purlin and bolting and part RCC roof in order to support the Water tank of capacity 4000 liters.

16. A bore well near the toilet Block which is opposite to the new cemetery shall be the source for water. The water shall be pumped directly to the Sintex Water tank on the roof of the toilet block and also to the Sump inside the Toilet block with a valve arrangement.

17. Water shall be pumped from the sump to water tank on roof by using the pump whenever required.

18. The waste water from Toilet is conveyed to the maintenance Chamber in the passage of the toilet block. All the maintenance Chambers are connected and are conveyed to the Inspection Chamber.

19. Steps and Ramp has been provided in front for easy access

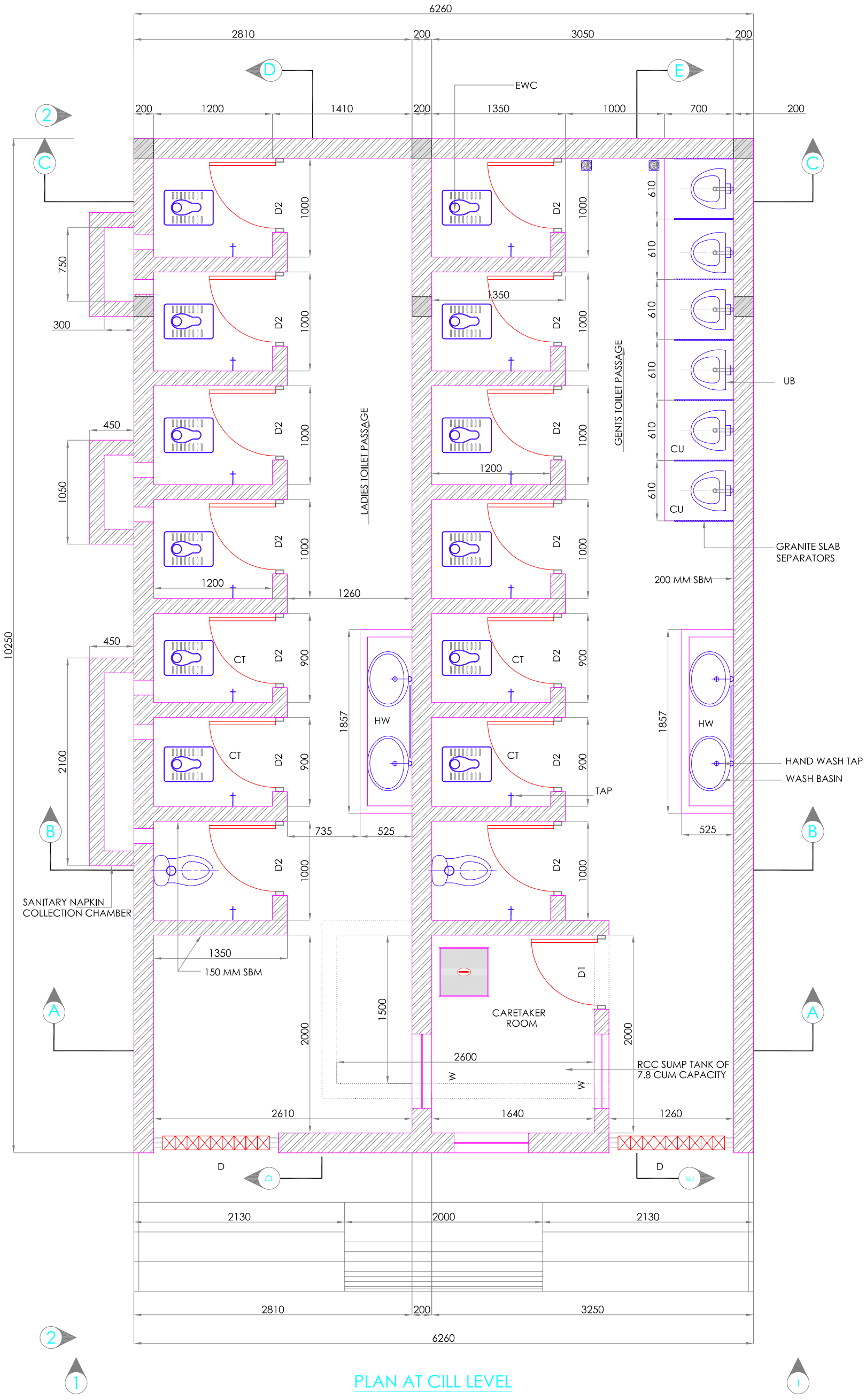
20. Care Taker House shall be provided inside the layout of Community Toilet Block with DEWATS –Optional

SITE VISIT PHOTOGRAPHS

Location of the Proposed Community Toilet Block 1 with DEWATS

Location of the Proposed Community Toilet Block 2 with DEWATS

Location of Bore Well opposite to the new cemetery which shall pump water to Community Toilet Block 2 with DEWATS



PLAN AT CILL LEVEL

NOTES:-

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4. PIPE IN THE WALL TO BE EMBEDDED IN PCC 1:3:6.
5. TMT STEEL SHALL BE ADOPTED FOR REINFORCEMENT OF THE STRUCTURES.
6. CEMENT-SULPHATE RESITENCE CEMENT FOR SPECIFIED ITEMS OF THE STRUCTURES.
7. M20 GRADE CEMENT CONCRETE = 1 : 1.5 : 3 AS PER IS STANDARDS AND SPECIFICATIONS.

ABBREVATIONS	
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CM	CEMENT MORTAL
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DESIGN OF SEWERAGE SYSTEM IN KAVERI NAGAR

FIGURE 2.1
PLAN SHOWING COMMUNITY TOILET BLOCK AT GOVERNMENT PRIMARY SCHOOL & URDU PRIMARY SCHOOL IN KAVERI NAGAR

CHAPTER – 3

DEWATS

Chapter 3

DEWATS

3.1 Location of DEWATS

Two community toilet blocks with DEWATS are proposed to be constructed under this assignment.

WSUP has identified two locations for construction of toilet blocks in the Kaveri Nagar area. The details of these locations are given in Table 3.1

Table 3.1 Locations for Construction of Toilet Blocks

S. No	Nomenclature	Location	Current land use	Ownership of land
1	Location -1	Adjacent to Government Primary School Building	Open Area	This land belongs School(BBMP)
2	Location - 2	Opposite to Urdu School near Railway Track	Open Area	This land belongs to BBMP

3.2 Disposal Standards

Treatment of sewage is being planned to meet required discharge standards, which are discussed below:

The environment (Protection) Act, Second Amendment Rules, 1993 of Government of India specify limits of various parameters for disposal of treated wastewater. These limits are different for different modes of disposal. Table 3.2 below presents disposal standards for alternative methods of disposal as fixed given in the Environment Protection Act.

Table 3.2 Disposal Standards for Alternative Methods of Disposal

S.No	Parameter	STANDARDS			
		Inland Surface Water	Public Sewer	Land for Irrigation	Marine Coastal Areas
1	Colour and odour	See Note 1	-	See Note1	See Note 1
2	Suspended solids mg/l	100	600	200	For process wastewater-100
3	Particle size of suspended solids	Shall pass 850 micron sieve	-	-	a) Floatable solids max. 3 mm b) Settleable solids max. 850 micron
4	Dissolved solids	2100	-	2100	-

S.No	Parameter	STANDARDS			
		Inland Surface Water	Public Sewer	Land for Irrigation	Marine Coastal Areas
	(inorganic), mg/l, max.				
5	pH value	5.5 - 9.0	5.5-9.0	5.5 - 9.0	-
6	Temperature, deg. C., Max.	Shall not exceed 5° C above the receiving water temp.	-	-	Shall not exceed 5°C above the receiving water temp.
7	Oil and grease, mg/l, max.	10	20	10	20
8	Total residual chlorine, mg/l, max.	1.0	-	-	1.0
9	Ammonical nitrogen (as N) mg/l, max.	50	50	-	50
10	Total kjeldahl nitrogen (as N) mg/l, max.	100	-	-	100
11	Free ammonia (as NH3) mg/l, max.	5.0	-	-	5.0
12	Biochemical oxygen demand (5 days at 20°C) max.	30	350	100	100
13	Chemical Oxygen demand	250	250	250	250

Note 1: All efforts should be made to remove colour and unpleasant odour as far as practicable.

Note 2: The standards mentioned in this notification shall apply to all the effluent discharged, such as industrial, mining and mineral processing activities, municipal sewage etc.

Note 3: This notification shall not apply to those industries for which standards have been notified by the Central Government vide S.O.844 (E), dated the 19th November, 1986, S.O.393 (E), dated 16th April, 1987, S.O.443 (E), dated the 28th April, 1987 and S.O.64 (E), dated the 18th January, 1988. This notification shall cease to apply with regard to a particular industry, when industry specific standards are notified for that industry.

3.3 Disposal Options

The treated sewage from the DEWATS at both the locations (after achieving surface water discharge standards) shall be discharged in to the storm water drain adjacent to the School. This drain runs from South to East in the Kaveri Nagar and leads to Hoodi Kere located on the North East of Kaveri Nagar area. This is the only feasible location, where the treated sewage effluent can be discharged by gravity.

The other option is letting treated effluent in to the ChikDevasandra Kere located on North West of Kaveri Nagar. However this option requires lifting (pumping) of the effluent in to the drain leading to Chik Devasandra Kere. Since the pumping option entails higher capital and O&M costs, this option is not considered further.

3.4 Sewage Quantity

Sewage Quantity generated from each toilet block is calculated as follows:

No. of users to each toilet block	=	460 persons
Toilet flushing rate including cleaning	=	20 liters/capita/day
Sewage Quantity from toilet block	=	460 x 20 liters/day
	=	9200 liters/day
	=	9.2 m^3/day

3.5 Raw Sewage Quality

In an urban area, it is usual to let the water from bath and kitchen sinks into the sewer. The norm for discharge into sewers is 80 percent of the water consumption i.e. 80 percent of a minimum of 135 lpcd, which is the CPHEEO accepted minimum standard for per capita water supply. This flow ensures that the BOD in the public sewers is diluted to levels ranging from 100 to 300 mg/l.

In the case of Kaveri Nagar, the sewage will be only that generated in the Community toilet block. There will not be any dilution by flows from bath or kitchen sinks.

Therefore sewage from toilet block consists of high BOD since it contains only toilet waste.

Normally, in India the BOD values in sewage are in the range of 40 – 45 gm per capita day (Ref: DEWATS, BORDA & Manual on Sewage and Treatment, CPHEEO, 1993)

Out of which, major contribution (i.e about 75%) comes from toilet waste where as other wastes such as Kitchen waste, other biodegradable wastes contribute to remaining BOD.

Hence the BOD from toilet waste	=	0.75 x 40 gm/capita/day
	=	30 gm/capita/day
BOD value in terms of mg/l	=	30 x 1000 / 20 mg/l
	=	**1500 mg/l.**
Corresponding COD in mg/l	=	**2850 mg/l.**

3.6 Treated Sewage Quality

Treated sewage is proposed to be discharged into Hoodi Kere (Water Tank) through drains. Hence, the effluent quality shall meet the inland surface water standards as given in the following Table 3.3.

Table 3.3: Standards for Discharge of Liquid Waste into Inland Surface Water Body

Parameters	Permissible limits
pH	5.5 - 9.0
Suspended solids	100 mg/l
Oil & Grease	10 mg/l
BOD	30 mg/l
COD	250 mg/l

3.7 Process Description of DEWATS

Decentralized Wastewater treatment system (DEWATS) is a combination of the following treatment systems:

- Sedimentation and primary treatment in settlers, SepticTanks or Imhoff tanks.
- Secondary Anaerobic Treatment in fixed bed filters or Baffled Reactors
- Secondary and tertiary aerobic/anaerobic treatment in reedbed / duckweed ponds / constructed wetlands or Planted Gravel Filters

The advantages of the system are

1. Water can be treated to CPCB discharge standards and recycled for irrigation
2. Operable with semi skilled/ unskilled labour
3. Can be decentralized thereby reducing plumbing and pumping costs.
4. Adaptability to varying load conditions and to varying climatic conditions
5. Can treat waste water with high fat, suspended solids and BOD.
6. No mechanical parts
7. Less expensive than comparable conventional treatment systems and
8. Very low operational and maintenance costs

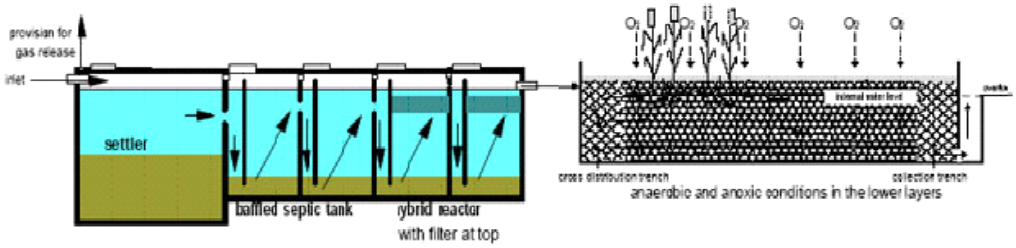
The proposed DEWATS under this assignment consists of the following units:

1. Settler
2. Baffled Septic Tank combined with filter
3. Horizontal Gravity filter

In this system sewage and sullage from toilet block is directed to a settler. The settled effluent is then transferred to subsurface baffled reactor. The effluent from the reactor is drained into a constructed planted filter. The resulting effluent can be used for agriculture or community garden or can be discharged into drain.

The schematic diagram of DEWATS is shown in Fig 3.1

Figure 3.1 Schematic diagram of DEWATS



3.8 Unit Description of DEWATS

The various units proposed in the DEWATS are described below:

3.8.1 Inspection Chamber

The waste from toilet blocks will be carried through 110 mm diameter PVC pipe and collected in the inspection chamber provided outside the toilet block.

From the inspection chamber, the sewage is conveyed to the Settler.

3.8.2 Settler

The settler is basically a sedimentation tank in which settled sludge is stabilized by anaerobic digestion. Dissolved and suspended matter leaves the tank more or less untreated.

The settler consists of two compartments. The first compartment occupies two third volume of the tank and most of the sludge settle in the first compartment. The effluent from the second compartment leaves at the outlet 1.5 m above the bottom of the tank.

The desludging of the settler shall be done at an interval 1.5 to 2.0 years. The ventilating pipe to let out the digester gases is provided 3 m above the roof slab level.

Manholes, each of 600 mm diameter, are placed in the cover slab at inlet, outlet and above the partition wall.

Approximately 25 –30% BOD removal is achieved in the settler.

From the outlet of the settler, the supernatant enters the baffled septic tank. In other words, settler acts as first section of baffled septic tank.

3.8.3 Baffled Septic Tank

In Baffled septic tank, anaerobic degradation of suspended and dissolved solids takes place. It is simple and durable, has high treatment efficiency, requires very little permanent space above ground, shall have hardly any blockage and finally is relatively cheap compared to an anaerobic filter.

The tank combines several anaerobic process principles - the septic tank, the fluidized bed reactor and the UASB. The baffled septic tank is also known as “baffled reactor”.

The effluent flows upward in the Tank. The wastewater flows from bottom to top with the effect that sludge particles settle against the up-stream of the liquid. This provides the possibility of intensive contact between resident sludge and newly incoming liquid.

The up-flow velocity in the baffled septic tank shall be maintained less than 2 m/h. The baffled septic tank consists of five chambers in series. The water stream between chambers is directed by baffle walls that form a down-shaft which provides better distribution of flow. Distance between chambers should not exceed 75 cm.

The advantage of tanks in series is that a part of the active sludge that is washed out from one chamber is trapped in the next, where it helps to digest difficult degradable substances. This process occurs predominantly in the rear part, as easily degradable matters have already been digested in the front part.

The last two chambers have a filter in its upper part in order to retain eventual solid particles.

The final outlet as well as the outlets of each tank is placed slightly below surface in order to retain any possible scum. Treatment performance is in the range of 70% - 95% BOD(65% - 90% COD) removal.

3.8.4 Horizontal Gravity Filter

The effluent from the Baffled septic tank is conveyed to the Horizontal gravity filter for further treatment.

The horizontal filter is permanently soaked with water and operates partly aerobic (free oxygen present), partly anoxic (no free oxygen but nitrate -NO3- present) and partly anaerobic (no free oxygen and no nitrate present). Removal of suspended solids occurs by gravity sedimentation, straining, physical capture and adsorption on biomass film attached to gravel and root systems.

Planted horizontal gravel filters are also referred to as Subsurface Flow Wetlands (SSF), Constructed Wetlands or Root Zone Treatment Plants.

Clogging is caused by suspended solids and by newly formed biological or mineralized sludge from the decomposition of organic matter. Therefore, the front portion must have voids that are small enough to retain enough Suspended Solids (SS) and large enough to distribute the filtered SS over a longer distance.

The design parameters for planted gravel filters are summarized as given in Table 3.4.

Table 3.4: Design parameters for Horizontal Gravel Filter

S No.	Particulars	Value
1	Media Depth	0.4 -0.6 m
2	Length	Minimum of 12 -15 m
3	Width	Maximum of 61 m
4	Bottom slope	0.5 -1.0 %
5	Hydraulic Conductivity	
5.1	First 30 % of length	1 % of clean K*
5.2	Last70 % of length	10 % of clean K
6	Media	
6.1	Inlet Zone(Ist 2 m)	40 – 80 mm
6.2	Treatment zone	20 – 30 mm
6.3	Outlet zone(last 1 m)	40 – 80 mm
6.4	Planting Media(top 10 cm)	5 – 20 mm

* K is the permeability of the gravel used.

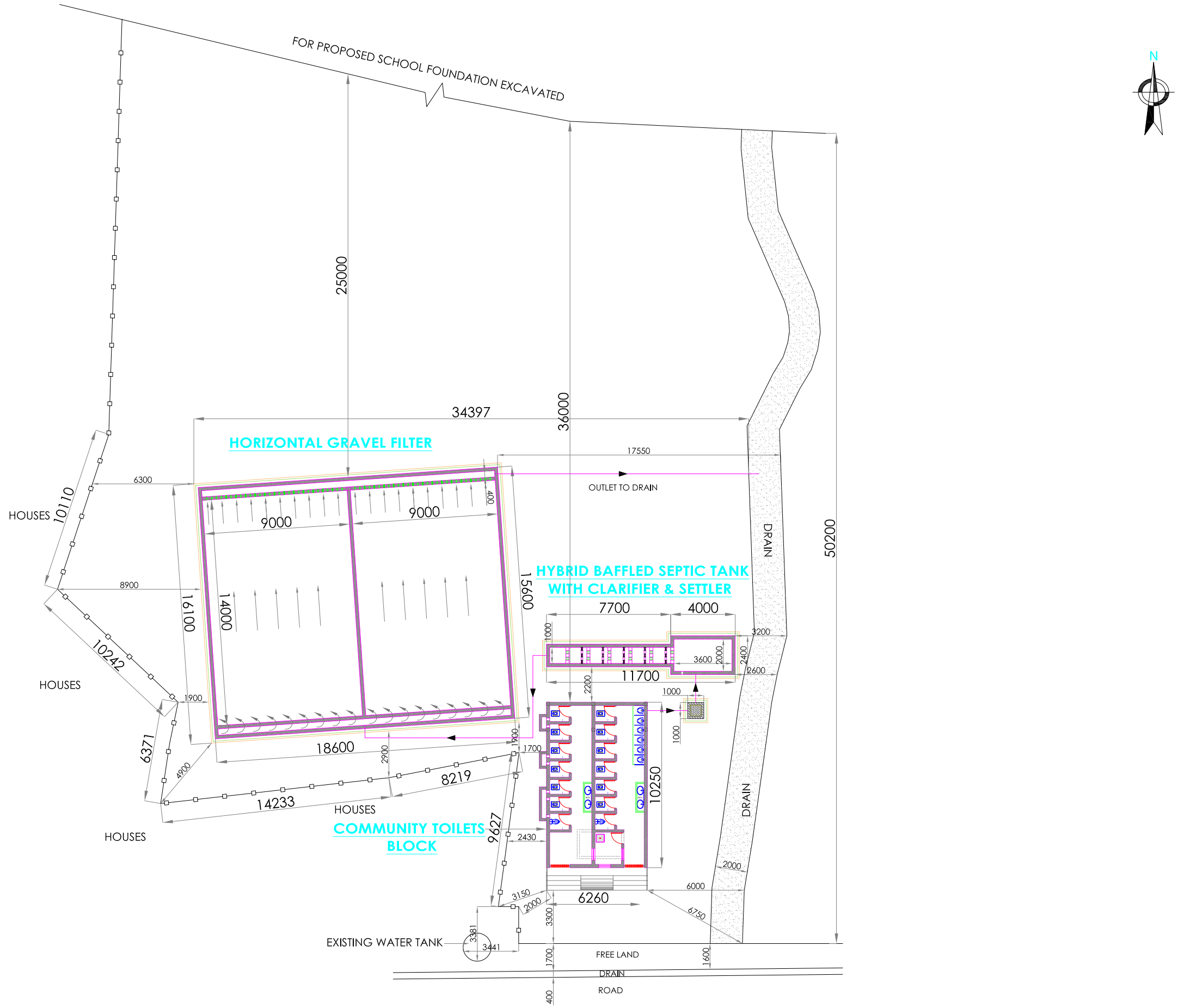
The treated sewage effluent from baffled septic tank flows into distribution channel of gravel filter. Effluent from this distribution channel flows over a weir into the gravel filter. This weir arrangement allows for uniform distribution of flow over the filter area.

