

Liner system within a landfill involves prevention of percolation of leachate from waste in landfill to the sub-soil by a suitable protective system (liner system). The liner system proposed for Gangtok comprises a combination of barrier material such as natural clay and amended soil and a flexible geo-membrane (1.5 mm thick HDPE sheet). The liner system will be of low permeability and will be robust, durable and to resist the chemical attack, puncture, rupture, etc.

### 5.9.3 Bottom Liner for Landfill :

A 90 cm thick of clay liner is constructed using wet clay or soil amended with bentonite or other agents, having coefficient of permeability not greater than  $1 \times 10^{-7}$  cm/sec, laid in layers of 150 mm thickness, tamped and the top surface smooth finished, The liner system is designed in compliance with Municipal Solid Waste (Management and Handling) Rules 2000 and, will comprise, a 90 cm thick compacted clay or amended soil (Bentonite amended soil) of permeability not greater than  $1 \times 10^{-7}$ , a HDPE geo-membrane liner of thickness 1.5mm and a drainage layer of 30 cm thick granular material of permeability not greater than  $1 \times 10^{-2}$  cm/sec. After the preparation of the amended soil liner, the liner should be constructed in series of lifts each of 25cm compacted to about 15cm by four to five passes of sheep foot roller. The finished thickness of the liner should be 90 cm and the final permeability of the amended soil should also be checked for the desired permeability of  $1 \times 10^{-7}$ . The plan and section of proposed landfill site is presented in the drawing (Dwg. no. NERCCDIP-SWM-GANGTOK-LF-LCRS-005). The Soil Processing area within the landfill during construction is given in Drawing No. NERCCDIP-SWM-GANGTOK-LF-LAYOUT-003.

### 5.9.4 Geo-Membrane Liner.

Geo-membrane is relatively a thin sheet of flexible thermoplastic or thermo polymeric material. Because of their inherent impermeability, geo-membranes are proposed as barrier layer in landfill site. Even though geo-membranes are highly impermeable, their safety against manufacturing, installation, handling and other defects is essential criteria in design of liner system.

The thickness of geo-membrane against puncture is determined as below, with various factors being considered, as indicated in the following tables.

Table 5.6: Design Parameters for Geo-Membrane Liner

Item	Details
Factor of Safety Against Puncture	2.50
Unit Weight of Solid Waste	8.33 KN / m <sup>3</sup>
Depth of Fill	8 m
Height of protrusion above drainage layer	25 mm
Modification Factor for Protrusion Shape	1.00
Modification Factor for Packing Density	1.00
Modification Factor for Arching in Solids	1.00
Reduction Factor for Long-Term Creep	1.00
Reduction Factor for Long-Term Chemical/Biological Degradation	1.30

The effectiveness of barrier layer basically depends on the hydraulic conductivity of the clay/amended soil liner and density of the geo-membrane. The clay/amended soil liner is effective only if it is compacted properly and geo-membrane liner is effective only if it has the density or mass per unit area is sufficient enough against punctures. The mass per unit area is calculated based on the following factors.

Factor of Safety (F) =  $(P_{ai} / P_{ac})$

$P_{ai}$  = Allowable Pressure for different Types of Geo-Membrane;

$P_{ac}$  = Actual Pressure due to landfill =  $W \times D$ ;

$P_{ai} = [50 + 0.00045(M/H^2)] \times [1/(MF_s \times MF_p \times MF_a)] \times [1/(RF_{cr} \times RF_{cbd})]$ ;

M = Geomembrane Mass per Unit Area;

H = Height of protrusion above drainage layer;

W = Unit Weight of Solid Waste;

D = Depth of Fill;

$MF_s$  = Modification Factor for Protrusion Shape;

$MF_p$  = Modification Factor for Packing Density;

$MF_a$  = Modification Factor for Arching in Solids;

$RF_{cr}$  = Reduction Factor for Long-Term Creep; and

$RF_{cbd}$  = Reduction Factor for Long-Term Chemical/Biological Degradation.