Filters are covered by suitable plantation. The different type of plantation which grow on waste water and whose roots go deep and spread wide are used. These include cattails, bulrushes, cana etc. At least 2 bunches of plants or four sprouted rhizomes shall be placed per square meter when starting plantation. Plants transport oxygen via their roots into the ground. This helps in degradation of organic matter.

The treated effluent is then collected from the bed of the filter and discharged in to the near by drain.

The layout plan of the units of DEWATS for both the locations are shown in Fig 3.2 and Fig 3.3 respectively.

The hydraulic flow diagram of DEWATS for both the locations are shown in Fig 3.4 and Fig 3.5



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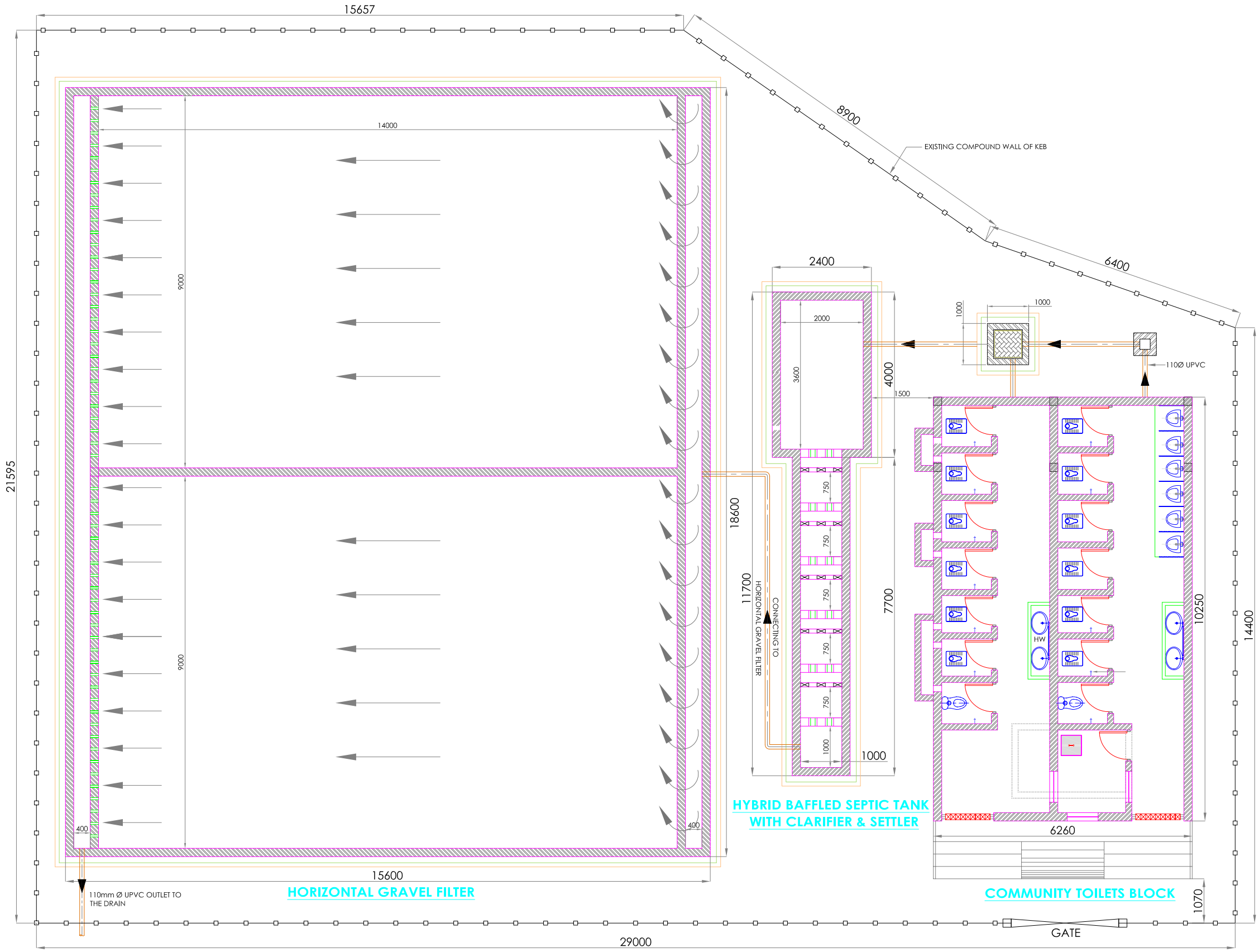
DESIGN OF SEWERAGE SYSTEM IN KAVERI NAGAR

FIGURE 3.2 : LAYOUT PLAN OF THE DEWATS AT GOVERNMENT PRIMARY SCHOOL



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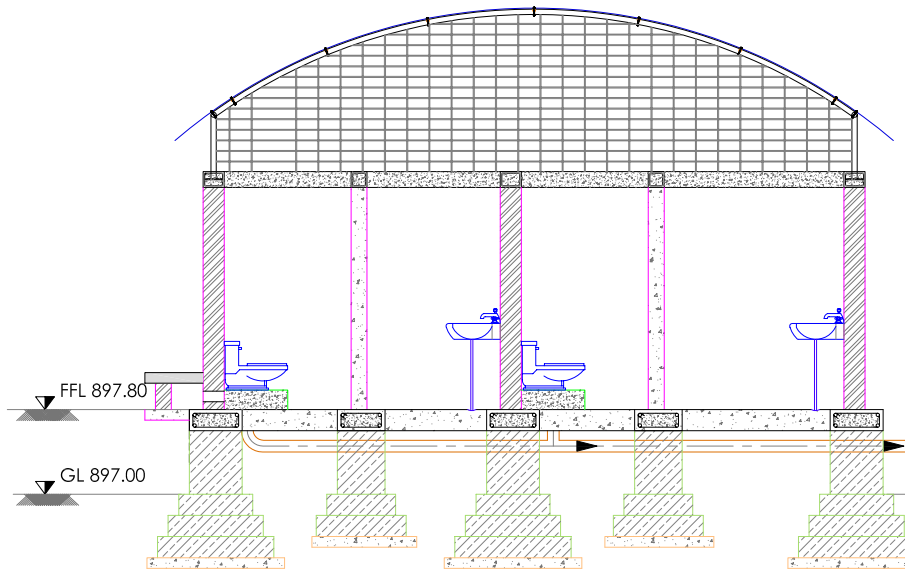
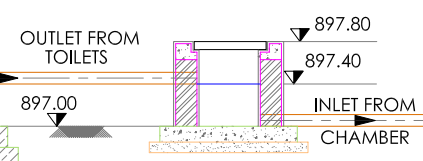
DESIGN OF SEWERAGE SYSTEM IN KAVERI NAGAR

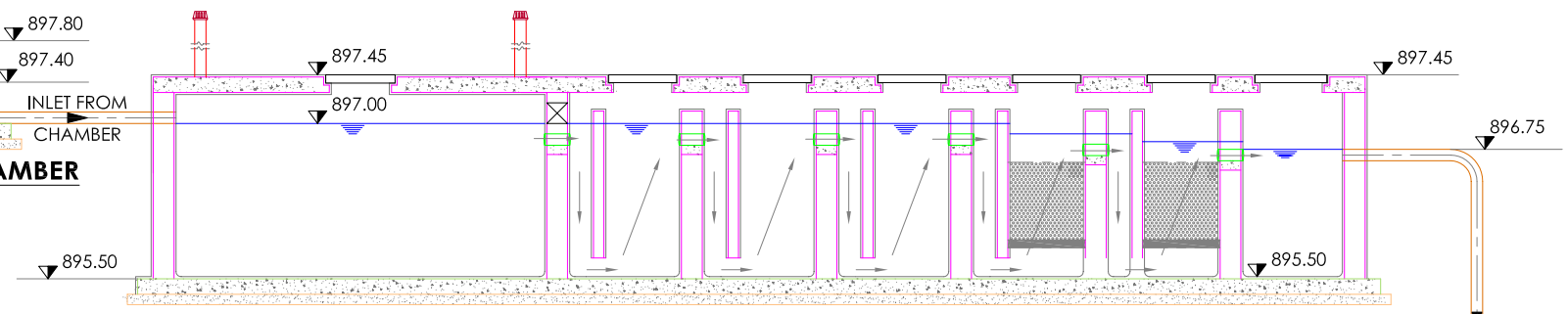
FIGURE 3.3 : LAYOUT PLAN OF THE DEWATS OPPOSITE TO URDU PRIMARY SCHOOL



COMMUNITY TOILETS BLOCK

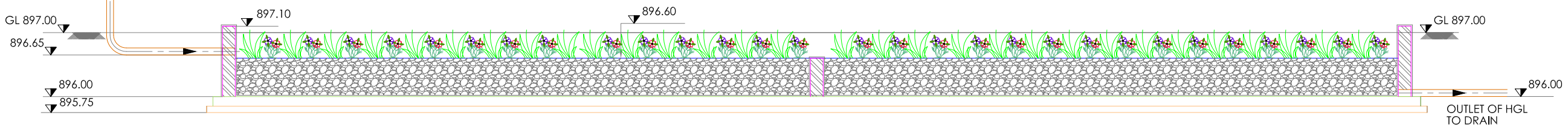


INSPECTION CHAMBER



HYBRID BAFFLED SEPTIC TANK
WITH CLARIFIER & SETTLER (HBST)

110Ø UPVC INTER CONNECTING PIPE FROM
OUTLET OF HBST TO INLET OF HGL



HORIZONTAL GRAVEL FILTER (HGL)

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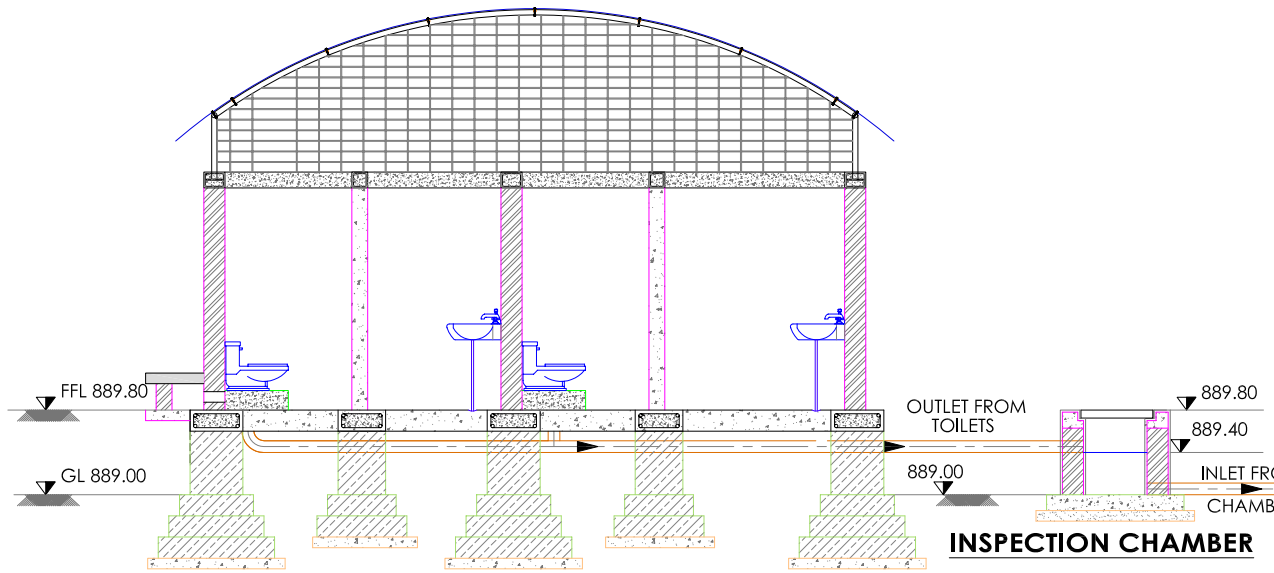
5. TMT STEEL SHALL BE ADOPTED FOR REINFORCEMENT OF THE STRUCTURES.
6. CEMENT-SULPHATE RESITENCE CEMENT FOR SPECIFIED ITEMS OF THE STRUCTURES.
7. M20 GRADE CEMENT CONCRETE = 1 : 1.5 : 3 AS PER IS STANDARDS AND SPECIFICATIONS.

ABBREVATIONS	
SBM	CONCRETE SOLID BLOCK MASONRY
CM	CEMENT MORTAL
RCC	REINFORCED CEMENT CONCRETE
PCC	PLAIN CEMENT CONCRETE
CT	CHILD TOILET
SSM	SIZE STONE MASONRY
EGL	EXISTING GROUND LEVEL
FGL	FINISHED GROUND LEVEL
IL	INVERT LEVEL

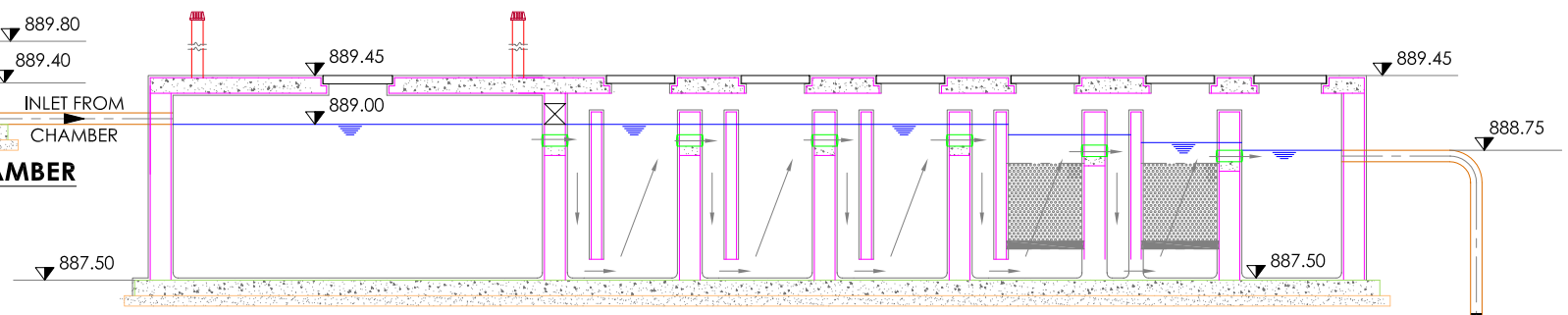
DESIGN OF SEWERAGE SYSTEM IN KAVERI NAGAR

FIGURE 3.4 : HYDRAULIC FLOW DIAGRAM OF COMMUNITY TOILET BLOCK-1 & DEWATS NEAR GOVERNMENT PRIMARY SCHOOL

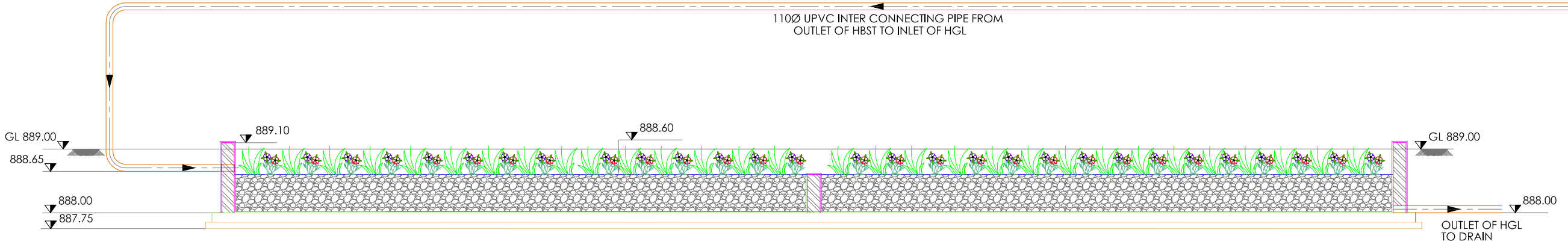


COMMUNITY TOILETS BLOCK

INSPECTION CHAMBER



HYBRID BAFFLED SEPTIC TANK
WITH CLARIFIER & SETTLER (HBST)



HORIZONTAL GRAVEL FILTER (HGL)

NOTES:-

1. ALL DIMENSIONS ARE IN MILLIMETERS AND LEVELS ARE IN METERS.
2. ALL DIMENTIONS SHOWN ARE CLEAR(EXCLUDING PLASTERING THK.).
3. THICKNESS OF PLASTERING 1:4 C.M ON BOTH SIDES AS PER SPECIFICATION.
4. PIPE IN THE WALL TO BE EMBEDDED IN PCC 1:3:6.
5. TMT STEEL SHALL BE ADOPTED FOR REINFORCEMENT OF THE STRUCTURES.
6. CEMENT-SULPHATE RESITENCE CEMENT FOR SPECIFIED ITEMS OF THE STRUCTURES.
7. M20 GRADE CEMENT CONCRETE = 1 : 1.5 : 3 AS PER IS STANDARDS AND SPECIFICATIONS.

ABBREVATIONS	
SBM	CONCRETE SOLID BLOCK MASONRY
CM	CEMENT MORTAL
RCC	REINFORCED CEMENT CONCRETE
PCC	PLAIN CEMENT CONCRETE
CT	CHILD TOILET
SSM	SIZE STONE MASONRY
EGL	EXISTING GROUND LEVEL
FGL	FINISHED GROUND LEVEL
IL	INVERT LEVEL

DESIGN OF SEWERAGE SYSTEM IN KAVERI NAGAR

FIGURE 3.5 : HYDRAULIC FLOW DIAGRAM OF COMMUNITY TOILET BLOCK-2 & DEWATS OPPOSITE TO URDU SCHOOL

3.9 Design of DEWATS

The design of DEWATS units are presented below. Number of users at two locations are 460 and 450.Hence for design purpose, 460 users have been considered for both the locations.

Table 3.5: Design of DEWATS units

HYBRID BAFFLED SEPTIC TANK WITH INTEGRATED SETTLER AND CLARIFIER				
Design Flow				
Number of Users		=	460	persons
Toilet Flushing Quantity including cleaning		=	20	lpcd
Sewage Flow = (no of users x flushing rate)		=	9200	l/d
		=	9.2	m3/d
Provide DEWATS		=	1	No
Capacity of each DEWATS		=	9.2	m3/d
Raw Sewage Characteristics				
BOD inflow		=	1500	mg/l
COD inflow		=	2850	mg/l
Design of Settler				
Time of most waste water flow		=	12	h
Max. peak flow per hour		=	0.77	m3/h
COD/BOD ratio		=	1.9	
Settleable SS/COD ratio	Given	=	0.42	
Lowest digester temperature	Given	=	25	^{o}C
Desludging interval	Chosen	=	18	months
HRT in settler (no settler HRT=0)	Chosen	=	1.5	h
COD removal rate in settler	Calculated	=	23	%
BOD5 Removal rate in settler	Calculated	=	25	%
COD inflow into Baffled Reactor	Calculated	=	2195	mg/l
BOD inflow into Baffled Reactor	Calculated	=	1134	mg/l
COD/BOD5 ratio after settler	Calculated	=	1.93	

HYBRID BAFFLED SEPTIC TANK WITH INTEGRATED SETTLER AND CLARIFIER				
Factors to calculate COD removal rate of Baffled reactor				
f-overload		=	1.00	
f-strength		=	1.06	
f-temp		=	1.00	
f-HRT		=	1.02	
Theoretical removal rate acc. To factors		=	84	%
COD removal rate baffle only		=	72	%
COD out of Baffle reactor		=	614	mg/l
Total COD removal rate	Calculated	=	78	%
Total BOD5 removal rate	Calculated	=	85	%
BOD out of Baffle reactor	Calculated	=	223	mg/l
Dimensions of Settler				
Inner masonry measurements chosen according to required volume				
Width		=	**1.5**	**m**
Depth		=	**1.5**	**m**
Sludge accumulation rate	Calculated	=	0.0037	l/g COD
Length of Settler	Chosen	=	**3.6**	**m**
Design of Baffled Septic tank				
Max. up flow velocity	Chosen	=	1.4	m/h
Number of up flow chambers	Chosen	=	5.0	No.
Depth of outlet	**Chosen**	**=**	**1.5**	**m**
Length of chambers should not exceed half depth		=		
Length of chambers	Calculated	=	0.75	m
Length of chambers	**chosen**	**=**	**0.75**	**m**
Area of single up flow chamber	Calculated	=	0.55	m^2
Width of chambers	Calculated	=	0.73	m
Width of chambers	**Chosen**	**=**	**1.0**	**m**
Actual up flow velocity	Calculated	=	1.02	m/h
Width of down flow shaft	Chosen	=	0.25	m
Actual volume of baffled reactor	Calculated	=	7.5	m^3

HYBRID BAFFLED SEPTIC TANK WITH INTEGRATED SETTLER AND CLARIFIER				
Actual total HRT	Calculated	=	18.63	h
Organic load (BOD5)	Calculated	=	2.78	kg/m^3 x d
Biogas (assumed CH4 70% and 50% Dissolved)	Calculated	=	4.51	m^3/d
Horizontal Gravity Filter				
Average Flow		=	9.2	m^3/d
COD inflow to Filter	Calculated	=	404.25	mg/l
(in settler -23% removal eff.				
in baffled reactor -79% removal eff.)				
BOD inflow to Filter	Calculated	=	250.8	mg/l
(in settler -24% removal eff.				
in baffled reactor -78% removal eff.)				
COD/BOD	Calculated	=	1.61	
Outlet BOD reqd		=	30	mg/l
BOD removal. rate		=	88	%
COD removal. rate		=	85	%
COD out		=	57	%
Min annual temp.		=	25	OC
HRT factor acc. K20=0.3		=	0.93	
HRT		=	12.11	d
Hydraulic conduct		=	200	m/d
HRT in 35% pore space		=	4.24	d
Bottom slope	Chosen	=	1%	
Depth of filter at inlet	Chosen	**=**	**0.6**	**m**
Cross section area	Calculated	=	15.38	m^2
Width of filter basin	Calculated	=	25.64	m
Surface area required	Calculated	=	230.74	m^2
Length of filter basin	Calculated	=	9	m
Chosen width	**Chosen**	**=**	**18**	**m**
No. of compartments	**Chosen**	**=**	**2**	**No**
Width of each compartment	**Chosen**	**=**	**9**	**m**
Length chosen	**Chosen**		**14**	**m**

HYBRID BAFFLED SEPTIC TANK WITH INTEGRATED SETTLER AND CLARIFIER				
Actual surface area chosen			252	m
Hydraulic loading on chosen surface	(max load 0.1)		0.041	m/d
Organic loading on chosen surface	(max load 10)		10.255	g/m2 BOD

The summary of the units along with their treatment efficiencies are given below in Table 3.6

Table 3.6: Summary of Unit Sizes of DEWATS Units

Sl.No	Unit	No	Length	Width	Depth	BOD inlet	BOD outlet	% BOD removal
1	Settler	1	3.6	1.5	1.5	1500	1134	25
2	Baffled Septic Tank	5	0.75	1.0	1.5	1134	251	78
3	Horizontal Gravity Filter	3	15	5	0.6	251	30	88.0

3.10 Start up, Operation and Maintenance of DEWATS

Diligent and continued operation and maintenance of the plant is required for the sustainability of the plant and to achieve discharge standards. After execution of the units, start up phase is an important activity and requires sufficient time to deliver the effluent of required discharge standards. The starting up and maintenance of each unit is described below:

3.10.1 Settler

A settler may be used immediately. It does not require special arrangements before usage. However, digestion of sludge starts after some days only. Regular desludging after one to three years is required.

When removing the sludge, some immature (still active) sludge should be left inside to enable continuous decomposition of newly settling solids. This means, if the sludge is removed by pumping, the pump head should be brought down to the very bottom. It is not necessary to remove all the liquid.

The sludge should be immediately treated further in drying beds or compost pits for pathogen control. The surrounding of the septic tank should be kept free of plants in order to prevent roots from growing into the pipe lines and chambers.

3.10.2 Baffled Septic Tank with Clarifier

Treatment performance depends on the availability of active bacterial mass. Inoculation with old sludge from septic tanks hastens the achievement of adequate treatment performance. In principle it is advantageous to start with a quarter of the daily flow and if possible with a slightly stronger wastewater. The loading rate increases slowly over three months. This would give the bacteria enough time to multiply before suspended solids are washed out. Starting with the full hydraulic load from the beginning will severely delay maturation.

Although desludging at regular intervals (2 –2.5 years) is necessary, it is vital that some active sludge is left in each of the compartments to maintain a stable treatment process.

3.10.3 Horizontal Gravity Filter

Young plant seedlings may not grow on waste water. It is therefore advisable to plant prior to commissioning of the settler, start feeding the plant with plenty of fresh water and to let the pollution load grow slowly and parallel to plant growth.

When plants are under full load, the outlet level is adjusted according to the flow. Water should not stand on the surface near the inlet. Optimal water distribution at the inlet side is important and must be controlled from time to time.

It is necessary to replace the filter media when treatment efficiency goes down. The normal period of cleaning interval would be 8 – 10 years. Since there is no treatment during the time that the filter media is being replaced, it is advantageous to install several parallel filter beds. Storm water should neither be mixed with the wastewater before, nor should outside storm water overflow the filter bed, because of the fine soil particles which come with that water.

3.11 Construction Material

The Finished Ground Level of Community Toilet Block with DEWATS site should be fixed above the flooding level in that area.

The Finished Ground Level at Government Primary School is fixed at 897.80

1. Digester gases

2. Settled Sludge

3. Treated Water

1. Digester Gases

It is expected that bio gas generated from the proposed DEWATS is in the range of 4-4.5 cu.m per day. It consists of high content of methane (about 70%); therefore the gas generated can be used for cooking purposes. After discussions with WSUP officials, this option has not been considered as it requires maintenance on regular basis.

An option of converting bio gas into electricity for plant lighting can also be explored. Generally one bio gas mantle lamp consumes 4 – 6 cft (cubic feet) of biogas per hour, having illumination capacity 80 W electric bulbs at 220 volts. Thus 4 cum of bio gas can produce electricity for 20 lamps per hour. i.e 2 lamps can be operated for 10 hrs. But the conversion needs capital investment.


Use of biogas for lighting mantle lamps

In case of emitting out the gases into the atmosphere, it is recommended to fix a odor eliminator to the vent pipe (such as **sweet filter** which consists of activated carbon) so that odor free gases will be escaped into the atmosphere which otherwise may cause smell nuisance to the surrounding areas. The cost of sweet filter with transportation cost would be about Rs.10000/-.The filter material shall be regenerated once in a year.

The supplier of this product is

M/s Pennington Equipment Company,
1520 N,6th Street,
Springfield,
Illinois, United States,
Website:http://www.SolarAerator.com,www.DickPennington.com

2. Settled Sludge

The digester gases are proposed to be let out into the atmosphere. The settled sludge from the settler and baffled septic tank will be removed at regular intervals of one and half to two years. The sludge shall be taken to drying beds and after drying the sludge can be used as manure.

3. Treated Water

The treated water can be used for irrigation purposes if sufficient land is available near by. Otherwise, it can be discharged into near by drains.

The Finished Ground Level of layout at opposite to Urdu Primary School is fixed at 889.80 i.e raised about 0.4 m to prevent flooding.

The materials proposed to be used in used in the construction of DEWATS are described below:

Table 3.7: Construction Material used in DEWATS

S No	Item	Construction Material
1	Walls	Made of solid cement blocks, with outside and inside plastering for water tightness
2	Raft	Foundation slab in RCC M20 with blinding concrete PCC M10 below the raft
3	Slabs	Slabs are made of RCC in M20
4	Manhole Covers	Manhole covers are made up of Fiber Reinforced Cement Concrete (FRC)
5	Baffle walls	Baffle walls are in RCC M20 of 100 mm thickness
6	Piping	PVC Class 6
7	Media in gravel Filter	i) Gravel 5 – 20 mm ii) Gravel 20 – 30 mm iii) Gravel 40 – 80 mm
8	Plants	Cana, Cattails, Bulrushes

3.12 Utilities and Services

3.12.1 Security Room

Security will be provided to guard against vandalism of the plant property. The security staff is provided with a room at the gate for giving shelter against elements. The shelter will be made of solid cement blocks and roof with Asbestos Cement sheets. The shelter will have one power point for lighting

3.12.2 Plant Lighting

One sodium vapour lamp shall be provided in the premises for External lighting

3.12.3 Green Belt

There will be a green belt of –m width all around the plant. This green belt, consisting of tall plants, will act as air purifier. This will help in circumventing to some extent the odour problem in the eventuality of an improper operation of the plant. Besides, a green belt will act as natural screen against the outside populace.

3.13 Resource Recovery

The product of DEWATS after treatment is summarized as follows:

CHAPTER – 4

Capital and O&M Cost

Chapter 4

Capital and O&M Cost

Detailed quantity estimates have been carried out for toilet block and DEWATS. The abstract of cost estimates is given Table 4.1. For cost estimates, the rates given in BWSSB and PWD schedule of rates 2008-09 have been adopted. For the items not given in schedule of rates, prevailing markets have been considered.

Table 4.1: Abstract of Cost Estimate for Community Toilet Blocks and DEWATS at Two Locations

S. No.	Description	No.	Amount (1 Toilet Block)	Total
1.0	Construction Community Toilet Blocks	2	1096416.00	2192832.00
2.0	**DEWATS**			
2.1	Construction of Settler and Baffle Reactor with Anaerobic Filter	2	167334.00	334668.00
2.2	Construction of Planted Gravel Filter	2	1037173.00	2074346.00
	Total Cost for DEWATS		**1204507.00**	**2409014.00**
3	**Cost of Other items**			
3.1	Barbed wire fencing around the treatment modules	2	35944.00	71888.00
3.2	Formation of Ground level	2	6446.00	12892.00
	Total Cost for Other Items		**2343313.00**	**4686626.00**
4	Contingencies and unforeseen charges, 10%		234331.00	468663.00
	Total Cost		**2577644.00**	**5155289.00**
	Say Rs in Lakhs			**51.55**

Table 4.2 Total Operation & Maintenance cost for DEWATS at each location

S. No	Description	Cost in Rupees	Details
1	Annual Operation Cost	10,000	Man power, Electricity, Repairs
2	Annual Maintenance cost	6,000	De-summing, de-sludging.
3	**Total cost**	**16,000**	

CHAPTER – 5

Project Execution Schedule

Chapter 5
Project Execution Schedule

The execution plan for construction of DEWATS is given in Figure 5.1.The time schedule for execution is based on the WSUP requirements. The construction period for toilet block and DEWATS is 6 months. The work mainly consists of three elements namely

1. Construction of Toilet Block
2. Construction of DEWATS units
3. Security room and other services

It is assumed that all the elements shall be executed simultaneously.

ID	Task Name	Duration	Start	Finish
1	**Project Execution Schedule for Toilet Blocks & DEWAT System**	**140 days**	**Sat 5/1/10**	**Mon 10/11/10**
2	**Construction of Toilet Block**	**140 days**	**Sat 5/1/10**	**Mon 10/11/10**
3	Earthwork Excavation	4 wks	Sat 5/1/10	Mon 5/24/10
4	PCC Bed in Foundation	5 wks	Wed 5/19/10	Wed 6/16/10
5	Construction of RCC Columns, Walls and Roof	6 wks	Thu 6/17/10	Wed 7/21/10
6	Fixing of Doors, Windows & Electrical Fixures	4 wks	Sat 7/10/10	Mon 8/2/10
7	Internal Plumbing and Fixing of WC	4 wks	Tue 8/3/10	Wed 8/25/10
8	Plastering Flooring and Fixures	4 wks	Thu 8/26/10	Fri 9/17/10
9	Painting and Finishing	4 wks	Sat 9/18/10	Mon 10/11/10
10	**Construction of DEWATs**	**75 days**	**Sat 5/1/10**	**Tue 7/27/10**
11	Earthwork Excavation	3 wks	Sat 5/1/10	Tue 5/18/10
12	PCC Bed in Foundation	6 wks	Thu 5/13/10	Wed 6/16/10
13	Construction of Walls and Roof	6 wks	Thu 6/17/10	Wed 7/21/10
14	Construction of Planted Gravel Filter	6 wks	Sat 6/5/10	Fri 7/9/10
15	Internal Piping, Plastering and Finishing	6 wks	Wed 6/23/10	Tue 7/27/10
16	Construction of Security room and other services	6 wks	Wed 6/23/10	Tue 7/27/10

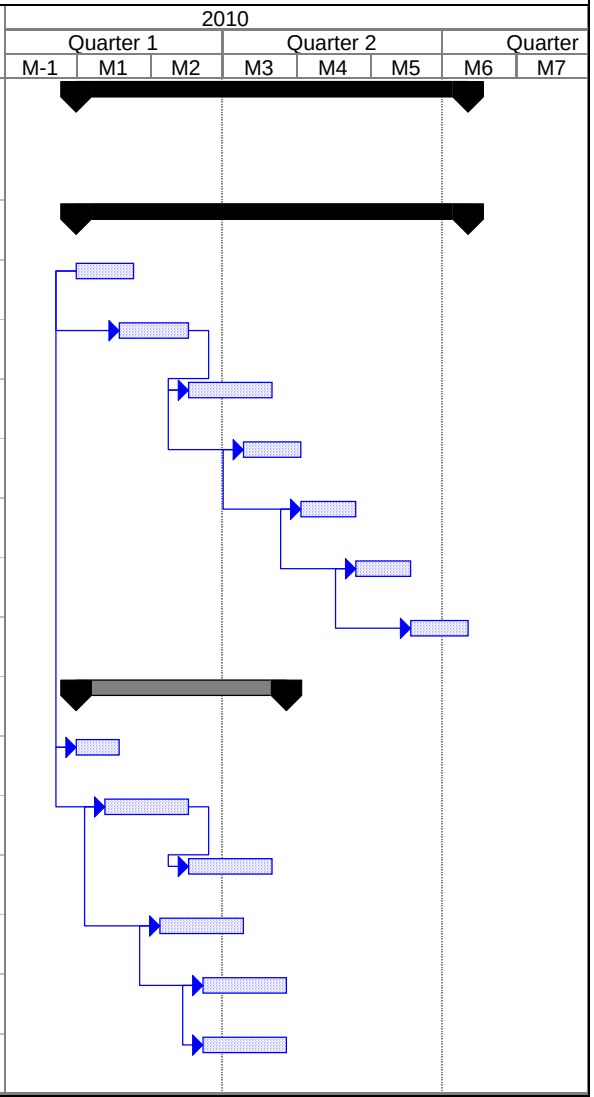


FIGURE 5.1 PROJECT EXECUTION SCHEDULE

Task
Continuous
Progress
Milestone
Summary
Project Summary
External Tasks
External Milestone
Deadline

Annexure- 1

Cost Estimation

Annexure - I - Cost Estimations

Summary of Cost Estimations for the Construction of Community Toilet Block and DEWATS		
Sl. No	**Particulars**	**Amount**
I	**Community Toilet Block**	**1,096,416**
II	**DEWATS**	
1	Hybrid Baffled Tank with Clarifier and Settler	167,334
2	Horizontal Gravel Filter	1,037,173
	Total Cost for DEWATS	**1,204,507**
III	**Associated Works**	
1	Fencing	**35,944**
2	Formation of Ground level	**6,446**
	Total	**2,343,313**
RUPEES TWENTY THREE LAKH FORTY THREE THOUSAND THREE HUNDRED AND THIRTEEN ONLY		

Cost Estimation for Construction of Community Toilet Block at Kaveri Nagar									
S. No.	**Item Description**	**Unit**	**No.**	**L(m)**	**B (m)**	**D (m)**	**Quantity**	**Rate (Rs.)**	**Amount (Rs.)**
I	**Civil Works**								
1.0	KSRB 2-1.1:Earthwork in surface excavation in ordinary soil for levelling and lowering the ground manually and removing the excavated stuff to a distance not exceeding 50m and lift upto 1.5m,excavated surface levelled and neatly dressed ,disposed earth to be levelled after breaking of clods and neatly dressed as per specifications.Specification No.KBS 2.1 (a)/2.3.1 (PWDSR 08-09, Pg. No. 6, Item No.2.1)								
i	For Entire Layout	Cum	1	30.00	21.00	0.10	63.00	78.36	4,937.00
2.0	KSRB 2-2.1:Earthwork excavation for foundation of buildings, culverts, water supply, sanitary lines and electrical conduits either in pits or in trenches 1.5 m and above in width, in **Ordinary soil** not exceeding 1.5 m in depth including dressing the bottom and sides of pits and trenches, stacking the excavated soil clear from edges of excavation with lead upto 50 m after breaking of clods complete as per specifications. Specification. No. KBS 2.1 (a)/2.3.5 (PWDSR 08-09, Pg. No. 6, Item No.2.3)								
2.1	For foundation (0.2 m Walls)	cum	1	43.27	1.30	0.50	28.13		
2.2	For foundation (0.15 m Walls)	cum	1	22.66	1.05	0.50	11.90		
2.3	For Sump tank of Capacity 7.5 cum	cum	1	2.50	1.50	0.50	1.88		
	Total						**41.90**	94.02	3,940.00
3.0	KSRB 2-2.4 : Excavation 1.5 m and above in width, in **soft rock without blasting** for foundation of buildings, culverts, water supply, sanitary lines and electrical conduits either in pits or in trenches not exceeding 1.5 m in depth,stacking the exacavated stuff from edges of exacavation with lead upto 50 mts,labour and HOM of equipment cpmplete as per specifications.Specification. No. KBS 2.1.C/2.9.4/2.1.8/2.1.9 (PWDSR 08-09, Pg. No. 6, Item No.2.3)								
i	**0-1.5 mtrs**								
3.1	For foundation (200mm Walls)	cum	1	43.27	1.30	0.40	22.50		
3.2	For foundation (150mm Walls)	cum	1	22.66	1.05	0.15	3.57		
3.3	For Sump tank of Capacity 7.5 cum	cum	1	2.50	1.50	1.00	3.75		
ii	**Total**						**29.82**	441.64	13,170.00
	1.5 to 2.5mtrs								
3.4	For Sump tank of Capacity 7.5 cum	cum	1	3.20	1.50	0.65	3.12	452.61	1,413.00
	Total Quantity of Earth Work Exacavation						**74.84**		
4.0	KSRB 4-1.1: Providing and laying in position **Plain Cement Concrete of nominal mix 1:2:4** using 40mm and down size graded granite metal machine mixedconcrete laid in layers not excedding 15 cms thick, well compacted including cost of all materials, labour, HOM of machinery, curing complete etc., complete as per specifications.Specification No. KBS 4.1,4.2 (PWDSR 08-09, Pg. No. 14, Item No.4.1)								
4.1	For base slab/ bed concrete at foundation of 200mm walls	cum	1	43.27	1.30	0.10	5.63		
4.2	For base slab/ bed concrete at foundation of 150mm walls	cum	1	22.66	1.05	0.10	2.38		