**Table 5.7: Modification and Reeducation Factors for Geo-Membrane**

$MF_s$		$MF_p$		$MF_a$	
Angular	1.00	Isolated	1.00	Hydrostatic	1.00
Subrounded	0.50	Dense, 38mm	0.83	Geostatic, Shallow	0.75
Rounded	0.25	Dense, 25mm	0.67	Geostatic, Moderate	0.50
		Dense, 12mm	0.50	Geostatic, Deep	0.25

**Table 5.8: Reduction Factor for Long-Term Creep**

Mass/Unit Area ( $g/m^2$ )	Protrusion (mm)		
	38	25	12
270	NR	NR	> 1.5
550	NR	1.5	1.3
1,100	1.3	1.2	1.1
>1,100	1.2	1.1	1.0

**Table 5.9 : Reduction Factor for Long-Term Chemical/Biological Degradation**

Rate of Leachate Generation	Reduction Factor
Mild Leachate	1.1
Moderate Leachate	1.3
Harsh Leachate	1.5

Based on the parameters / factors presented in tables 77 to 80, the required density of geo-membrane is calculated as 1.01gm/cc, and thickness as 1.5 mm. Before installation the membrane shall also be tested for key parameters presented in Error! Reference source not found..

Table 5.10 : Typical Values for Geo-Membrane Measure in Performance Tests

Property	Typical Value
1. Thickness	1.5mm
2. Density	0.94gm/cc
3. Roll Width X Length	6.5m X 150m
4. Tensile Strength	
a. Tensile Strength at Yield	24kN/m
b. Tensile Strength at Break	42kN/m
c. Elongation at Yield	15%
d. Elongation at Break	700%
e. Secant Modulus (1%)	500MPa
5. Toughness	
a. Tear Resistance (initiation)	200N
b. Puncture Resistance	480N
c. Low Temperature Brittleness	-94°F
6. Durability	
a. Carbon Black	62%
b. Carbon Black Dispersion	A-1
c. Accelerated Heat Ageing	Negligible Strength Changes after 1 month at 110°C
7. Chemical Resistance	
a. Resistance to Chemical Waste Mixture	10% Strength Change Over 120 days
b. Resistance to Chemical Reagents	10% Strength Change Over 7 days
8. Environmental Stress Crack Resistance	1500hrs
9. Dimensional Stability	2%
10. Seam Strength	80% or more (of Tensile Strength)

Source: Page 386, CPHEEO Manual.

### 5.9.5 Side Lining with Geo-synthetic Clay Liner (GCL).

As per the MSW Rules 2000, the sides of the landfill also to be impervious. In the present context since Gabion wall is a vertical structure it is difficult to provide clay lining facility. Therefore the Geo-synthetic Clay Liner (GCL) of equivalent permeability requirement is proposed. Since the RCC wall is a vertical structure the DSMC suggested for HDPE and Geo-synthetic Clay Liner (GCL) of equivalent permeability requirement was proposed for the sides of landfill. However the CPHEEO directed to consider the quantities of HDPE and GCL on hill side only and accordingly deleted for RCC wall side.

### 5.10 Leachate Collection & Removal System (LCRS)

Leachate refers to the liquid that has passed through or emerged from solid waste and contains dissolved and suspended materials from solid waste. Leachate is generated due to exposure of uncovered waste to the precipitation and should be collected and treated to prevent contamination of ground water.

#### 5.10.1 Assessment of Leachate Quantity.

The leachate generation is a function of precipitation and is directly proportional to rainfall intensity and surface area. Therefore the following rainfall data is considered for arriving the quantity of leachate generation

Month	Rainfall(mm)	
	Monthly total	No. of rainy days
January	40.4	3.2
February	50.2	5.2
March	127.1	8
April	270.5	13.7
May	534.7	22.3
June	650.4	24.6
July	666.4	27
August	578.2	26.3
September	429.3	20.9
October	180.3	8.6
November	35.8	3.1
December	17.2	1.8
	3580.5	164.7

Source : Meteorological Centre, IMD, Ministry of Earth Sciences, Government of India, Sikkim ([www.imdsikkim.gov.in](http://www.imdsikkim.gov.in)), Station: M.O Gangtok,

From the above Table it is observed that about 87% of the precipitation occurs in six months of rainfall from April to September and amounts to 3130 mm (95%) with 135 number of rainy days. The quantity of leachate generated from active landfill is estimated by the following formula Leachate Generation Rate,  $Q_a = (C \times I \times A) / 1,000 \text{ m}^3/\text{day}$

Table 5.11: Method 1 - CPHEEO (Ref: Annexure 17.2, Page 678)

Calculation for Quantity of Leachate Generation - cum/day	Data/ Calculations	Unit
Leachate Generation Rate, $Q_a = (C \times I \times A)$ m <sup>3</sup> /day	36	cum/d
C = Coefficient of Runoff,	0.9	
I = Intensity of Rainfall (Avg. total precipitation in Gangtok)	3130	mm
A = Effective Surface area of Operating Phase; $A = N \times a$	1706	Sq.m
N = No of Rainy Days in a year	135	Nos
a = Surface Area of Daily Cell, in m <sup>2</sup> for Gangtok.	13	Sq.m
Waste for Landfill - 17 t/day (Average)	17	T/d
Density	0.9	T/cum
Volume, cum	19	Cum
Waste height of daily cell	1.5	m
Leachate Generation from Landfill Area	36	cum/day
Leachate from Compost Plant		
Waste Quantity per day to be handled in compost plant TPD	42.25	
Moisture content as Leachate	10%	
Leachate from Compost Plant cum /day	4	cum/day
Say	40	cum/day

The leachate generation from Landfill area works out to 36 m<sup>3</sup>/day. Also from compost plant about 4 m<sup>3</sup> /day is generated. Thus the total quantity of leachate generation works out to about 40 m<sup>3</sup>/day.

**Method 2 - Swiss Method (Adapted from: Lima, Luiz Mario Queiroz. Tratamento do lixo. São Paulo. Hemus. 1991.), for estimating the flow of leachate or percolated liquid by using the equation:** (Source: Down loaded from Internet – Guidelines for the Design, Construction and Operation of Manual Sanitary Landfill- Jorge Jaramillo, 2003, Reference- PAHO/CEPIS/PUB/03.108.)

$$Q = (P \times A \times K) / t$$

where:

Q = Mean flow of leachate (l/s)

P = Mean annual precipitation (mm/year) - 3130 mm/year

A = Surface area of the landfill (m<sup>2</sup>) - 9916 sq.m

t = Number of rainy days in a year - 135 (11646720 seconds for total number of rainy days)

K = Coefficient that depends on the degree of compaction of the waste, the recommended values of which are the following:

1. For weakly compacted landfills with a specific gravity of 0.4 to 0.7 t/m<sup>3</sup>, the estimated production of leachate is between 25 and 50% (K = 0.25 to 0.50) of the mean annual precipitation for the landfill area.

2. For strongly compacted landfills with a specific gravity  $> 0.7$  t/m<sup>3</sup>, the estimated production of leachate is between 15 and 25 % ( $K = 0.15$  to  $0.25$ ) of the mean annual precipitation for the landfill area.

Therefore;

$$Q = (3130 \times 9916 \times 0.16) / 11646720$$

$$= 0.43 \text{ lit. per sec. or } 36.8 \text{ cum per day}$$

$$= 37 \text{ cubic meters per day (say).}$$

Also the Leachate generation was calculated with various other models suggested and summarized below;

- Based on a field study of 13 municipal landfills in North West Germany Ehrig (1983) reported the following leachate generation rate, which depends on type of compactor used for compacting the waste. If steel wheel compactors are used, the leachate generation from landfill suggested was about 15-25% of Annual precipitation (Ref: Design of Landfills, Amalendu Bagchi, John Wiley & Sons, Inc, New Jersey, USA, ), On calculation it was found to be 32 cum/day of leachate is produced for 15%
- As suggested in the CPHEEO Manual Thumb rule (page 352) with 25% of the precipitation from active landfill area was estimated to 40 cum/day.

#### 5.10.2 Post Closure Leachate Leakage.

After construction of final cover, only that water, which can infiltrate through final cover percolates through the waste and generates leachate. The major quantity of precipitation will be converted to surface runoff. Therefore the leachate generation rate after closure of landfill is always less than the pre closure period (active life).