Cost Estimation for Construction of Community Toilet Block at Kaveri Nagar									
S. No.	**Item Description**	**Unit**	**No.**	**L(m)**	**B (m)**	**D (m)**	**Quantity**	**Rate (Rs.)**	**Amount (Rs.)**
4.3	For base slab /bed concrete at foundation of Sump tank	cum	1	2.50	1.50	0.10	0.38		
4.4	For base slab /bed concrete for steps infront	cum	1	6.26	1.20	0.10	0.75		
4.5	For base slab /bed concrete for flooring	cum	1	55.18		0.12	6.62		
	Total Quantity						**15.75**	**3,932.60**	61,948.00
5.0	KSRB 5.2-3:Providing and constructing granite/trap/basalt **Size Stone Masonry in foundation** with cement mortar 1:6, stone hammered dressed in courses not less than 20 cms high, bond stones at two m apart in each course including cost of materials, labour, curing complete as per specifications. KBS 5.1.13 (PWDSR 08-09, Pg. No. 24, Item No.5.6)								
i	**For 200 mm thick walls**								
5.1	For first course	cum	1	43.27	1.10	0.20	9.52		
5.2	For second course	cum	1	43.27	0.90	0.20	7.79		
5.3	For third course	cum	1	43.27	0.70	0.20	6.06		
5.4	For fourth and course	cum	1	43.27	0.50	1.00	21.64		
ii	**For 150 mm thick walls**								
5.4	For first course	cum	1	22.66	0.85	0.20	3.85		
5.5	For second course	cum	1	22.66	0.65	0.20	2.95		
5.6	For third course	cum	1	22.66	0.45	1.00	10.20		
	Total quantity						**62.00**	2,226.00	138,003.00
6.0	KSRB 2.3:Filling available excavated earth (excluding rock) in sides of foundations upto plinth in layers not exceeding **20 cms** in depth, compacting each deposited layer by ramming after watering with a lead upto 50 m and lift upto 1.5 m including cost of all labour complete as per specifications. Specification No. KBS 2.9 (PWDSR 08-09, Pg. No. 7, Item No.2.10)								
6.1	Filling the side of foundation	Cum	1				44.67	63.30	2,828.00
6.2	Filling with earth inside toilet block from ground level upto the Finished floor level	cum	1	9.85	5.86	0.40	23.09	63.30	1,462.00
7.0	KSRB 4-2.2: Providing and laying in position **Reinforced Cement Concrete of nominal mix 1:1.5:3** using 20mm and down size graded granite metal machine mixed concrete laid in layers not excedding 15 cms thick,vibrated for all works in foundation plinth and ground floor level,lintels,cillsetc., including cost of materials, labour, HOM of machinery, curing, comlete as per specifications.Specification No. KBS 4.1,4.6 (PWDSR 08-09, Pg. No. 15, Item No.4.11)								
i	**for Sump**								
7.1	For Sump side walls	cum	1	8.00	2.00	0.10	1.60		
7.2	For sump roof slab	cum	1	2.50	1.50	0.15	0.56		
7.3	For Sump bottom Slap	cum	1	8.00	2.00	0.15	2.40		
ii	**For Plinth Beam**								
7.3	For 200mm thick walls	cum	1	43.26	0.50	0.20	4.33		
7.4	For 150mm thick walls	cum	1	21.31	0.25	0.20	1.07		
iii	**For Lintel Beam**	cum							
7.5	For 200 mm thick walls	cum	1	43.26	0.20	0.20	1.73		
7.6	For 150 mm thick walls	cum	1	21.31	0.15	0.20	0.64		
iv	**for Columns for roof slab**	cum	4	0.50	0.20	0.50	0.20		
v	**for roof slab**	cum	1	2.00	6.26	0.15	1.88		
	Total Quantity						**14.40**	4,556.94	65,628.00

Cost Estimation for Construction of Community Toilet Block at Kaveri Nagar									
S. No.	**Item Description**	**Unit**	**No.**	**L(m)**	**B (m)**	**D (m)**	**Quantity**	**Rate (Rs.)**	**Amount (Rs.)**
8.0	KSRB 4.9.2 : Providing **TMT steel Reinforcement** for RCC work including straightening, cutting, bending, hooking, placing in position,lapping and/or Welding whever required tying with binding wire and anchoring to the adjoining members wherever necessary complete as per design ,cost of materials,labour,HOM of machinery complete as per specifications.specification No.KBS 4.6.3 (PWDSR 08-09, Pg. No. 19, Item No.4.46)								
	Considering 80 kgs of steel per cum of concrete	q					11.52	6,167.08	71,054.00
9.0	KSRB 4-6.4 **Providing and removing Centering**, shuttering, strutting, propping etc and removal of formwork for flat surface such as suspended floors,roofs,landings,balconies and likes,thickness upto 20mm including cost of all material, labour complete as per specifications. specification No.KBS 4.6.2(PWDSR 08-09, Pg. No. 17, Item No.4.29)								
9.1	For Plinth beam	sqm	1	62.95	0.20		12.59		
9.2	For Sump tank side walls	sqm	1	8.00	2.00		16.00		
9.3	For sump roof slab	sqm	1	2.50	1.50		3.75		
9.3	For Lintel	sqm	1	62.95	0.20		12.59		
9.4	For RCC slab	sqm	1	6.26	2.00		12.52		
9.5	For RCC Columns	sqm	4	0.90	0.50		1.80		
	Total						59.25	206.70	12,247.00
10.0	Providing and constructing precast concrete solid block Masonary with compressive strength not less than 35 Kg/sqm with cement mortar 1:4 masonry (quoin, Jamb, closer blocks) with **Solid Concrete Blocks of size 40x20x20cms** conforming to I.S:2185/1965 in superstructure including cost of materials, labour charges, scaffolding, curing complet as per specifications.								
10.1	Outer Walls-Longer side	sqm	2	10.20	2.10		42.84		
10.2	Outer Walls-shorter side	sqm	2	6.26	2.10		26.29		
10.3	for steps infront of the toilet block	sqm	1				20.03		
10.4	Inner Partion Wall	sqm	1	10.20	2.10		21.42		
10.5	Deduct doors-D	sqm	2	2.10	1.00		4.20		
	Total						**106.38**	662.50	70,480.00
11.0	Providing and constructing precast concrete solid block Masonary with compressive strength not less than 35 Kg/sqm with cement mortar 1:4 masonry (quoin, Jamb, closer blocks) with **Solid Concrete Blocks of size 40x15x15cms** conforming to I.S:2185/1965 in superstructure including cost of materials, labour charges, scaffolding, curing complet as per specifications.								
11.1	Internal toilet room walls	sqm	14	0.25	2.10		7.35		
11.2	Care taker room walls	sqm	1	2.60	2.10		5.46		
11.2	Care taker room walls	sqm	1	3.00	2.10		6.30		
	Total						**19.11**	555.00	10,607.00

Cost Estimation for Construction of Community Toilet Block at Kaveri Nagar									
S. No.	**Item Description**	**Unit**	**No.**	**L(m)**	**B (m)**	**D (m)**	**Quantity**	**Rate (Rs.)**	**Amount (Rs.)**
12.0	KSRB 15.3.1: Providing **rough cement plastering 15 mm thick** in single coat with cement mortar 1:4, to brick masonry for base of dadooing works with sand of approved quality,providing and removing scaffolding,icluding cost of materials, labour, curing complete as per specifications (PWDSR 08-09, Pg. No. 110, Item No.15.30)								
i	for inside walls	sqm	1	83.12	1.50		124.68		
ii	for outside walls	sqm	1	41.92	1.50		62.88		
	Total						**187.56**	97.63	18,311.00
13.0	KSRB 15.3.1: Providing 12 mm thick cement plaster in single coat with **cement mortar 1:3**, to brick masonry including roundif off corners, wherever required smooth rendering, providing and removing scaffolding, including cost of materials, labour, curing complete as per specifications (PWDSR 08-09, Pg. No. 108, Item No.15.9) **For inside walls**								
i	for inside walls	sqm	1	83.12	0.70		58.18		
ii	for inside roof slab	sqm	1	2.00	6.26		12.52		
iii	for Columnsof roof slab	sqm	4	1.20	0.50		2.40		
iv	For sump walls	sqm	1	8.00	2.00		16.00		
	Total						**89.10**	102.18	9,106.00
14.0	KSRB 15.3.1: Providing 12 mm thick cement plaster in single coat with **cement mortar 1:3**, to brick masonry including roundif off corners, wherever required smooth rendering, providing and removing scaffolding, including cost of materials, labour, curing complete as per specifications (PWDSR 08-09, Pg. No. 108, Item No.15.9) **For outside walls**								
14.1	For outside walls	sqm	1	41.92	0.70		29.34		
14.2	for steps infront of the toilet block	sqm	3	6.26	0.30		5.63		
14.3	for steps infront of the toilet block	sqm	1	6.26	0.50		3.13		
	Total						**38.11**	102.18	3,895.00
15.0	KSRB 15-4.7 Extra for Providing and mixing **Water Proofing Compound in cement Plaster** for brick masonary work at one kg per bag or in proportion recommended by the manufacturers, for cement mortar 1:4, 20 mm thick cost of materials complete as per specifications.(PWDSR 08-09, Pg. No. 110, Item No.15.29) **for sump and and roof Slab**	sqm	1	2*6.26+2.5*1.5+8*2			32.27	8.68	281.00
16.0	KSRB 15-13.1:Providing and applying one coat **Distemper Primer** of approved brand on wall surface after thoroughly brooming the surface to remove all dirt, dust, mortar drops and other foreign matter including preparing the surface, even and sand paper smooth, cost of materials, labour, complete as per specifications (PWDSR 08-09, Pg. No. 109, Item No.15.23)								
16.1	For interior walls above dadooing	sqm	1	Refer item no 13			89.10	14.34	1,278.00
17.0	KSRB 15-18.4: Providing and applying **alluminium paint two coats** (excluding priming coat) over new steel or other metal surface brushing to give an shade after cleaning oil, grease, dirt and other foreign matter, including cost of materials, labour, complete as per specifications (PWDSR 08-09, Pg. No. 117, Item No.15.76)								
17.1	For ventilators	sqm	1	51.02	0.50		25.51		
17.2	For collapsable doors	sqm	2	2.10	1.20		5.04		

Cost Estimation for Construction of Community Toilet Block at Kaveri Nagar									
S. No.	**Item Description**	**Unit**	**No.**	**L(m)**	**B (m)**	**D (m)**	**Quantity**	**Rate (Rs.)**	**Amount (Rs.)**
	Total						**30.55**	34.00	1,039.00
18.0	Providing flooring with **60 x 60 cms size** vitrified glazed tiles of approved quality & make fixed on top of existing **flooring** fixed suitable adhesive including cutting the tiles to the required size and fixing etc., complete. (BWSSBSR 08-09, Pg. No. 196, Item No.14.44)	sqm					55.18	997.46	55,040.00
19.0	**Providing skirting, dado,** rises of steps with white glazed tiles 20 cms x 20 cms 6 mm thick on 10 mm thick cement plaster 1:3 and jointed with white cement slurry over rough plaster surface (excluding cost of rough plastered surface which should be measured and paid separately) using glazed tiles of approved make and size inclucing cost of materials, labour, complete as per specifications. Specification No. KBS 14.5 (BWSSBSR 08-09, Pg. No. 195, Item No.14.40) **Inside walls**	sqm		Refer item no 12(i)			124.68	658.26	82,072.00
20.0	**Providing Ceramic** tiles of size 30 X 30cms of approved make,shade and size for flooring,teads of steps and landing,laid on be of 12 mm thick cement mortar 1:3 mix, flush pointing with white cement using colur pigment,including cost inclucing cost of materials, labour, complete as per specifications. Specification No. KBS 14.36.2 (BWSSBSR 08-09, Pg. No. 195, Item No.14.36.2) **Outside walls**	sqm		Refer item no 12 (ii)			62.88	576.64	36,260.00
21.0	KSRB 15-16.1.1 Providing and finishing **exeternal walls in two coats with water proof cement paint** of approved brand on wall surface to give an even shade after throuoghly brooming the surface to remove all dirt and loose powdered material, free form mortar drops and other foreign matter cost of materials, complete as per specifications with primer (PWD SR page no 113 item no.15.53.2)	sqm		Refer item no 14.1			89.10	53.00	4,723.00
22.0	KSRB 15-15.1 Providing and applying **painting internal walls in two coats with plastic emulsion paint** of approved brand on wall surface to give an even shade after throuoghly brushing the surface to remove all dirt and loose powdered material, free form mortar drops and other foreign matterincluding preparing the surface even and sand paper smooth, cost of materials, complete as per specifications with primer(PWD SR page no 113 item no.15.51.2)	sqm					29.34	53.00	1,556.00
23.0	Supply and fixing, C I manhole cover of size 600 X 600 mm and frames with hinge arrangements of approved Ist quality and make conforming to I.S.I specification and fixing to the slab as per specification and as directed by engineers in charge. (Rate includes cost of all materials laying, curing and conveyance to work spot etc.(for Sump tank)	LS	1				1.00	4,000.00	4,000.00
24.0	Providing and Fixing PVC doors for Toilets (Sintex) including cost of frame & fittings (Handle, hinges, tower bolts)								
24.1	Doors- D2	No.					14.00	1,896.11	26,546.00

Cost Estimation for Construction of Community Toilet Block at Kaveri Nagar									
S. No.	**Item Description**	**Unit**	**No.**	**L(m)**	**B (m)**	**D (m)**	**Quantity**	**Rate (Rs.)**	**Amount (Rs.)**
24.2	Doors-D1	No.					1.00	1,820.11	1,821.00
25.0	Providing and fixing Collapsable steel doors for main entrance foe male side and Female side	No.	2				2.00	9,000.00	18,000.00
26.0	Providing and fixing MS square bars of 10 mm X10 mm for Safety protection and Ventilation on all the four sides of the toilet block								
i	Horizontal alignment								
26.1	For longer side	Rmts	5	16.00			80.00		
26.2	For shorter side	Rmts	5	12.00			60.00		
26.3	below RCC roof for longer side	Rmts	5	6.00			30.00		
26.4	below RCC roof for shorter side	Rmts	5	4.00			20.00		
ii	Vertical Alignment								
26.5	For longer side	Rmts	80	0.50			40.00		
26.6	For shorter side	Rmts	60	0.50			30.00		
26.7	below RCC roof for longer side	Rmts	30	0.50			15.00		
26.8	below RCC roof for shorter side	Rmts	20	0.50			10.00		
	Total						**285.00**	95.00	27,075.00
27.0	Fabrication and Erection of Tubular Frame work all at site with main arches 65 NB 3.6 thick @ 6.420/kg mtr 5nos ,and purlin @ every interval of 1000 mm 3.2 thick 3.49/kg mtr, Meta color sheet crimped fixed with SDS screws With suitable fasteners and bolts etc and Meta Sheet for roofing as shown in the drawing and as per directions of Engineer in charge	sqm		7.80	9.30		72.86	1,250.00	91,075.00
28.0	Providing and Fixing the Windows in the care Taker room with 10 mm square rods with outer frame with MS flat	sqm	2	1.00	1.00		2.00	5,000.00	10,000.00
II	**Plumbing and Sanitary Works**								
29.0	Providing and Fixing of GI pipe lines of 12 mm dia for Water supplying								
29.1	From sump to Sintex tank at roof	Rmt					30.00		
29.2	From Sintex tank to taps	Rmt					90.00		
	Total	Rmt					**120.00**	393.30	47,196.00
30.0	KSRB 11-13.1: Providing and f**ixing laboratory sink of white glazed fire clay**, of size 600 mm x 450 mm x 200 mm with MS/CI brackets, CP brass chain with rubber plug, 32 mm CP Brass waste, tap and union, brass stop cock complete, painting of fittings and brackers, cutting and making good the wall and floor wherever required, including cost of materials, labour complete as per specifications, Specification No. KBS 11 (BWSSBSR 08-09, Pg. No. 172., Item No.12.34)								
30.1	in Male block	No.					2.00		
30.2	in Female block	No.					2.00		
	Total	No.					**4.00**	2,247.20	8,989.00
31.0	Providing and Fixing with polished surface and Bull nosed for edges **black Granite Slab** of 15 mm thick for Wash basins	sqm	2	0.53	1.85		1.96	800.00	1,569.00
32.0	KSRB 11-15.1: Providing and fixing 600 mm x 450 mm bevel **lead edge mirror** of superior glass with 6 mm hard board backing and fixed to wooden cleats with C.P. screws, washers, including cost of materials, labour complete as per specifications (BWSSBSR 08-09, Pg. No. 173., Item No.12.39)								
32.1	in Male block	Unit					2.00		
32.2	in Female block	Unit					2.00		
	Total	Unit					**4.00**	1,105.58	4,423.00

Cost Estimation for Construction of Community Toilet Block at Kaveri Nagar									
S. No.	**Item Description**	**Unit**	**No.**	**L(m)**	**B (m)**	**D (m)**	**Quantity**	**Rate (Rs.)**	**Amount (Rs.)**
33.0	KSRB 16-6.2: Providing and fixing in position brass bib cock of approved quality of 20 mm nominal bore including cost of all materials, labour and HOM of eqipments with all leads complete as per specifications. Specification No. KBS 13.2.19/3.16 **(For Wash basin)** (BWSSBSR 08-09, Pg. No. 181, Item No.13.24)	No.							-
33.1	in Male block	Unit					2.00		-
33.2	in Female block	Unit					2.00		-
	Total	Unit					**4.00**	182.32	730.00
34.0	KSRB 13-6.2-2: Providing and fixing in position **brass stop cock** of approved quality 20 mm nominal bore including cost of all materials, labour and HOM of equipments with all leads complete as per specifications, Specification No, KBS 13.2.2/13.3 (BWSSBSR 08-09, Pg. No. 181, Item No.13.26)								
34.1	in Male block = 7 in toiltes + 6 for urinals + 2 at Wash basin	No.					15.00		
34.2	in Female block = 7 in toiltes + 2 at Wash basin	No.					9.00		
	Total						**24.00**	135.68	3,257.00
35.0	Providing and fixing the Sintex water tank in position (Sintex industries)	Lts					4,000.00	3.90	15,600.00
36.0	KSRB 11-1: Providing and fixing white vitreous china clay, **water closet Indian type** (Squatting pan) of size 580 mm with footrests, 100 mm S or P trap, 10 litre low level, P.V.C flushing cistern (all are approved make) with fittings, C.I/M.S, brackets, 32 mm diameter flush pipe fittings and clamps, overflow arrangements with specials and 25 mm mosquito proof coupling of approved design, painting of fittings and brackets, cutting and making good the wall and floor wherever required, including cost of materials, labour complete as per specifications. Specification No. KBS 11 (BWSSBSR 08-09, Pg. No. 169, Item No.12.1)								
36.1	in Male block = 4 for adult toiltes + 2 for Child toiltes(Child friendly toilets)	No.					6.00		
36.2	in Female block = 4 for adult toiltes + 2 for Child toiltes(Child friendly toilets)	No.					6.00		
	Total	**No.**					**12.00**	2,682.86	32,195.00
37.0	KSRB 11-6: Providing and fixing white vitreous china clay, **Water closet Europen type** (Pedestal type, S-trap) with black solid plastic seat and lid, CP brass hinges, rubber buffers, 10 litre white glazed/vitreous china clay low level, flushing cistern (all approved make) with fittings, C.I/M.S brackets, 40 mm diameter flush bend with fittings and clamps, overflow arrangements with specials and 25 mm mosquito proof coupling of approved design, painting of fittings and brackets, cutting and making good the wall and floor wherever required, including cost of materials, labour complete as per specifications, Specification No. KBS 11 (BWSSBSR 08-09, Pg. No. 170, Item No.12.6)								-
37.1	in Male block	No.					1.00		-
37.2	in Female block	No.					1.00		-