#### 5.10.3 Leachate Collection Network System

Leachate collection system to collect above calculated quantity comprises a network of pipes known as feeder pipes and header pipes. The primary function of leachate collection system is to collect and convey the leachate out of the landfill unit and control the depth of the leachate above the liner. As per USEPA Manual the leachate collection system should be designed to maintain a leachate depth or head of 30cm above the liner. The design leachate head is very important as flow of leachate through imperfections in the liner system increases with an increase in leachate head above liner.

The main components of leachate collection system are feeder mains and header main and leachate collection sump. The design of above collection network has considered the following factors:

- The required flow using known percolation impingement rates and pipe spacing;
- Pipe size using required flow and maximum slope; and
- Structural strength of the pipes.

#### 5.10.4 Sizing of feeder and header pipes

This is calculated by using hydraulic principle and the following equation is derived:

$$\text{Diameter of Pipe, } D = \sqrt{(A \times Q) / (\pi \times N \times V)}$$

A = Area of Segment Considered for Design;

Q = Leachate Flow Rate;

N = Number of Pipes in each Segment; and

V = Velocity of Flow (allowable hydraulic velocity).

In view of the small size of the landfill, the design calculations for leachate collection network yields a smaller diameter pipes which generally not feasible. Therefore a minimum size of 110 mm HDPE pipes is recommended for feeder pipe. The leachate from feeder pipes flow into header pipe with ultimately transferred to leachate collection sump. Similarly the header pipes are designed to take the flow from feeder pipe and accordingly a minimum size of 150 mm is recommended.

The spacing of leachate pipes is worked out by the Mound Model. The maximum height of fluid between two parallel drainage pipes is calculated based on the following formula:

$$h_{\max} = \{ [(L \times C^{0.5}) / 2] \times [(\tan^2 a) / c] + 1 - [(\tan a / c)] \times [(\tan^2 a + c)^{0.5}] \}$$

Where,  $c = q/k$

$h_{\max}$  = Maximum Hydraulic Depth (30 cm)

L = Distance between the Pipes

k = Permeability, 8.64 m/day

q = Inflow Rate, 0.00994 m<sup>3</sup>/m<sup>2</sup>/day

a = Slope, 2%

Accordingly and considering the sensitivity of the site, the design features etc. the spacing between feeder pipes are spaced at 25 m and same is recommended in the design.

#### 5.10.5 Feeder and Header Pipe Material.

Perforated drainage pipes provide long-term performance and these pipes transmit fluids rapidly and maintain good service lives. Considering the above, HDPE perforated pipes of the above design size are considered in the design. It will be ensured that the depth of the drainage layer is deeper than the diameter of the pipe. The pipes will be placed in trenches to provide the extra depth. In addition, the trench serves as a sump (low point) for leachate collection.

Feeder Pipe – 110 mm dia

Header Pipe – 160 mm dia

The details of the LCRS is presented in the drawing (Dwg. no. NERCCDIP-SWM-GANGTOK-LF-LCRS-006). Also the Manhole arrangements are made to collect the leachate from compost plant. (Dwg. no. NERCCDIP-SWM-GANGTOK-LF-06B 1-2-3).

### 5.10.6 Drainage Layer

A 200 mm thick graded pebble and 100 mm thick sand layer is provisioned as drainage layer to facilitate the removal of leachate.

### 5.10.7 Leachate Collection Sump / Well.

The purpose of leachate collection sump is to collect leachate from header pipes, active landfill area and compost plant. The leachate will be collected through header pipe and discharged in the leachate collection sump / well, provided at the leachate treatment plant. The dimensions of leachate collection sumps are worked out to be with 5.0 m dia x 2.5m height. (Dwg. no. NERCCDIP-SWM-GANGTOK-LF-LTP-LIN-07).

### 5.11 Leachate Treatment Plant.

It is estimated that the landfill generates about 40 m<sup>3</sup> of leachate, The quality of leachate is a function of waste characteristics and climatic conditions, especially precipitation. The leachate is generally expected to be high in TDS, BOD and Heavy metals. Treatment of the same involves a combination of technologies. Since the characteristics of leachate vary with time and town and also based on the type of waste disposed off in the landfill conventional treatment technology of Facultative aerated lagoon (FAL) is suggested. Based on the characteristics of leachate specific to the site certain modifications may be taken up at the end of life of landfill. The design details of the same are furnished below;

Design of Leachate Treatment Plant			
SI No	Description of Parameter	Value	Unit
1	<u>Lagoon Size</u>		
	BOD in leachate is normally high therefore, assume Detention Period as t	60.00	Days
	Leachate generation at	40.00	Cum/day
	Total Leachate generation	40.00	cum/day
	Lagoon Volume	2400.00	cum
	Depth of Lagoon d	4.50	m
	Area of lagoon	533.33	sqm
	Let Lagoon dimensions be		
	Using 2 chambers in parallel Series, area per chamber	266.67	
	with l/b = 6, Width of lagoon b	6.70	
	With 3 baffles effective width	2.25	m
	Length	39.50	
	Say	39.50	m
	Length of travel	158.00	m
	Depth	4.50	m
	Provide 0.5m free board and 0.5m sludge zone , Total	5.50	m



Depth			
	Retention Time	59.55	Days
<b>2</b>	<b><u>Reaction Rate and Dispersion Characters</u></b>		
	Assume K at 20 C	0.70	
	Summer Leachate Temperature Tisu	17.00	c
	Summer Ambient temperature Tasu	20.00	c
	Winter leachate Temperature Tiw	10.00	c
	Winter Ambient temperature Taw	12.00	c
	Liquid Temperature in Summer in lagoon Tlsu	19.60	c
	Liquid Temperature in Winter in lagoon Tlw	11.73	
	For the lagoon configuration, Dispersion Coefficient $D = 11.5 \times \text{width}^2$	58.22	
	Dispersion Number D/UL	3.33	
	Dispersion Number D/UL	3.33	
<b>3</b>	<b><u>Lagoon Performance</u></b>		
	Influent substrate concentration So (soluble BOD)	2500.00	
	<b><u>During Summer</u></b>		
	K	0.69	
	The term a	23.42	
	S/So	0.01	
	Final Substrate concentration S	13.56	
	Final Effluent BOD	18.78	
	Overall efficiency in summer	99.24	
	<b><u>During Winter</u></b>		
	K	0.53	
	The term a	20.46	
	S/So	0.01	
	Final Substrate concentration S	23.94	mg/l
	Final Effluent BOD	33.16	mg/l
	Overall efficiency in winter	98.66	
	The lagoon will perform within the rated efficiencies of 80 to 90%. But during winter, the effluent BOD shall be slightly higher. Considering the dilution potential of river and economics, this seems acceptable		
<b>4</b>	<b><u>Power Requirement</u></b>		
	Concentration of bio solids produced	38.38	g/m <sup>3</sup>
	Amount of bio-solids wasted per day Pxbio	1.54	kg/d
	Oxygen Requirement Ro	156.95	kg/d
	Aerator rating at	1.80	kgO <sub>2</sub> /kWh
	Oxygen Saturation Concentration at 20 deg C	9.08	g/m <sup>3</sup>
	Oxygen Saturation Concentration at 19.62 deg C	9.10	g/m <sup>3</sup>
	Required O <sub>2</sub> Transfer rate AOTR	192.65	kg/d
	Energy required Ereq	4.46	KW
	Use 3 Nos. 3 HP aerators,		

5	<u>Sludge Accumulation</u>		
	At a rate of 0.04 cum per capita per year, sludge generated	19.04	m <sup>3</sup> /year
	Volume provided for sludge storage	44.44	m <sup>3</sup> /year
	Frequency of de-sludging	2.33	years

The Leachate treatment units are given in Dwg. no. NERCCDIP-SWM-GANGTOK-LF-LTP- LIN-07). The aerators provisioned in the estimates were deleted by CPHEEO and based on the actual leachate characteristics an appropriate options may be included so as to treat the leachate to the required standards as per the guidelines laid out in MSW Rules 2000.

## 6 LANDFILL ASSOCIATED INFRASTRUCTURE FACILITIES

In continuation to the above scientifically designed sanitary landfill as per the MSW rules 2000, there is a need for associated infrastructure to be developed to facilitate management of long term landfill operation and maintenance period efficiently. This would involve development of the landfill site with provision of the basic infrastructure of proper road access, fence, gatehouse with weighbridge, office, stores, workers room, toilet facility, washing and toilets for staff, green belt/buffer zone, water supply, lighting etc. The same are mentioned below.