Cost Estimation for Construction of Community Toilet Block at Kaveri Nagar									
S. No.	**Item Description**	**Unit**	**No.**	**L(m)**	**B (m)**	**D (m)**	**Quantity**	**Rate (Rs.)**	**Amount (Rs.)**
	Total	**No.**					**2.00**	3,789.50	7,579.00
38.0	KSRB 11-7.1: Providing and fixing white vitreous china clay, **flat back, lipped front urinal basin 430 mm x 260 mm x 350 mm with 5 litres PVC automatic flusing cistern**, CI/MS brackets, standard flush pipe and CP brass spreaders with brass unions and GI clamps complete painting of fittings brackets, cutting and making good the wall and floor wherever required, including cost of materials, labour complete as per specifications. Specification No. KBS 11 (BWSSBSR 08-09, Pg. No. 170, Item No.12.7)	No.	6				6.00	2,237.66	13,426.00
39.0	Providing and Fixing **CI Nahani trap** of 10 cms x 7.5 cms of approved make conforming to ISI specifications and construction of Cistern in CC 1:2:4 as directions (Rate is inclusive of cost of materials and fixtures and conveyance of materials to work spot) (BWSSBSR 08-09, Pg. No. 179, Item No.12.113.2)								
39.1	in Male block	No.					12.00		
39.2	in Female block	No.					6.00		
	Total	**No.**					**18.00**	220.00	3,960.00
40.0	Providing and Fixing with double side polished surface and Bull nosed for edges black Granite Slab of 15 mm thick for separators at urinals	sqm	6				6.00	950.00	5,700.00
41.0	Soil lines for Sewerage								
41.1	Providing and laying the Connecting pipe from the closet to maintainence chamberand to the inspection chamber using 110 mm dia uPVC material	Rmt					25.00	821.50	20,538.00
41.2	Providing and constructing maintainence chamber in the passage for Toilet of each 300X300X300 with CI cover with all specifications as shown indrawing and as per directions of Engineer in charge	No.					14.00	750.00	10,500.00
42.0	Providing and fixing the PVC Rain Water Pipe of 100mm dia fitted with shoe bend at the bottom	Rmt	1				8.00	338.14	2,706.00
III	**Mechanical & Electrical**								
43.0	Providing and installing 2 HP Cetrifugal pump	No.	1				1.00	6,000.00	6,000.00
44.0	Providing and fixing of Gate valve to control the water from the sintex tank (12mm dia)	No.	1				1.00	2,000.00	2,000.00
45.0	Providing and fixing Switch boards and switches	sqm	1				5.00	1,600.00	8,000.00
46.0	Providing and fixing the fittings for lighting and providing lights	No.	20				20.00	495.00	9,900.00
47.0	Providing and Fixing Metre board and meter from BESCOM	No.	1				1.00	4,250.00	4,250.00
48.0	Providing and wiring through out complete with concealed plastic pipe with ISI mark in the wall	No.	1				1.00	15,000.00	15,000.00
49.0	Providing and fixing Main Switch board	No.	1				1.00	3,000.00	3,000.00
50.0	Providing and laying electrical supply cable from the electrical pole to meter board	No.	1				1.00	8,000.00	8,000.00
IV	**Miscellaneous**								
51.0	Locks 2nos,mats-2o's Dustbins-2nos, Table -1no etc.,	LS					1.00	5,000.00	5,000.00
	Total								**1,089,313.00**

Cost Estimation for Construction of Community Toilet Block at Kaveri Nagar									
S. No.	**Item Description**	**Unit**	**No.**	**L(m)**	**B (m)**	**D (m)**	**Quantity**	**Rate (Rs.)**	**Amount (Rs.)**
V	**Cost Estimation for Construction of Inspection Chamber**								
1	KSRB 2-2.1:Earthwork excavation for foundation of buildings, culverts, water supply, sanitary lines and electrical conduits either in pits or in trenches 1.5 m and above in width, in **Ordinary soil** not exceeding 1.5 m in depth including dressing the bottom and sides of pits and trenches, stacking the excavated soil clear from edges of excavation with lead upto 50 m after breaking of clods complete as per specifications. Specification. No. KBS 2.1 (a)/2.3.5 (PWDSR 08-09, Pg. No. 6, Item No.2.3)	Cum	1	1.00	1.00	0.70	0.70	94.02	66.00
2	KSRB 2.3:Filling available excavated earth (excluding rock) in sides of foundations upto plinth in layers not exceeding **20 cms** in depth, compacting each deposited layer by ramming after watering with a lead upto 50 m and lift upto 1.5 m including cost of all labour complete as per specifications. Specification No. KBS 2.9 (PWDSR 08-09, Pg. No. 7, Item No.2.10)	Cum	4	1.00	0.10	0.55	0.22	63.30	14.00
3	Carting of excavated soils/silt with 5 kms lead and and disposal with lead and lift by maching and depositing the same on out of working areas as directed by the officials	Cum					0.48	40.00	20.00
4	KSRB 4-1.1: Providing and laying in position **Plain Cement Concrete of nominal mix 1:2:4** using 40mm and down size graded granite metal machine mixedconcrete laid in layers not excedding 15 cms thick, well compacted including cost of all materials, labour								
	Base slab (Bed Concrete)	Cum	1	1.00	1.00	0.10	0.10	3,932.60	394.00
5	Providing and constructing precast concrete solid block Masonary with compressive strength not less than 35 Kg/sqm with cement mortar 1:4 masonry (quoin, Jamb, closer blocks) with **Solid Concrete Blocks of size 40x15x15cms** conforming to I.S:2185/1965 in superstructure including cost of materials, labour charges, scaffolding, curing complet as per specifications.	Sqmt	4	1.00	1.00		4.00	550.00	2,200.00
7	KSRB 15.3.1: Providing 12 mm thick cement **plaster in single coat with cement mortar 1:3**, to brick masonry including roundif off corners, wherever required smooth rendering, providing and removing scaffolding, including cost of materials, labour, curing complete as per specifications (PWDSR 08-09, Pg. No. 108, Item No.15.9) For inside walls	Sqmt	4	1.00	1.00		4.00	102.18	409.00
8	Supply and fixing, C I manhole cover of size 100 X 100 mm and frames with hinge arrangements of approved Ist quality and make conforming to I.S.I specification and fixing to the slab as per specification and as directed by engineers in charge. (Rate includes cost of all materials laying, curing and conveyance to work spot etc.(for covering the Collection Tank)	No.	1				1.00	4,000.00	4,000.00
	Total								**7,103.00**
	GRAND TOTAL								**1,096,416.00**

Cost Estimation for Construction of Hybrid Baffled Tank with Clarifier and Settler									
Sl.No	**Description**	**Unit**	**Nos**	**L (mtrs)**	**B (mtrs)**	**D (mtrs)**	**Quantity**	**Rate (Rupees)**	**Amount (Rupees)**
1	KSRB 2-2.1:Earthwork excavation for foundation of buildings, culverts, water supply, sanitary lines and electrical conduits either in pits or in trenches 1.5 m and above in width, in **ordinary soil** not exceeding 1.5 m in depth including dressing the bottom and sides of pits and trenches, stacking the excavated soil clear from edges of excavation with lead upto 50 m after breaking of clods complete as per specifications. Specification. No. KBS 2.1 (a)/2.3.5 (PWDSR 08-09, Pg. No. 6, Item No.2.3)								
a	For Settler	Cum	1	4.50	2.90	0.50	6.53		
b	For Hybrid Baffled Tank with Clarifier and Settler (HBST)	Cum	1	7.70	1.90	0.50	7.32		
	Total						13.84	94.02	1,302.00
2	KSRB 2-2.4 : Excavation 1.5 m and above in width, in **soft rock without blasting** for foundation of buildings, culverts, water supply, sanitary lines and electrical conduits either in pits or in trenches not exceeding 1.5 m in depth,stacking the exacavated stuff from edges of exacavation with lead upto 50 mts,labour and HOM of equipment cpmplete as per specifications.Specification. No. KBS 2.1.C/2.9.4/2.1.8/2.1.9 (PWDSR 08-09, Pg. No. 6, Item No.2.3)								
i	**0.0 - 1.5m**								
a	For Settler	Cum	1	4.50	2.90	1.00	13.05		
b	For HBST	Cum	1	7.70	1.90	1.00	14.63		
	Total						27.68	441.64	12,225.00
ii	**1.5 to 2.5mtrs**								
a	For Settler	Cum	1	4.50	2.90	0.25	3.26		
b	For HBST	Cum	1	7.70	1.90	0.25	3.66		
	Total						6.92	452.61	3,133.00
	Total Earth Work Excavation Quantity	Cum					**48.44**		
3	KSRB 2.3:**Filling available Excavated earth** (excluding rock) in sides of foundations upto plinth in layers not exceeding 20 cms in depth, compacting each deposited layer by ramming after watering with a lead upto 50 m and lift upto 1.5 m including cost of all labour complete as per specifications. Specification No. KBS 2.9 (PWDSR 08-09, Pg. No. 7, Item No.2.9)								
	For Settler-long side	Cum	2	4.50	0.25	1.65	3.71		
	For Settler-short side	Cum	1	2.90	0.25	1.65	1.20		
	For HBST-long side	Cum	2	7.70	0.25	1.65	6.35		
	For HBST-short side	Cum	1	1.90	0.25	1.65	0.78		
	Total						**12.05**	63.30	763.00
4	Carting of excavated soils/silt with 5 kms lead and and disposal with lead and lift by maching and depositing the same on out of working areas as directed by the officials	Cum					36.40	40.00	1,456.00

Cost Estimation for Construction of Hybrid Baffled Tank with Clarifier and Settler									
Sl.No	**Description**	**Unit**	**Nos**	**L (mtrs)**	**B (mtrs)**	**D (mtrs)**	**Quantity**	**Rate (Rupees)**	**Amount (Rupees)**
5	KSRB 4-1.1: Providing and laying in position **Plain Cement Concrete (SRC) of nominal mix 1:2:4** using 40mm and down size graded granite metal machine mixedconcrete laid in layers not excedding 15 cms thick, well compacted including cost of all materials, labour, HOM of machinery, curing complete etc., complete as per specifications.Specification No. KBS 4.1,4.2 (PWDSR 08-09, Pg. No. 14, Item No.4.1)								
	Base slab (Bed Concrete)								
	For Settler	Cum	1	4.50	2.90	0.10	1.31		
	For HBST	Cum	1	7.70	1.90	0.10	1.46		
	Total						2.77	3,932.60	10,886.00
6	KSRB 4-2.2: Providing and laying in position **Reinforced Cement Concrete (SRC) of nominal mix 1:1.5:3** using 20mm and down size graded granite metal machine mixed concrete laid in layers not excedding 15 cms thick,vibrated for all works in foundation plinth and ground floor level,lintels,cillsetc., including cost of materials, labour, HOM of machinery, curing, comlete as per specifications.Specification No. KBS 4.1,4.6 (PWDSR 08-09, Pg. No. 15, Item No.4.11)								
	Base Slab								
	For Settler	Cum	1	4.30	2.70	0.15	1.74		
	For HBST	Cum	1	7.70	1.70	0.15	1.96		
	Roof Slab								
	For Settler	Cum	1	4.00	2.40	0.15	1.44		
	For HBST	Cum	1	7.40	1.40	0.15	1.55		
	Deduct area for circular manhole openings of 0.6m dia	Cum	7	0.28		0.15	0.29		
	Baffle wall	Cum	5	1.00	1.65	0.10	0.83		
	0.075 m thick precast Perforated slab for supporting the filter media for clarificator	Cum	2	0.75	1.00	0.08	0.11		
	Deduct area for wall openings	Cum	10	0.15	0.20	0.20	0.06		
	Deduct area for wall openings	Cum	2	0.25	0.20	0.20	0.02		
	Total						**7.26**	4,556.94	33,095.00
7	KSRB 4.9.2 : Providing **TMT steel Reinforcement** for RCC work including straightening, cutting, bending, hooking, placing in position,lapping and/or Welding whever required tying with binding wire and anchoring to the adjoining members wherever necessary complete as per design ,cost of materials,labour,HOM of machinery complete as per specifications.specification No.KBS 4.6.3 (PWDSR 08-09, Pg. No. 19, Item No.4.46)								
	Considering 80 kgs per Cum of concrete	q		5.81			5.81	6,167.08	35,831.00
8	KSRB 4-6.4 **Providing and removing Centering**, shuttering, strutting, propping etc and removal of formwork for flat surface such as suspended floors,roofs,landings,balconies and likes,thickness upto 20mm including cost of all material, labour complete as per specifications. specification No.KBS 4.6.2(PWDSR 08-09, Pg. No. 17, Item No.4.29)								

Cost Estimation for Construction of Hybrid Baffled Tank with Clarifier and Settler									
Sl.No	**Description**	**Unit**	**Nos**	**L (mtrs)**	**B (mtrs)**	**D (mtrs)**	**Quantity**	**Rate (Rupees)**	**Amount (Rupees)**
	For Settler for roof slab	Sqmt	1	3.60	2.00		7.20		
	For HBST for roof slab	Sqmt	1	6.00	1.00		6.00		
	For long sides at roof Slab	Sqmt	2	11.70	0.15		3.51		
	For short sides at roof Slab	Sqmt	1	2.40	0.15		0.36		
	For short sides at roof Slab	Sqmt	1	1.40	0.15		0.21		
	Baffle walls = 5 no. X 2 sides	Sqmt	10	1.00	0.60		6.00		
	0.075m thick precast Perforated slab	Cum	2	0.75	1.00		1.50		
	For long sides at raft foundation of Settler	Cum	2	4.30	0.15		1.29		
	For short sides at raft foundation of Settler	Cum	2	2.90	0.15		2.31		
	For long sides at raft foundation of HBST	Cum	2	7.70	0.15		0.57		
	For short sides at raft foundation of HBST	Cum	2	1.90	0.60		2.28		
	Total						**31.23**	206.70	6,456.00
9	Providing and constructing precast concrete solid block Masonary with compressive strength not less than 35 Kg/sqm with cement mortar 1:4 masonry (quoin, Jamb, closer blocks) with **Solid Concrete Blocks of size 40x20x20cms** conforming to I.S:2185/1965 in superstructure including cost of materials, labour charges, scaffolding, curing complet as per specifications.								
	For Settler Outer Longer wall	Sqmt	2	4.30	1.90		16.34		
	For Settler Outer Shorter wall	Sqmt	1	2.00	1.90		3.80		
	For HBST Outer Longer wall	Sqmt	2	7.90	1.90		30.02		
	For HBST Outer Shorter wall	Sqmt	1	1.00	1.90		1.90		
	For HBST Inner Walls	Sqmt	6	1.00	1.90		11.40		
	Deduct for wall opening for flow	Sqmt	12	0.10	0.10		0.12		
	Total						**63.34**	662.50	41,963.00
10	KSRB 15.3.1: Providing **12 mm thick Cement Plaster (SRC)** in single coat with cement mortar 1:3, to brick masonry including roundif off corners, wherever required smooth rendering, providing and removing scaffolding, including cost of materials, labour, curing complete as per specifications (PWDSR 08-09, Pg. No. 108, Item No.15.9) (For innerside of Walls)								
	For Settler Inner side of Longer wall	Sqmt	2	4.30	1.90		16.34		
	For Settler Inner side of Shorter wall	Sqmt	1	2.00	1.90		3.80		
	For HBST Inner side of Longer wall	Sqmt	2	7.90	1.90		30.02		
	For HBST Inner side of Shorter wall	Sqmt	1	1.00	1.90		1.90		
	For HBST Internal Walls	Sqmt	6	1.00	1.90		11.40		
	Deduct at wall locations	Sqmt	6	2.10	0.20		2.52		
	Deduct at wall locations	Sqmt	5	1.90	0.10		0.95		
	Total						**59.99**	102.18	6,130.00
11	KSRB 15.3.1: Providing **12 mm thick cement plaster (SRC)**in single coat with cement mortar 1:3, to brick masonry including roundif off corners, wherever required smooth rendering, providing and removing scaffolding, including cost of materials, labour, curing complete as per specifications (PWDSR 08-09, Pg. No. 108, Item No.15.9) (For outerside of Walls)								
	For Settler outer side of Longer wall	Sqmt	2	4.30	0.45		3.87		
	For Settler outer side of Shorter wall	Sqmt	1	2.40	0.45		1.08		
	For HBST outer side of Longer wall	Sqmt	2	7.90	0.45		7.11		
	For HBST outer side of Shorter wall	Sqmt	1	1.40	0.45		0.63		

Cost Estimation for Construction of Hybrid Baffled Tank with Clarifier and Settler									
Sl.No	**Description**	**Unit**	**Nos**	**L (mtrs)**	**B (mtrs)**	**D (mtrs)**	**Quantity**	**Rate (Rupees)**	**Amount (Rupees)**
	Total						**12.69**	102.18	1,297.00
12	KSRB 15-4.7 Extra for Providing and mixing **Water Proofing Compound in cement Plaster (SRC)** for brick masonary work at one kg per bag or in proportion recommended by the manufacturers, for cement mortar 1:4, 20 mm thick cost of materials complete as per specifications.(PWDSR 08-09, Pg. No. 110, Item No.15.29)	Sqmt	1				74.69	8.68	649.00
13	Supply and fixing SFRC frames with cover of approved 1st quality and make confirming to I.S.I specification and fixing to the slab as per specification and as directed by engineers (Rate includes cost of all materials laying, curing and conveyance to work spot etc,).	Nos	7				7.00	863.90	6,048.00
14	Providing laying and jointing SDR 41 UPVC blue pipes (6 kg / sq.cm) conforming to I.S specification of approved make with necessary fittings with cuts and threads using jointing ring with solutions including drilling holes in walls for laying of pipes and making it neat with all required finishes as per specification, including all leads and lifts as directed by the engineer-in charge.								
	110 mm Dia connecting pipe to from settler HGF	Rmt	15					200.00	3,000.00
15	Supply and fixing Air vent pipe of size 110 mm dia of 3mtr height with cowl and supporting arrangements.	Nos	2				2.00	1,250.00	2,500.00
16	Providing and installing the Gravel Filter media with all required finishes as per specification, including all leads and lifts as directed by the engineer-in charge.	Nos	2	0.75	1.00	0.50	0.75	800.00	600.00
									167,334.00

Cost Estimation for Construction of Horizontal Gravel Filter									
Sl.No	**Description**	**Unit**	**Nos**	**L (mtrs)**	**B (mtrs)**	**D (mtrs)**	**Quantity**	**Rate (Rupees)**	**Amount (Rupees)**
1	KSRB 2-2.1:Earthwork excavation for foundation of buildings, culverts, water supply, sanitary lines and electrical conduits either in pits or in trenches 1.5 m and above in width, in **ordinary soil** not exceeding 1.5 m in depth including dressing the bottom and sides of pits and trenches, stacking the excavated soil clear from edges of excavation with lead upto 50 m after breaking of clods complete as per specifications. Specification. No. KBS 2.1 (a)/2.3.5 (PWDSR 08-09, Pg. No. 6, Item No.2.3)								
i	0.0 - 1.5m	Cum	1	16.10	19.10	0.50	153.76	94.02	14,457.00
2	KSRB 2-2.4 : Excavation 1.5 m and above in width, in **soft rock without blasting** for foundation of buildings, culverts, water supply, sanitary lines and electrical conduits either in pits or in trenches not exceeding 1.5 m in depth,stacking the exacavated stuff from edges of exacavation with lead upto 50 mts,labour and HOM of equipment cpmplete as per specifications.Specification. No. KBS 2.1.C/2.9.4/2.1.8/2.1.9 (PWDSR 08-09, Pg. No. 6, Item No.2.3)								
i	0 to 1.5 mtrs	Cum	1	16.10	19.10	0.83	253.70	441.64	112,042.00
	Total Earth Work Excavation Quantity						**407.45**		
3	KSRB 2.3: **Filling available Excavated earth** (excluding rock) in sides of foundations upto plinth in layers not exceeding 20 cms in depth, compacting each deposited layer by ramming after watering with a lead upto 50 m and lift upto 1.5 m including cost of all labour complete as per specifications. Specification No. KBS 2.9 (PWDSR 08-09, Pg. No. 7, Item No.2.10)								
i	Long wall side	Cum	2	19.10	0.25	1.23	11.75		
ii	Short wall side	Cum	2	16.10	0.25	1.23	9.90		
	Total						**21.65**	63.30	1,371.00
4	Carting of excess excavated soils/silt after formation of required ground levelwith 5 kms lead and and disposal with lead and lift by maching and depositing the same on out of working areas as directed by the officials	Cum					128.80	40.00	5,153.00
5	KSRB 4-1.1: Providing and laying in position **Plain Cement Concrete (SRC) of nominal mix 1:2:4** using 40mm and down size graded granite metal machine mixedconcrete laid in layers not excedding 15 cms thick, well compacted including cost of all materials, labour, HOM of machinery, curing complete etc., complete as per specifications.Specification No. KBS 4.1,4.2 (PWDSR 08-09, Pg. No. 14, Item No.4.1)								
	Base slab (Bed Concrete)	Cum	1	19.10	16.10	0.10	30.75	3,932.60	120,932.00
	Slab over brick bats	Cum	1	18.20	0.40	0.10	0.73	3,932.60	2,863.00