- An entrance gate of 5 m wide with two door system is proposed nearby the security cabin. (Dwg. no. NERCCDIP-SWM-GANGTOK-LF-015).
- A chain link fencing is proposed all around the site for a length of 1050 m. The height of the fence is 1.8m with MS rectangular poles fabricated out of 2 equal angles of 65x65x65 mm(Dwg. no. NERCCDIP-SWM-GANGTOK-LF-014).
- Security Cabin with Room and Toilet is provisioned for construction with dimension as 6.7 m x 4.5 m(Dwg. no. NERCCDIP-SWM-GANGTOK-LF-012 A and 012 B),
- Office cum Workers Room is provisioned for construction with dimension as 47 sq.m (Dwg. no. NERCCDIP-SWM-GANGTOK-LF-011).
- Toilet Block is provisioned for construction with dimension as 6.6 m x 4.8 m(Dwg. no. NERCCDIP-SWM-GANGTOK-LF-013 A, 013B, 013C).
- Proposed Access Roads (Internal roads) of 470.m is proposed (Dwg. no. NERCCDIP-SWM-GANGTOK-LF-09).
- Storm water drainage network of 430 m length all along the access and haul roads are proposed; (Dwg. no. NERCCDIP-SWM-GANGTOK-LF-010).
- Water supply facilities with a bore well, pump and storage tank is provisioned with sufficient liters capacity;
- In addition to above an open area of about 986 sq.m is earmarked for waste segregation and recycling area, Top soil storage area of 1850 sq.m, green belt area of 4572 sq.m, vehicle washing area, vehicle parking area is earmarked.. (Dwg. no. NERCCDIP-SWM-GANGTOK-LF-003).
- Electrical Works for the street lighting and internal lighting is provisioned (Dwg. no. NERCCDIP-SWM-GANGTOK-LF-016).
- Provisions for Green Belt of 5 m wide vegetative cover (with three rows of trees) all

around the site boundary is proposed for Green belt. (Dwg. no. NERCCDIP-SWM-GANGTOK-LF-003).

- Provisions for Bore Well for water and as well as for monitoring well is provisioned (Dwg. no. NERCCDIP-SWM-GANGTOK-LF-003).

## 7 FINAL CLOSURE & ENVIRONMENTAL MONITORING PLAN

### 7.1 Operation Phases

**Daily Soil Cover:** Wastes shall be covered immediately or at the end of each working day with minimum 10 cm of soil, inert debris or construction material till such time waste processing facilities for composting or recycling or energy recovery are set up as per Schedule I of MSW Rules 2000.

### 7.2 Intermediate Cover/Monsoon Cover:

Prior to the commencement of monsoon season, an intermediate cover of 40-65 cm thickness of soil shall be placed on the landfill with proper compaction and grading to prevent infiltration during monsoon. Proper drainage berms shall be constructed to divert run-off away from the active cell of the landfill.

The waste shall be filled upto RL of 76.00 m forms the first phase of operation. The second phase of landfill operation starts above this RL with every 3 m of height referring to each phases subsequently. (Dwg. no. NERCCDIP-SWM-GANGTOK-LF-004).

### 7.3 Final Cover

The final cover system shall than be done above RL. 79.00 m and will comprise a 600 mm thick compacted clay barrier layer of permeability  $1 \times 10^{-7}$  cm/sec, followed by a drainage layer of 150 mm thick granular material of permeability  $1 \times 10^{-2}$  cm/sec and a 300 mm thick vegetative layer (Dwg. no. NERCCDIP-SWM-GANGTOK-LF-008).

### 7.4 Availability of Cover Soil:

As per the Schedule III, [see rules 6(1) and (3), 7(2)], Specifications for Landfill Sites, that the huge quantity of cover soil is required during the operation of the landfill. And accordingly series of discussions regarding availability of suitable cover soil were already held with Department of Mines & Geology GREF etc. They had expressed that various tunneling operations are active in the region and the required soil would be available and suitable directions are only required to the concerned department to dump/stock the soil in a pre designated place (i.e. nearest to Martam Landfill).