Cost Estimation for Construction of Horizontal Gravel Filter									
Sl.No	**Description**	**Unit**	**Nos**	**L (mtrs)**	**B (mtrs)**	**D (mtrs)**	**Quantity**	**Rate (Rupees)**	**Amount (Rupees)**
6	KSRB 4-2.2: Providing and laying in position **Reinforced Cement Concret (SRC) of nominal mix 1:1.5:3** using 20mm and down size graded granite metal machine mixed concrete laid in layers not excedding 15 cms thick,vibrated for all works in foundation plinth and ground floor level,lintels,cillsetc., including cost of materials, labour, HOM of machinery, curing, comlete as per specifications.Specification No. KBS 4.1,4.6 (PWDSR 08-09, Pg. No. 15, Item No.4.11)								
	Raft Foundation	Cum	1	18.90	15.90	0.15	45.08	4,556.94	205,411.00
7	KSRB 4.9.2 : Providing **TMT steel Reinforcement** for RCC work including straightening, cutting, bending, hooking, placing in position,lapping and/or Welding whever required tying with binding wire and anchoring to the adjoining members wherever necessary complete as per design ,cost of materials,labour,HOM of machinery complete as per specifications.specification No.KBS 4.6.3 (PWDSR 08-09, Pg. No. 19, Item No.4.46)								
	Considering 80 kgs per Cum of concrete	q	1				36.06	6,167.08	222,393.00
8	KSRB 4-6.4 **Providing and removing Centering**, shuttering, strutting, propping etc and removal of formwork for flat surface such as suspended floors,roofs,landings,balconies and likes,thickness upto 20mm including cost of all material, labour complete as per specifications. specification No.KBS 4.6.2 (PWDSR 08-09, Pg. No. 17, Item No.4.29)	Sqmt							
	For long sides at raft foundation	Sqmt	2	18.90	0.15		5.67		
	For short sides at raft foundation	Sqmt	2	15.90	0.15		4.77		
	Total						**10.44**	206.70	2,158.00
9	Providing and constructing precast concrete solid block Masonary with compressive strength not less than 35 Kg/sqm with cement mortar 1:4 masonry (quoin, Jamb, closer blocks) with **solid concrete blocks of size 40x20x20cms** conforming to I.S:2185/1965 in superstructure including cost of materials, labour charges, scaffolding, curing complet as per specifications.								
	For outer walls of thickness 0.2 mts-long walls	Sqmt	2	18.60	1.68		62.31		
	For outer walls of thickness 0.2 mts-short walls	Sqmt	2	15.20	1.68		50.92		
	for internal wall -longer side	Sqmt	2	18.20	0.60		21.84		
	for internal wall -shorter side	Sqmt	1	14.00	0.80		11.20		
	Total						**146.27**	662.50	96,904.00

Cost Estimation for Construction of Horizontal Gravel Filter									
Sl.No	**Description**	**Unit**	**Nos**	**L (mtrs)**	**B (mtrs)**	**D (mtrs)**	**Quantity**	**Rate (Rupees)**	**Amount (Rupees)**
10	KSRB 15.3.1: Providing **12 mm thick Cement Plaster (SRC)** in single coat with cement mortar 1:3, to brick masonry including roundif off corners, wherever required smooth rendering, providing and removing scaffolding, including cost of materials, labour, curing complete as per specifications (PWDSR 08-09, Pg. No. 108, Item No.15.9) (For innerside Walls)								
	For Inner side of Longer wall	Sqmt	2	18.60	1.68		62.31		
	For Inner side of Shorter wall	Sqmt	2	15.20	1.68		50.92		
	for internal wall -longer side	Sqmt	4	18.20	0.60		43.68		
	for internal wall -shorter side	Sqmt	2	14.00	0.80		22.40		
	screeding for slab over brick bats	Cum	1	18.20	0.40		7.28		
	Total						**186.59**	102.18	19,067.00
11	KSRB 15.3.1: Providing **12 mm thick Cement Plaster (SRC)** in single coat with cement mortar 1:3, to brick masonry including roundif off corners, wherever required smooth rendering, providing and removing scaffolding, including cost of materials, labour, curing complete as per specifications (PWDSR 08-09, Pg. No. 108, Item No.15.9) (For outside Walls)								
	For outside of Longer wall	Sqmt	2	18.60	0.60		22.32		
	For outside of Shorter wall	Sqmt	2	15.60	0.60		18.72		
	Total						**41.04**	102.18	4,194.00
12	KSRB 15-4.7 Extra for Providing and mixing **Water Proofing Compound in cement Plaster (SRC)** for brick masonary work at one kg per bag or in proportion recommended by the manufacturers, for cement mortar 1:4, 20 mm thick cost of materials complete as per specifications.(PWDSR 08-09, Pg. No. 110, Item No.15.29)	Sqmt					441.39	8.68	3,832.00
13	Providing and laying CM 1:4 as screeding on the bottom floor of filter to maintain slope of 1% from inlet to outlet including cost of materials,labour etc complete as per specifications	Sqmt	2	14.00	9.00		252.00	63.87	16,094.00
14	Providing laying and jointing SDR 41 UPVC blue pipes (6 kg / sq.cm) conforming to I.S specification of approved make with necessary fittings with cuts and threads using jointing ring with solutions including drilling holes in walls for laying of pipes and making it neat with all required finishes as per specification, including all leads and lifts as directed by the engineer-in charge.								
i	110 mm dia Outlet pipe to the drain	Rmt	1	10.00			100.00	768.00	76,800.00
ii	50 mm dia pipe sleeves connecting from filter to collecting channel	No.	60					40.00	2,400.00
15	Providing & laying coarse aggregate /rounded gravel of sizes as below after washing and sieving to make it free from fines & dust								
i	Passing through 5mm and retained on 20mm sieve	1	Cum	14.00	18.00	0.10	25.20	850.00	21,420.00
ii	Passing through 20mm and retained on 30 mm sieve	1	Cum	11.00	18.00	0.50	99.00	850.00	84,150.00
iii	Passing through 40mm and retained on 80 mm sieve	1	Cum	3.00	18.00	0.50	27.00	600.00	16,200.00

Cost Estimation for Construction of Horizontal Gravel Filter									
Sl.No	**Description**	**Unit**	**Nos**	**L (mtrs)**	**B (mtrs)**	**D (mtrs)**	**Quantity**	**Rate (Rupees)**	**Amount (Rupees)**
16	Providing and planting the young plants of cana/cattails/bulrushes on the filter surface including cost of plants,labour etc complete	LS						5,000.00	5,000.00
17	Providing and filling broken brick bats in the distribution channel including cost of materials,labour etc complete including all leads and lifts as directed by the engineer-in charge.	1	Cum	18.20	0.40	0.35	2.55	1,700.00	4,332.00
	Total								**1,037,173.00**

Cost Estimation for Barbed Wire Fencing with MS Gate and formation of Ground level									
Sl.No	**Description**	**Unit**	**Nos**	**L (mtrs)**	**B (mtrs)**	**D (mtrs)**	**Quantity**	**Rate (Rupees)**	**Amount (Rupees)**
1	KSRB 2-2.1:Earthwork excavation for foundation of buildings, culverts, water supply, sanitary lines and electrical conduits either in pits or in trenches 1.5 m and above in width, in **ordinary soil** not exceeding 1.5 m in depth including dressing the bottom								
i	0.0 - 1.5m	Cum	36	0.30	0.30	0.60	1.94	94.02	183.00
2	Carting of excavated soils/silt with 5 kms lead and and disposal with lead and lift by maching and depositing the same on out of working areas as directed by the officials	Cum					1.94	40.00	78.00
3	KSRB 4-1.1: Providing and laying in position **Plain Cement Concrete of nominal mix 1:2:4** using 40mm and down size graded granite metal machine mixedconcrete laid in layers not excedding 15 cms thick, well compacted including cost of all materials, labour,								
i	Base slab (Bed Concrete)	Cum	36	0.30	0.30	0.50	1.62	3,932.60	6,371.00
4	Providing and Fixing the stone Pillar of 15cmsX7.5cms and height of 1.5 mtrs above ground fixed vertically at interval of 2.0 mtrsC/C including fixing poles in the ground for a minimum depth of 0.4 mtrs including cost and conveyance of all materials,labour,lead and lift charges and complete	Nos	36				36.00	400.00	14,400.00
5	Providing and fixing the barbed GI wire fencing of 12X12 gauge to pillars excluding the cost of pillars but including the cost of pillarsbut including the cost of barbed wire and binding wire etc., complete	m	4	72.00			288.00	24.00	6,912.00
6	Providing and fixing MS gate of size 3 m x 2 m	LS						8,000.00	8,000.00
	Total								**35,944.00**
1	KSRB 2.3:**Filling available Excavated earth** (excluding rock) in sides of foundations upto plinth in layers not exceeding 20 cms in depth, compacting each deposited layer by ramming after watering with a lead upto 50 m and lift upto 1.5 m including cost of all labour complete as per specifications. Specification No. KBS 2.9 (PWDSR 08-09, Pg. No. 7, Item No.2.9)- for formation of groundlevel	Cum			254.58	0.40	101.83	63.30	**6,446.00**

Annexure – 2

Bill of Quantities

Annexure 2 - BOQs

Summary of BOQs for the Construction of Community Toilet Block and DEWATS		
Sl. No	**Particulars**	**Amount**
I	**Community Toilet Block**	
II	**DEWATS**	
1	Hybrid Baffled Tank with Clarifier and Settler	
2	Horizontal Gravel Filter	
	Total Cost for DEWATS	
III	**Associated Works**	
1	Fencing	
2	Formation of Ground level	
	Total	

Bill of Quantities for Construction of Community Toilet Block at Kaveri Nagar									
S. No.	**Item Description**	**Unit**	**No.**	**L(m)**	**B (m)**	**D (m)**	**Quantity**	**Rate (Rs.)**	**Amount (Rs.)**
I	**Civil Works**								
1.0	KSRB 2-1.1:Earthwork in surface excavation in ordinary soil for levelling and lowering the ground manually and removing the excavated stuff to a distance not exceeding 50m and lift upto 1.5m,excavated surface levelled and neatly dressed ,disposed earth to be levelled after breaking of clods and neatly dressed as per specifications.Specification No.KBS 2.1 (a)/2.3.1 (PWDSR 08-09, Pg. No. 6, Item No.2.1)								
i	For Entire Layout	Cum	1	30.00	21.00	0.10	63.00		
2.0	KSRB 2-2.1:Earthwork excavation for foundation of buildings, culverts, water supply, sanitary lines and electrical conduits either in pits or in trenches 1.5 m and above in width, in **Ordinary soil** not exceeding 1.5 m in depth including dressing the bottom and sides of pits and trenches, stacking the excavated soil clear from edges of excavation with lead upto 50 m after breaking of clods complete as per specifications. Specification. No. KBS 2.1 (a)/2.3.5 (PWDSR 08-09, Pg. No. 6, Item No.2.3)								
2.1	For foundation (0.2 m Walls)	cum	1	43.27	1.30	0.50	28.13		
2.2	For foundation (0.15 m Walls)	cum	1	22.66	1.05	0.50	11.90		
2.3	For Sump tank of Capacity 7.5 cum	cum	1	2.50	1.50	0.50	1.88		
	Total						**41.90**		
3.0	KSRB 2-2.4 : Excavation 1.5 m and above in width, in **soft rock without blasting** for foundation of buildings, culverts, water supply, sanitary lines and electrical conduits either in pits or in trenches not exceeding 1.5 m in depth,stacking the exacavated stuff from edges of exacavation with lead upto 50 mts,labour and HOM of equipment cpmplete as per specifications.Specification. No. KBS 2.1.C/2.9.4/2.1.8/2.1.9 (PWDSR 08-09, Pg. No. 6, Item No.2.3)								
i	**0-1.5 mtrs**								
			1	43.27	1.30	0.40	22.50		
0.1	For foundation (150mm Walls)	cum	1	22.66	1.05	0.15	3.57		
0.2	For Sump tank of Capacity 7.5 cum	cum	1	2.50	1.50	1.00	3.75		
ii	**Total**						**29.82**		
	1.5 to 2.5mtrs								
3.4	For Sump tank of Capacity 7.5 cum	cum	1	3.20	1.50	0.65	3.12		
	Total Quantity of Earth Work Exacavation						**74.84**		
4.0	KSRB 4-1.1: Providing and laying in position **Plain Cement Concrete of nominal mix 1:2:4** using 40mm and down size graded granite metal machine mixedconcrete laid in layers not excedding 15 cms thick, well compacted including cost of all materials, labour, HOM of machinery, curing complete etc., complete as per specifications.Specification No. KBS 4.1,4.2 (PWDSR 08-09, Pg. No. 14, Item No.4.1)								
4.1	For base slab/ bed concrete at foundation of 200mm walls	cum	1	43.27	1.30	0.10	5.63		
4.2	For base slab/ bed concrete at foundation of 150mm walls	cum	1	22.66	1.05	0.10	2.38		

Bill of Quantities for Construction of Community Toilet Block at Kaveri Nagar									
S. No.	**Item Description**	**Unit**	**No.**	**L(m)**	**B (m)**	**D (m)**	**Quantity**	**Rate (Rs.)**	**Amount (Rs.)**
4.3	For base slab /bed concrete at foundation of Sump tank	cum	1	2.50	1.50	0.10	0.38		
4.4	For base slab /bed concrete for steps infront	cum	1	6.26	1.20	0.10	0.75		
4.5	For base slab /bed concrete for flooring	cum	1	55.18		0.12	6.62		
	Total Quantity						**15.75**		
5.0	KSRB 5.2-3:Providing and constructing granite/trap/basalt **Size Stone Masonry in foundation** with cement mortar 1:6, stone hammered dressed in courses not less than 20 cms high, bond stones at two m apart in each course including cost of materials, labour, curing complete as per specifications. KBS 5.1.13 (PWDSR 08-09, Pg. No. 24, Item No.5.6)								
i	**For 200 mm thick walls**								
5.1	For first course	cum	1	43.27	1.10	0.20	9.52		
5.2	For second course	cum	1	43.27	0.90	0.20	7.79		
5.3	For third course	cum	1	43.27	0.70	0.20	6.06		
5.4	For fourth and course	cum	1	43.27	0.50	1.00	21.64		
ii	**For 150 mm thick walls**								
5.4	For first course	cum	1	22.66	0.85	0.20	3.85		
5.5	For second course	cum	1	22.66	0.65	0.20	2.95		
5.6	For third course	cum	1	22.66	0.45	1.00	10.20		
	Total quantity						**62.00**		
6.0	KSRB 2.3:Filling available excavated earth (excluding rock) in sides of foundations upto plinth in layers not exceeding **20 cms** in depth, compacting each deposited layer by ramming after watering with a lead upto 50 m and lift upto 1.5 m including cost of all labour complete as per specifications. Specification No. KBS 2.9 (PWDSR 08-09, Pg. No. 7, Item No.2.10)								
6.1	Filling the side of foundation	Cum	1				44.67		
6.2	Filling with earth inside toilet block from ground level upto the Finished floor level	cum	1	9.85	5.86	0.40	23.09		
7.0	KSRB 4-2.2: Providing and laying in position **Reinforced Cement Concrete of nominal mix 1:1.5:3** using 20mm and down size graded granite metal machine mixed concrete laid in layers not excedding 15 cms thick,vibrated for all works in foundation plinth and ground floor level,lintels,cillsetc., including cost of materials, labour, HOM of machinery, curing, comlete as per specifications.Specification No. KBS 4.1,4.6 (PWDSR 08-09, Pg. No. 15, Item No.4.11)								
i	**for Sump**								
7.1	For Sump side walls	cum	1	8.00	2.00	0.10	1.60		
7.2	For sump roof slab	cum	1	2.50	1.50	0.15	0.56		
7.3	For Sump bottom Slap	cum	1	8.00	2.00	0.15	2.40		
ii	**For Plinth Beam**								
7.3	For 200mm thick walls	cum	1	43.26	0.50	0.20	4.33		
7.4	For 150mm thick walls	cum	1	21.31	0.25	0.20	1.07		
iii	**For Lintel Beam**	cum							
7.5	For 200 mm thick walls	cum	1	43.26	0.20	0.20	1.73		
7.6	For 150 mm thick walls	cum	1	21.31	0.15	0.20	0.64		
iv	**for Columns for roof slab**	cum	4	0.50	0.20	0.50	0.20		
v	**for roof slab**	cum	1	2.00	6.26	0.15	1.88		
	Total Quantity						**14.40**		

Bill of Quantities for Construction of Community Toilet Block at Kaveri Nagar									
S. No.	**Item Description**	**Unit**	**No.**	**L(m)**	**B (m)**	**D (m)**	**Quantity**	**Rate (Rs.)**	**Amount (Rs.)**
8.0	KSRB 4.9.2 : Providing **TMT steel Reinforcement** for RCC work including straightening, cutting, bending, hooking, placing in position,lapping and/or Welding whever required tying with binding wire and anchoring to the adjoining members wherever necessary complete as per design ,cost of materials,labour,HOM of machinery complete as per specifications.specification No.KBS 4.6.3 (PWDSR 08-09, Pg. No. 19, Item No.4.46)								
	Considering 80 kgs of steel per cum of concrete	q					11.52		
9.0	KSRB 4-6.4 **Providing and removing Centering**, shuttering, strutting, propping etc and removal of formwork for flat surface such as suspended floors,roofs,landings,balconies and likes,thickness upto 20mm including cost of all material, labour complete as per specifications. specification No.KBS 4.6.2(PWDSR 08-09, Pg. No. 17, Item No.4.29)								
9.1	For Plinth beam	sqm	1	62.95	0.20		12.59		
9.2	For Sump tank side walls	sqm	1	8.00	2.00		16.00		
9.3	For sump roof slab	sqm	1	2.50	1.50		3.75		
9.3	For Lintel	sqm	1	62.95	0.20		12.59		
9.4	For RCC slab	sqm	1	6.26	2.00		12.52		
9.5	For RCC Columns	sqm	4	0.90	0.50		1.80		
	Total						59.25		
10.0	Providing and constructing precast concrete solid block Masonary with compressive strength not less than 35 Kg/sqm with cement mortar 1:4 masonry (quoin, Jamb, closer blocks) with **Solid Concrete Blocks of size 40x20x20cms** conforming to I.S:2185/1965 in superstructure including cost of materials, labour charges, scaffolding, curing complet as per specifications.								
10.1	Outer Walls-Longer side	sqm	2	10.20	2.10		42.84		
10.2	Outer Walls-shorter side	sqm	2	6.26	2.10		26.29		
10.3	for steps infront of the toilet block	sqm	1				20.03		
10.4	Inner Partion Wall	sqm	1	10.20	2.10		21.42		
10.5	Deduct doors-D	sqm	2	2.10	1.00		4.20		
	Total						**106.38**		
11.0	Providing and constructing precast concrete solid block Masonary with compressive strength not less than 35 Kg/sqm with cement mortar 1:4 masonry (quoin, Jamb, closer blocks) with **Solid Concrete Blocks of size 40x15x15cms** conforming to I.S:2185/1965 in superstructure including cost of materials, labour charges, scaffolding, curing complet as per specifications.								
11.1	Internal toilet room walls	sqm	14	0.25	2.10		7.35		
11.2	Care taker room walls	sqm	1	2.60	2.10		5.46		
11.2	Care taker room walls	sqm	1	3.00	2.10		6.30		
	Total						**19.11**		

Bill of Quantities for Construction of Community Toilet Block at Kaveri Nagar									
S. No.	**Item Description**	**Unit**	**No.**	**L(m)**	**B (m)**	**D (m)**	**Quantity**	**Rate (Rs.)**	**Amount (Rs.)**
12.0	KSRB 15.3.1: Providing **rough cement plastering 15 mm thick** in single coat with cement mortar 1:4, to brick masonry for base of dadooing works with sand of approved quality,providing and removing scaffolding,icluding cost of materials, labour, curing complete as per specifications (PWDSR 08-09, Pg. No. 110, Item No.15.30)								
i	for inside walls	sqm	1	83.12	1.50		124.68		
ii	for outside walls	sqm	1	41.92	1.50		62.88		
	Total						**187.56**		
13.0	KSRB 15.3.1: Providing 12 mm thick cement plaster in single coat with **cement mortar 1:3**, to brick masonry including roundif off corners, wherever required smooth rendering, providing and removing scaffolding, including cost of materials, labour, curing complete as per specifications (PWDSR 08-09, Pg. No. 108, Item No.15.9) **For inside walls**								
i	for inside walls	sqm	1	83.12	0.70		58.18		
ii	for inside roof slab	sqm	1	2.00	6.26		12.52		
iii	for Columnsof roof slab	sqm	4	1.20	0.50		2.40		
iv	For sump walls	sqm	1	8.00	2.00		16.00		
	Total						**89.10**		
14.0	KSRB 15.3.1: Providing 12 mm thick cement plaster in single coat with **cement mortar 1:3**, to brick masonry including roundif off corners, wherever required smooth rendering, providing and removing scaffolding, including cost of materials, labour, curing complete as per specifications (PWDSR 08-09, Pg. No. 108, Item No.15.9) **For outside walls**								
14.1	For outside walls	sqm	1	41.92	0.70		29.34		
14.2	for steps infront of the toilet block	sqm	3	6.26	0.30		5.63		
14.3	for steps infront of the toilet block	sqm	1	6.26	0.50		3.13		
	Total						**38.11**		
15.0	KSRB 15-4.7 Extra for Providing and mixing **Water Proofing Compound in cement Plaster** for brick masonary work at one kg per bag or in proportion recommended by the manufacturers, for cement mortar 1:4, 20 mm thick cost of materials complete as per specifications.(PWDSR 08-09, Pg. No. 110, Item No.15.29) **for sump and and roof Slab**	sqm	1				32.27		
16.0	KSRB 15-13.1:Providing and applying one coat **Distemper Primer** of approved brand on wall surface after thoroughly brooming the surface to remove all dirt, dust, mortar drops and other foreign matter including preparing the surface, even and sand paper smooth, cost of materials, labour, complete as per specifications (PWDSR 08-09, Pg. No. 109, Item No.15.23)								
16.1	For interior walls above dadooing	sqm	1				89.10		
17.0	KSRB 15-18.4: Providing and applying **alluminium paint two coats** (excluding priming coat) over new steel or other metal surface brushing to give an shade after cleaning oil, grease, dirt and other foreign matter, including cost of materials, labour, complete as per specifications (PWDSR 08-09, Pg. No. 117, Item No.15.76)								
17.1	For ventilators	sqm	1	51.02	0.50		25.51		
17.2	For collapsable doors	sqm	2	2.10	1.20		5.04		

Bill of Quantities for Construction of Community Toilet Block at Kaveri Nagar									
S. No.	**Item Description**	**Unit**	**No.**	**L(m)**	**B (m)**	**D (m)**	**Quantity**	**Rate (Rs.)**	**Amount (Rs.)**
	Total						**30.55**		
18.0	Providing flooring with **60 x 60 cms size** vitrified glazed tiles of approved quality & make fixed on top of existing **flooring** fixed suitable adhesive including cutting the tiles to the required size and fixing etc., complete. (BWSSBSR 08-09, Pg. No. 196, Item No.14.44)	sqm					55.18		
19.0	**Providing skirting, dado,** rises of steps with white glazed tiles 20 cms x 20 cms 6 mm thick on 10 mm thick cement plaster 1:3 and jointed with white cement slurry over rough plaster surface (excluding cost of rough plastered surface which should be measured and paid separately) using glazed tiles of approved make and size inclucing cost of materials, labour, complete as per specifications. Specification No. KBS 14.5 (BWSSBSR 08-09, Pg. No. 195, Item No.14.40) **Inside walls**	sqm					124.68		
20.0	**Providing Ceramic** tiles of size 30 X 30cms of approved make,shade and size for flooring,teads of steps and landing,laid on be of 12 mm thick cement mortar 1:3 mix, flush pointing with white cement using colur pigment,including cost inclucing cost of materials, labour, complete as per specifications. Specification No. KBS 14.36.2 (BWSSBSR 08-09, Pg. No. 195, Item No.14.36.2) **Outside walls**	sqm					62.88		
21.0	KSRB 15-16.1.1 Providing and finishing **exeternal walls in two coats with water proof cement paint** of approved brand on wall surface to give an even shade after throuoghly brooming the surface to remove all dirt and loose powdered material, free form mortar drops and other foreign matter cost of materials, complete as per specifications with primer (PWD SR page no 113 item no.15.53.2)	sqm					89.10		
22.0	KSRB 15-15.1 Providing and applying **painting internal walls in two coats with plastic emulsion paint** of approved brand on wall surface to give an even shade after throuoghly brushing the surface to remove all dirt and loose powdered material, free form mortar drops and other foreign matterincluding preparing the surface even and sand paper smooth, cost of materials, complete as per specifications with primer(PWD SR page no 113 item no.15.51.2)	sqm					29.34		
23.0	Supply and fixing, C I manhole cover of size 600 X 600 mm and frames with hinge arrangements of approved Ist quality and make conforming to I.S.I specification and fixing to the slab as per specification and as directed by engineers in charge. (Rate includes cost of all materials laying, curing and conveyance to work spot etc.(for Sump tank)	LS	1				1.00		
24.0	Providing and Fixing PVC doors for Toilets (Sintex) including cost of frame & fittings (Handle, hinges, tower bolts)								
24.1	Doors- D2	No.					14.00		

Bill of Quantities for Construction of Community Toilet Block at Kaveri Nagar									
S. No.	**Item Description**	**Unit**	**No.**	**L(m)**	**B (m)**	**D (m)**	**Quantity**	**Rate (Rs.)**	**Amount (Rs.)**
24.2	Doors-D1	No.					1.00		
25.0	Providing and fixing Collapsable steel doors for main entrance foe male side and Female side	No.	2				2.00		
26.0	Providing and fixing MS square bars of 10 mm X10 mm for Safety protection and Ventilation on all the four sides of the toilet block								
i	Horizontal alignment								
26.1	For longer side	Rmts	5	16.00			80.00		
26.2	For shorter side	Rmts	5	12.00			60.00		
26.3	below RCC roof for longer side	Rmts	5	6.00			30.00		
26.4	below RCC roof for shorter side	Rmts	5	4.00			20.00		
ii	Vertical Alignment								
26.5	For longer side	Rmts	80	0.50			40.00		
26.6	For shorter side	Rmts	60	0.50			30.00		
26.7	below RCC roof for longer side	Rmts	30	0.50			15.00		
26.8	below RCC roof for shorter side	Rmts	20	0.50			10.00		
	Total						**285.00**		
27.0	Fabrication and Erection of Tubular Frame work all at site with main arches 65 NB 3.6 thick @ 6.420/kg mtr 5nos ,and purlin @ every interval of 1000 mm 3.2 thick 3.49/kg mtr, Meta color sheet crimped fixed with SDS screws With suitable fasteners and bolts etc and Meta Sheet for roofing as shown in the drawing and as per directions of Engineer in charge	sqm					72.86		
28.0	Providing and Fixing the Windows in the care Taker room with 10 mm square rods with outer frame with MS flat	sqm	2				2.00		
II	**Plumbing and Sanitary Works**								
29.0	Providing and Fixing of GI pipe lines of 12 mm dia for Water supplying								
29.1	From sump to Sintex tank at roof	Rmt					30.00		
29.2	From Sintex tank to taps	Rmt					90.00		
	Total	Rmt					**120.00**		
30.0	KSRB 11-13.1: Providing and f**ixing laboratory sink of white glazed fire clay**, of size 600 mm x 450 mm x 200 mm with MS/CI brackets, CP brass chain with rubber plug, 32 mm CP Brass waste, tap and union, brass stop cock complete, painting of fittings and brackers, cutting and making good the wall and floor wherever required, including cost of materials, labour complete as per specifications, Specification No. KBS 11 (BWSSBSR 08-09, Pg. No. 172., Item No.12.34)								
30.1	in Male block	No.					2.00		
30.2	in Female block	No.					2.00		
	Total	No.					**4.00**		
31.0	Providing and Fixing with polished surface and Bull nosed for edges **black Granite Slab** of 15 mm thick for Wash basins	sqm	2	0.53	1.85		1.96		
32.0	KSRB 11-15.1: Providing and fixing 600 mm x 450 mm bevel **lead edge mirror** of superior glass with 6 mm hard board backing and fixed to wooden cleats with C.P. screws, washers, including cost of materials, labour complete as per specifications (BWSSBSR 08-09, Pg. No. 173., Item No.12.39)								
32.1	in Male block	Unit					2.00		
32.2	in Female block	Unit					2.00		
	Total	Unit					**4.00**		

Bill of Quantities for Construction of Community Toilet Block at Kaveri Nagar									
S. No.	**Item Description**	**Unit**	**No.**	**L(m)**	**B (m)**	**D (m)**	**Quantity**	**Rate (Rs.)**	**Amount (Rs.)**
33.0	KSRB 16-6.2: Providing and fixing in position brass bib cock of approved quality of 20 mm nominal bore including cost of all materials, labour and HOM of eqipments with all leads complete as per specifications. Specification No. KBS 13.2.19/3.16 **(For Wash basin)** (BWSSBSR 08-09, Pg. No. 181, Item No.13.24)	No.							
33.1	in Male block	Unit					2.00		
33.2	in Female block	Unit					2.00		
	Total	Unit					**4.00**		
34.0	KSRB 13-6.2-2: Providing and fixing in position **brass stop cock** of approved quality 20 mm nominal bore including cost of all materials, labour and HOM of equipments with all leads complete as per specifications, Specification No, KBS 13.2.2/13.3 (BWSSBSR 08-09, Pg. No. 181, Item No.13.26)								
34.1	in Male block = 7 in toiltes + 6 for urinals + 2 at Wash basin	No.					15.00		
34.2	in Female block = 7 in toiltes + 2 at Wash basin	No.					9.00		
	Total						**24.00**		
35.0	Providing and fixing the Sintex water tank in position (Sintex industries)	Lts					4,000.00		
36.0	KSRB 11-1: Providing and fixing white vitreous china clay, **water closet Indian type** (Squatting pan) of size 580 mm with footrests, 100 mm S or P trap, 10 litre low level, P.V.C flushing cistern (all are approved make) with fittings, C.I/M.S, brackets, 32 mm diameter flush pipe fittings and clamps, overflow arrangements with specials and 25 mm mosquito proof coupling of approved design, painting of fittings and brackets, cutting and making good the wall and floor wherever required, including cost of materials, labour complete as per specifications. Specification No. KBS 11 (BWSSBSR 08-09, Pg. No. 169, Item No.12.1)								
36.1	in Male block = 4 for adult toiltes + 2 for Child toiltes(Child friendly toilets)	No.					6.00		
36.2	in Female block = 4 for adult toiltes + 2 for Child toiltes(Child friendly toilets)	No.					6.00		
	Total	**No.**					**12.00**		
37.0	KSRB 11-6: Providing and fixing white vitreous china clay, **Water closet Europen type** (Pedestal type, S-trap) with black solid plastic seat and lid, CP brass hinges, rubber buffers, 10 litre white glazed/vitreous china clay low level, flushing cistern (all approved make) with fittings, C.I/M.S brackets, 40 mm diameter flush bend with fittings and clamps, overflow arrangements with specials and 25 mm mosquito proof coupling of approved design, painting of fittings and brackets, cutting and making good the wall and floor wherever required, including cost of materials, labour complete as per specifications, Specification No. KBS 11 (BWSSBSR 08-09, Pg. No. 170, Item No.12.6)								
37.1	in Male block	No.					1.00		
37.2	in Female block	No.					1.00		

Bill of Quantities for Construction of Community Toilet Block at Kaveri Nagar									
S. No.	**Item Description**	**Unit**	**No.**	**L(m)**	**B (m)**	**D (m)**	**Quantity**	**Rate (Rs.)**	**Amount (Rs.)**
	Total	**No.**					**2.00**		
38.0	KSRB 11-7.1: Providing and fixing white vitreous china clay, **flat back, lipped front urinal basin 430 mm x 260 mm x 350 mm with 5 litres PVC automatic flusing cistern**, CI/MS brackets, standard flush pipe and CP brass spreaders with brass unions and GI clamps complete painting of fittings brackets, cutting and making good the wall and floor wherever required, including cost of materials, labour complete as per specifications. Specification No. KBS 11 (BWSSBSR 08-09, Pg. No. 170, Item No.12.7)	No.	6				6.00		
39.0	Providing and Fixing **CI Nahani trap** of 10 cms x 7.5 cms of approved make conforming to ISI specifications and construction of Cistern in CC 1:2:4 as directions (Rate is inclusive of cost of materials and fixtures and conveyance of materials to work spot) (BWSSBSR 08-09, Pg. No. 179, Item No.12.113.2)								
39.1	in Male block	No.					12.00		
39.2	in Female block	No.					6.00		
	Total	**No.**					**18.00**		
40.0	Providing and Fixing with double side polished surface and Bull nosed for edges black Granite Slab of 15 mm thick for separators at urinals	sqm	6				6.00		
41.0	Soil lines for Sewerage								
41.1	Providing and laying the Connecting pipe from the closet to maintainence chamberand to the inspection chamber using 110 mm dia uPVC material	Rmt					25.00		
41.2	Providing and constructing maintainence chamber in the passage for Toilet of each 300X300X300 with CI cover with all specifications as shown indrawing and as per directions of Engineer in charge	No.					14.00		
42.0	Providing and fixing the PVC Rain Water Pipe of 100mm dia fitted with shoe bend at the bottom	Rmt	1				8.00		
III	**Mechanical & Electrical**								
43.0	Providing and installing 2 HP Cetrifugal pump	No.	1				1.00		
44.0	Providing and fixing of Gate valve to control the water from the sintex tank (12mm dia)	No.	1				1.00		
45.0	Providing and fixing Switch boards and switches	sqm	1				5.00		
46.0	Providing and fixing the fittings for lighting and providing lights	No.	20				20.00		
47.0	Providing and Fixing Metre board and meter from BESCOM	No.	1				1.00		
48.0	Providing and wiring through out complete with concealed plastic pipe with ISI mark in the wall	No.	1				1.00		
49.0	Providing and fixing Main Switch board	No.	1				1.00		
50.0	Providing and laying electrical supply cable from the electrical pole to meter board	No.	1				1.00		
IV	**Miscellaneous**								
51.0	Locks 2nos,mats-2o's Dustbins-2nos, Table -1no etc.,	LS					1.00		
	Total								
V	**Cost Estimation for Construction of Inspection Chamber**								

Bill of Quantities for Construction of Community Toilet Block at Kaveri Nagar									
S. No.	**Item Description**	**Unit**	**No.**	**L(m)**	**B (m)**	**D (m)**	**Quantity**	**Rate (Rs.)**	**Amount (Rs.)**
1	KSRB 2-2.1:Earthwork excavation for foundation of buildings, culverts, water supply, sanitary lines and electrical conduits either in pits or in trenches 1.5 m and above in width, in **Ordinary soil** not exceeding 1.5 m in depth including dressing the bottom and sides of pits and trenches, stacking the excavated soil clear from edges of excavation with lead upto 50 m after breaking of clods complete as per specifications. Specification. No. KBS 2.1 (a)/2.3.5 (PWDSR 08-09, Pg. No. 6, Item No.2.3)	Cum	1	1.00	1.00	0.70	0.70		
2	KSRB 2.3:Filling available excavated earth (excluding rock) in sides of foundations upto plinth in layers not exceeding **20 cms** in depth, compacting each deposited layer by ramming after watering with a lead upto 50 m and lift upto 1.5 m including cost of all labour complete as per specifications. Specification No. KBS 2.9 (PWDSR 08-09, Pg. No. 7, Item No.2.10)	Cum	4	1.00	0.10	0.55	0.22		
3	Carting of excavated soils/silt with 5 kms lead and and disposal with lead and lift by maching and depositing the same on out of working areas as directed by the officials	Cum					0.48		
4	KSRB 4-1.1: Providing and laying in position **Plain Cement Concrete of nominal mix 1:2:4** using 40mm and down size graded granite metal machine mixedconcrete laid in layers not excedding 15 cms thick, well compacted including cost of all materials, labour								
	Base slab (Bed Concrete)	Cum	1	1.00	1.00	0.10	0.10		
5	Providing and constructing precast concrete solid block Masonary with compressive strength not less than 35 Kg/sqm with cement mortar 1:4 masonry (quoin, Jamb, closer blocks) with **Solid Concrete Blocks of size 40x15x15cms** conforming to I.S:2185/1965 in superstructure including cost of materials, labour charges, scaffolding, curing complet as per specifications.	Sqmt	4	1.00	1.00		4.00		
7	KSRB 15.3.1: Providing 12 mm thick cement **plaster in single coat with cement mortar 1:3**, to brick masonry including roundif off corners, wherever required smooth rendering, providing and removing scaffolding, including cost of materials, labour, curing complete as per specifications (PWDSR 08-09, Pg. No. 108, Item No.15.9) For inside walls	Sqmt	4	1.00	1.00		4.00		
8	Supply and fixing, C I manhole cover of size 100 X 100 mm and frames with hinge arrangements of approved Ist quality and make conforming to I.S.I specification and fixing to the slab as per specification and as directed by engineers in charge. (Rate includes cost of all materials laying, curing and conveyance to work spot etc.(for covering the Collection Tank)	No.	1				1.00		
	Total								
	GRAND TOTAL								

Bill of Quantities for Construction of Hybrid Baffled Tank with Clarifier and Settler									
Sl.No	**Description**	**Unit**	**Nos**	**L (mtrs)**	**B (mtrs)**	**D (mtrs)**	**Quantity**	**Rate (Rupees)**	**Amount (Rupees)**
1	KSRB 2-2.1:Earthwork excavation for foundation of buildings, culverts, water supply, sanitary lines and electrical conduits either in pits or in trenches 1.5 m and above in width, in **ordinary soil** not exceeding 1.5 m in depth including dressing the bottom and sides of pits and trenches, stacking the excavated soil clear from edges of excavation with lead upto 50 m after breaking of clods complete as per specifications. Specification. No. KBS 2.1 (a)/2.3.5 (PWDSR 08-09, Pg. No. 6, Item No.2.3)								
a	For Settler	Cum	1	4.50	2.90	0.50	6.53		
b	For Hybrid Baffled Tank with Clarifier and Settler (HBST)	Cum	1	7.70	1.90	0.50	7.32		
	Total						13.84		
2	KSRB 2-2.4 : Excavation 1.5 m and above in width, in **soft rock without blasting** for foundation of buildings, culverts, water supply, sanitary lines and electrical conduits either in pits or in trenches not exceeding 1.5 m in depth,stacking the exacavated stuff from edges of exacavation with lead upto 50 mts,labour and HOM of equipment cpmplete as per specifications.Specification. No. KBS 2.1.C/2.9.4/2.1.8/2.1.9 (PWDSR 08-09, Pg. No. 6, Item No.2.3)								
i	**0.0 - 1.5m**								
a	For Settler	Cum	1	4.50	2.90	1.00	13.05		
b	For HBST	Cum	1	7.70	1.90	1.00	14.63		
	Total						27.68		
ii	**1.5 to 2.5mtrs**								
			1	4.50	2.90	0.25	3.26		
b	For HBST	Cum	1	7.70	1.90	0.25	3.66		
	Total						6.92		
	Total Earth Work Excavation Quantity	Cum					**48.44**		
3	KSRB 2.3:**Filling available Excavated earth** (excluding rock) in sides of foundations upto plinth in layers not exceeding 20 cms in depth, compacting each deposited layer by ramming after watering with a lead upto 50 m and lift upto 1.5 m including cost of all labour complete as per specifications. Specification No. KBS 2.9 (PWDSR 08-09, Pg. No. 7, Item No.2.9)								
	For Settler-long side	Cum	2	4.50	0.25	1.65	3.71		
	For Settler-short side	Cum	1	2.90	0.25	1.65	1.20		
	For HBST-long side	Cum	2	7.70	0.25	1.65	6.35		
	For HBST-short side	Cum	1	1.90	0.25	1.65	0.78		
	Total						**12.05**		
4	Carting of excavated soils/silt with 5 kms lead and and disposal with lead and lift by maching and depositing the same on out of working areas as directed by the officials	Cum					36.40		

Bill of Quantities for Construction of Hybrid Baffled Tank with Clarifier and Settler									
Sl.No	**Description**	**Unit**	**Nos**	**L (mtrs)**	**B (mtrs)**	**D (mtrs)**	**Quantity**	**Rate (Rupees)**	**Amount (Rupees)**
5	KSRB 4-1.1: Providing and laying in position **Plain Cement Concrete (SRC) of nominal mix 1:2:4** using 40mm and down size graded granite metal machine mixedconcrete laid in layers not excedding 15 cms thick, well compacted including cost of all materials, labour, HOM of machinery, curing complete etc., complete as per specifications.Specification No. KBS 4.1,4.2 (PWDSR 08-09, Pg. No. 14, Item No.4.1)								
	Base slab (Bed Concrete)								
	For Settler	Cum	1	4.50	2.90	0.10	1.31		
	For HBST	Cum	1	7.70	1.90	0.10	1.46		
	Total						2.77		
6	KSRB 4-2.2: Providing and laying in position **Reinforced Cement Concrete (SRC) of nominal mix 1:1.5:3** using 20mm and down size graded granite metal machine mixed concrete laid in layers not excedding 15 cms thick,vibrated for all works in foundation plinth and ground floor level,lintels,cillsetc., including cost of materials, labour, HOM of machinery, curing, comlete as per specifications.Specification No. KBS 4.1,4.6 (PWDSR 08-09, Pg. No. 15, Item No.4.11)								
	Base Slab								
	For Settler	Cum	1	4.30	2.70	0.15	1.74		
	For HBST	Cum	1	7.70	1.70	0.15	1.96		
	Roof Slab								
	For Settler	Cum	1	4.00	2.40	0.15	1.44		
	For HBST	Cum	1	7.40	1.40	0.15	1.55		
	Deduct area for circular manhole openings of 0.6m dia	Cum	7	0.28		0.15	0.29		
	Baffle wall	Cum	5	1.00	1.65	0.10	0.83		
	0.075 m thick precast Perforated slab for supporting the filter media for clarificator	Cum	2	0.75	1.00	0.08	0.11		
	Deduct area for wall openings	Cum	10	0.15	0.20	0.20	0.06		
	Deduct area for wall openings	Cum	2	0.25	0.20	0.20	0.02		
	Total						**7.26**		
7	KSRB 4.9.2 : Providing **TMT steel Reinforcement** for RCC work including straightening, cutting, bending, hooking, placing in position,lapping and/or Welding whever required tying with binding wire and anchoring to the adjoining members wherever necessary complete as per design ,cost of materials,labour,HOM of machinery complete as per specifications.specification No.KBS 4.6.3 (PWDSR 08-09, Pg. No. 19, Item No.4.46)								
	Considering 80 kgs per Cum of concrete	q		5.81			5.81		
8	KSRB 4-6.4 **Providing and removing Centering**, shuttering, strutting, propping etc and removal of formwork for flat surface such as suspended floors,roofs,landings,balconies and likes,thickness upto 20mm including cost of all material, labour complete as per specifications. specification No.KBS 4.6.2(PWDSR 08-09, Pg. No. 17, Item No.4.29)								

Bill of Quantities for Construction of Hybrid Baffled Tank with Clarifier and Settler									
Sl.No	**Description**	**Unit**	**Nos**	**L (mtrs)**	**B (mtrs)**	**D (mtrs)**	**Quantity**	**Rate (Rupees)**	**Amount (Rupees)**
	For Settler for roof slab	Sqmt	1	3.60	2.00		7.20		
	For HBST for roof slab	Sqmt	1	6.00	1.00		6.00		
	For long sides at roof Slab	Sqmt	2	11.70	0.15		3.51		
	For short sides at roof Slab	Sqmt	1	2.40	0.15		0.36		
	For short sides at roof Slab	Sqmt	1	1.40	0.15		0.21		
	Baffle walls = 5 no. X 2 sides	Sqmt	10	1.00	0.60		6.00		
	0.075m thick precast Perforated slab	Cum	2	0.75	1.00		1.50		
	For long sides at raft foundation of Settler	Cum	2	4.30	0.15		1.29		
	For short sides at raft foundation of Settler	Cum	2	2.90	0.15		2.31		
	For long sides at raft foundation of HBST	Cum	2	7.70	0.15		0.57		
	For short sides at raft foundation of HBST	Cum	2	1.90	0.60		2.28		
	Total						**31.23**		
9	Providing and constructing precast concrete solid block Masonary with compressive strength not less than 35 Kg/sqm with cement mortar 1:4 masonry (quoin, Jamb, closer blocks) with **Solid Concrete Blocks of size 40x20x20cms** conforming to I.S:2185/1965 in superstructure including cost of materials, labour charges, scaffolding, curing complet as per specifications.								
	For Settler Outer Longer wall	Sqmt	2	4.30	1.90		16.34		
	For Settler Outer Shorter wall	Sqmt	1	2.00	1.90		3.80		
	For HBST Outer Longer wall	Sqmt	2	7.90	1.90		30.02		
	For HBST Outer Shorter wall	Sqmt	1	1.00	1.90		1.90		
	For HBST Inner Walls	Sqmt	6	1.00	1.90		11.40		
	Deduct for wall opening for flow	Sqmt	12	0.10	0.10		0.12		
	Total						**63.34**		
10	KSRB 15.3.1: Providing **12 mm thick Cement Plaster (SRC)** in single coat with cement mortar 1:3, to brick masonry including roundif off corners, wherever required smooth rendering, providing and removing scaffolding, including cost of materials, labour, curing complete as per specifications (PWDSR 08-09, Pg. No. 108, Item No.15.9) (For innerside of Walls)								
	For Settler Inner side of Longer wall	Sqmt	2	4.30	1.90		16.34		
	For Settler Inner side of Shorter wall	Sqmt	1	2.00	1.90		3.80		
	For HBST Inner side of Longer wall	Sqmt	2	7.90	1.90		30.02		
	For HBST Inner side of Shorter wall	Sqmt	1	1.00	1.90		1.90		
	For HBST Internal Walls	Sqmt	6	1.00	1.90		11.40		
	Deduct at wall locations	Sqmt	6	2.10	0.20		2.52		
	Deduct at wall locations	Sqmt	5	1.90	0.10		0.95		
	Total						**59.99**		
11	KSRB 15.3.1: Providing **12 mm thick cement plaster (SRC)**in single coat with cement mortar 1:3, to brick masonry including roundif off corners, wherever required smooth rendering, providing and removing scaffolding, including cost of materials, labour, curing complete as per specifications (PWDSR 08-09, Pg. No. 108, Item No.15.9) (For outerside of Walls)								
	For Settler outer side of Longer wall	Sqmt	2	4.30	0.45		3.87		
	For Settler outer side of Shorter wall	Sqmt	1	2.40	0.45		1.08		
	For HBST outer side of Longer wall	Sqmt	2	7.90	0.45		7.11		
	For HBST outer side of Shorter wall	Sqmt	1	1.40	0.45		0.63		

Bill of Quantities for Construction of Hybrid Baffled Tank with Clarifier and Settler									
Sl.No	**Description**	**Unit**	**Nos**	**L (mtrs)**	**B (mtrs)**	**D (mtrs)**	**Quantity**	**Rate (Rupees)**	**Amount (Rupees)**
	Total						**12.69**		
12	KSRB 15-4.7 Extra for Providing and mixing **Water Proofing Compound in cement Plaster (SRC)** for brick masonary work at one kg per bag or in proportion recommended by the manufacturers, for cement mortar 1:4, 20 mm thick cost of materials complete as per specifications.(PWDSR 08-09, Pg. No. 110, Item No.15.29)	Sqmt	1				74.69		
13	Supply and fixing SFRC frames with cover of approved 1st quality and make confirming to I.S.I specification and fixing to the slab as per specification and as directed by engineers (Rate includes cost of all materials laying, curing and conveyance to work spot etc,).	Nos	7				7.00		
14	Providing laying and jointing SDR 41 UPVC blue pipes (6 kg / sq.cm) conforming to I.S specification of approved make with necessary fittings with cuts and threads using jointing ring with solutions including drilling holes in walls for laying of pipes and making it neat with all required finishes as per specification, including all leads and lifts as directed by the engineer-in charge.								
	110 mm Dia connecting pipe to from settler HGF	Rmt	15						
15	Supply and fixing Air vent pipe of size 110 mm dia of 3mtr height with cowl and supporting arrangements.	Nos	2				2.00		
16	Providing and installing the Gravel Filter media with all required finishes as per specification, including all leads and lifts as directed by the engineer-in charge.	Nos	2	0.75	1.00	0.50	0.75		

Bill of Quantities for Construction of Horizontal Gravel Filter									
Sl.No	**Description**	**Unit**	**Nos**	**L (mtrs)**	**B (mtrs)**	**D (mtrs)**	**Quantity**	**Rate (Rupees)**	**Amount (Rupees)**
1	KSRB 2-2.1:Earthwork excavation for foundation of buildings, culverts, water supply, sanitary lines and electrical conduits either in pits or in trenches 1.5 m and above in width, in **ordinary soil** not exceeding 1.5 m in depth including dressing the bottom and sides of pits and trenches, stacking the excavated soil clear from edges of excavation with lead upto 50 m after breaking of clods complete as per specifications. Specification. No. KBS 2.1 (a)/2.3.5 (PWDSR 08-09, Pg. No. 6, Item No.2.3)								
i	0.0 - 1.5m	Cum	1	16.10	19.10	0.50	153.76		
2	KSRB 2-2.4 : Excavation 1.5 m and above in width, in **soft rock without blasting** for foundation of buildings, culverts, water supply, sanitary lines and electrical conduits either in pits or in trenches not exceeding 1.5 m in depth,stacking the exacavated stuff from edges of exacavation with lead upto 50 mts,labour and HOM of equipment cpmplete as per specifications.Specification. No. KBS 2.1.C/2.9.4/2.1.8/2.1.9 (PWDSR 08-09, Pg. No. 6, Item No.2.3)								
i	0 to 1.5 mtrs	Cum	1	16.10	19.10	0.83	253.70		
	Total Earth Work Excavation Quantity						**407.45**		
3	KSRB 2.3: **Filling available Excavated earth** (excluding rock) in sides of foundations upto plinth in layers not exceeding 20 cms in depth, compacting each deposited layer by ramming after watering with a lead upto 50 m and lift upto 1.5 m including cost of all labour complete as per specifications. Specification No. KBS 2.9 (PWDSR 08-09, Pg. No. 7, Item No.2.10)								
i	Long wall side	Cum	2	19.10	0.25	1.23	11.75		
ii	Short wall side	Cum	2	16.10	0.25	1.23	9.90		
	Total						**21.65**		
4	Carting of excess excavated soils/silt after formation of required ground levelwith 5 kms lead and and disposal with lead and lift by maching and depositing the same on out of working areas as directed by the officials	Cum					128.80		
	Base slab (Bed Concrete)	Cum	1	19.10	16.10	0.10	30.75		
	Slab over brick bats	Cum	1	18.20	0.40	0.10	0.73		

Bill of Quantities for Construction of Horizontal Gravel Filter									
Sl.No	**Description**	**Unit**	**Nos**	**L (mtrs)**	**B (mtrs)**	**D (mtrs)**	**Quantity**	**Rate (Rupees)**	**Amount (Rupees)**
6	KSRB 4-2.2: Providing and laying in position **Reinforced Cement Concret (SRC) of nominal mix 1:1.5:3** using 20mm and down size graded granite metal machine mixed concrete laid in layers not excedding 15 cms thick,vibrated for all works in foundation plinth and ground floor level,lintels,cillsetc., including cost of materials, labour, HOM of machinery, curing, comlete as per specifications.Specification No. KBS 4.1,4.6 (PWDSR 08-09, Pg. No. 15, Item No.4.11)								
	Raft Foundation	Cum	1	18.90	15.90	0.15	45.08		
7	KSRB 4.9.2 : Providing **TMT steel Reinforcement** for RCC work including straightening, cutting, bending, hooking, placing in position,lapping and/or Welding whever required tying with binding wire and anchoring to the adjoining members wherever necessary complete as per design ,cost of materials,labour,HOM of machinery complete as per specifications.specification No.KBS 4.6.3 (PWDSR 08-09, Pg. No. 19, Item No.4.46)								
	Considering 80 kgs per Cum of concrete	q	1				36.06		
8	KSRB 4-6.4 **Providing and removing Centering**, shuttering, strutting, propping etc and removal of formwork for flat surface such as suspended floors,roofs,landings,balconies and likes,thickness upto 20mm including cost of all material, labour complete as per specifications. specification No.KBS 4.6.2 (PWDSR 08-09, Pg. No. 17, Item No.4.29)	Sqmt							
	For long sides at raft foundation	Sqmt	2	18.90	0.15		5.67		
	For short sides at raft foundation	Sqmt	2	15.90	0.15		4.77		
	Total						**10.44**		
9	Providing and constructing precast concrete solid block Masonary with compressive strength not less than 35 Kg/sqm with cement mortar 1:4 masonry (quoin, Jamb, closer blocks) with **solid concrete blocks of size 40x20x20cms** conforming to I.S:2185/1965 in superstructure including cost of materials, labour charges, scaffolding, curing complet as per specifications.								
	For outer walls of thickness 0.2 mts-long walls	Sqmt	2	18.60	1.68		62.31		
	For outer walls of thickness 0.2 mts-short	Sqmt	2	15.20	1.68		50.92		
	for internal wall -longer side	Sqmt	2	18.20	0.60		21.84		
	for internal wall -shorter side	Sqmt	1	14.00	0.80		11.20		
	Total						**146.27**		

Bill of Quantities for Construction of Horizontal Gravel Filter									
Sl.No	**Description**	**Unit**	**Nos**	**L (mtrs)**	**B (mtrs)**	**D (mtrs)**	**Quantity**	**Rate (Rupees)**	**Amount (Rupees)**
10	KSRB 15.3.1: Providing **12 mm thick Cement Plaster (SRC)** in single coat with cement mortar 1:3, to brick masonry including roundif off corners, wherever required smooth rendering, providing and removing scaffolding, including cost of materials, labour, curing complete as per specifications (PWDSR 08-09, Pg. No. 108, Item No.15.9) (For innerside Walls)								
	For Inner side of Longer wall	Sqmt	2	18.60	1.68		62.31		
	For Inner side of Shorter wall	Sqmt	2	15.20	1.68		50.92		
	for internal wall -longer side	Sqmt	4	18.20	0.60		43.68		
	for internal wall -shorter side	Sqmt	2	14.00	0.80		22.40		
	screeding for slab over brick bats	Cum	1	18.20	0.40		7.28		
	Total						**186.59**		
11	KSRB 15.3.1: Providing **12 mm thick Cement Plaster (SRC)** in single coat with cement mortar 1:3, to brick masonry including roundif off corners, wherever required smooth rendering, providing and removing scaffolding, including cost of materials, labour, curing complete as per specifications (PWDSR 08-09, Pg. No. 108, Item No.15.9) (For outside Walls)								
	For outside of Longer wall	Sqmt	2	18.60	0.60		22.32		
	For outside of Shorter wall	Sqmt	2	15.60	0.60		18.72		
	Total						**41.04**		
12	KSRB 15-4.7 Extra for Providing and mixing **Water Proofing Compound in cement Plaster (SRC)** for brick masonary work at one kg per bag or in proportion recommended by the manufacturers, for cement mortar 1:4, 20 mm thick cost of materials complete as per specifications.(PWDSR 08-09, Pg. No. 110, Item No.15.29)	Sqmt					441.39		
13	Providing and laying CM 1:4 as screeding on the bottom floor of filter to maintain slope of 1% from inlet to outlet including cost of materials,labour etc complete as per specifications	Sqmt	2	14.00	9.00		252.00		
14	Providing laying and jointing SDR 41 UPVC blue pipes (6 kg / sq.cm) conforming to I.S specification of approved make with necessary fittings with cuts and threads using jointing ring with solutions including drilling holes in walls for laying of pipes and making it neat with all required finishes as per specification, including all leads and lifts as directed by the engineer-in charge.								
i	110 mm dia Outlet pipe to the drain	Rmt	1	10.00			100.00		
ii	50 mm dia pipe sleeves connecting from filter to collecting channel	No.	60						
15	Providing & laying coarse aggregate /rounded gravel of sizes as below after washing and sieving to make it free from fines & dust								
i	Passing through 5mm and retained on 20mm sieve	1	Cum	14.00	18.00	0.10	25.20		
ii	Passing through 20mm and retained on 30 mm sieve	1	Cum	11.00	18.00	0.50	99.00		

Bill of Quantities for Construction of Horizontal Gravel Filter									
Sl.No	**Description**	**Unit**	**Nos**	**L (mtrs)**	**B (mtrs)**	**D (mtrs)**	**Quantity**	**Rate (Rupees)**	**Amount (Rupees)**
iii	Passing through 40mm and retained on 80 mm sieve	1	Cum	3.00	18.00	0.50	27.00		
16	Providing and planting the young plants of cana/cattails/bulrushes on the filter surface including cost of plants,labour etc complete	LS							
17	Providing and filling broken brick bats in the distribution channel including cost of materials,labour etc complete including all leads and lifts as directed by the engineer-in charge.	1	Cum	18.20	0.40	0.35	2.55		
	Total								

Bill of Quantities for Barbed Wire Fencing with MS Gate and formation of Ground level									
Sl.No	**Description**	**Unit**	**Nos**	**L (mtrs)**	**B (mtrs)**	**D (mtrs)**	**Quantity**	**Rate (Rupees)**	**Amount (Rupees)**
1	KSRB 2-2.1:Earthwork excavation for foundation of buildings, culverts, water supply, sanitary lines and electrical conduits either in pits or in trenches 1.5 m and above in width, in **ordinary soil** not exceeding 1.5 m in depth including dressing the bottom								
i	0.0 - 1.5m	Cum	36	0.30	0.30	0.60	1.94		
2	Carting of excavated soils/silt with 5 kms lead and and disposal with lead and lift by maching and depositing the same on out of working areas as directed by the officials	Cum					1.94		
3	KSRB 4-1.1: Providing and laying in position **Plain Cement Concrete of nominal mix 1:2:4** using 40mm and down size graded granite metal machine mixedconcrete laid in layers not excedding 15 cms thick, well compacted including cost of all materials, labour,								
i	Base slab (Bed Concrete)	Cum	36	0.30	0.30	0.50	1.62		
4	Providing and Fixing the stone Pillar of 15cmsX7.5cms and height of 1.5 mtrs above ground fixed vertically at interval of 2.0 mtrsC/C including fixing poles in the ground for a minimum depth of 0.4 mtrs including cost and conveyance of all materials,labour,lead and lift charges and complete	Nos	36				36.00		
5	Providing and fixing the barbed GI wire fencing of 12X12 gauge to pillars excluding the cost of pillars but including the cost of pillarsbut including the cost of barbed wire and binding wire etc., complete	m	4	72.00			288.00		
6	Providing and fixing MS gate of size 3 m x 2 m	LS							
	Total								
1	KSRB 2.3:**Filling available Excavated earth** (excluding rock) in sides of foundations upto plinth in layers not exceeding 20 cms in depth, compacting each deposited layer by ramming after watering with a lead upto 50 m and lift upto 1.5 m including cost of all labour complete as per specifications. Specification No. KBS 2.9 (PWDSR 08-09, Pg. No. 7, Item No.2.9)- for formation of groundlevel	Cum			254.58	0.40	101.83		