Therefore GMC/UDHD shall co ordinate with the respective departments viz., NHPC, Forest department, GREF, Mines & Geology etc, Also the soil samples for testing and based on the soil analysis report the state shall take action for storing the stock piles in a designated place. The commitment letter in this regard is enclosed as Appendix 24.

### 7.5 Closure of Landfill site and Post - Care

The post-closure care of landfill site shall be conducted after fifteen years and long term monitoring to assess; (i) maintaining integrity and effectiveness of final cover and repair required, (ii) efficiency of leachate collection system, (iii) ground water quality and action required to improve, (iv) maintenance and operation of gas collection system to meet the

standards. The closed landfill may be used for human settlement after 15 years of post-closure care by ensuring gaseous emission and leachate compliance.

#### 7.6 Gas venting layer

The final cover system will comprise a 200 mm thick gas venting layer with a 150 mm thick gas vent pipe, 600 mm thick compacted clay barrier layer of permeability  $1 \times 10^{-7}$  cm/sec, followed by a drainage layer of 150 mm thick granular material of permeability  $1 \times 10^{-2}$  cm/sec and a 600 mm thick vegetative layer. (Dwg. no. NERCCDIP-SWM-GANGTOK-LF-008).

#### 7.7 Environmental Management Plan:

##### 7.7.1 Monitoring Key Environmental Parameters.

In order to ensure the optimal performance of the landfill site, identify impacts (if any) on environment pollution and comply with the regulatory requirements, the following environmental parameters shall be monitored regularly, at the landfill site.

- Quality of Treated Leachate;
- Surface Water Quality;
- Ground Waste Quality;
- Quantity and Quality of Gas Generated; and
- Ambient Air Quality.

The samples shall be collected as per the sampling plan and monitored as per the standards stipulated in MSW Rules 2000.

#### Sampling Specifications for Environmental Monitoring

Description	Sampling Specifications
Quality of Leachate after Treatment	One grab Sampling at out let of the treatment plant every month.
Surface Water Quality	One grab sample each at up stream side and down stream of treated leachate out fall into Ranikhola River once in three months.
Ground Waste Quality	One sample each from the monitoring well on upstream side and down stream side of the landfill site, once in three months.
Quantity and Quality of Gas Generated	24 hours continuous stack monitoring at selected vent every month.
Ambient Air Quality	24 hours continuous ambient air quality monitoring at one location in upwind and three locations in downwind directions once in six months.

## 8 COST ESTIMATION AND OPERATION & MAINTENANCE COST

### 8.1 Capital Cost of proposed SWM

The Detailed Cost estimate for the proposed development of landfill facility and associated infrastructure at Martam, and procurement of vehicles, gabion wall at landfill site, final closure to the existing dumped waste are based on the PWD SOR 2006, Market rates (Quotations Appendix 25) and few items from SOR of other State. Also, current Schedule of Rates available for Gangtok is from PWD revised in 2006. Normally the SOR are revised once in five years and is due for revision. The Tranche 1 projects for Water supply under NERCCDIP had considered 6% annual increase in cost which had been approved by MoUD, New Delhi. The same is considered for estimation purpose. A letter from SIPMIU is enclosed as Appendix 21.

**Table 8.1 : Abstract Cost for SWM works in Gangtok**

Sl	Name of Work	Rs. In Million
<b>A</b>	<b>Primary Collection</b>	
1	Household bins for Segregation of waste	6.61
2	Mini Garbage Tippers for Door step collection (1.5 cum capacity)	5.29
3	Tipper Truck - 4.5 cum capacity for dry waste	3.23
4	Personal Protective equipments	0.06
	<b>Sub Total 1</b>	<b>15.18</b>
<b>B</b>	<b>Street sweeping &amp; Road Side Bins</b>	
5	Push carts and Litter bins of various capacities	1.67
	<b>Sub Total 2</b>	<b>1.67</b>
<b>C</b>	<b>Secondary Collection &amp; Transportation</b>	
6	Closed Compactor Trucks	11.35
7	Closed Galvanized Steel Bins - 1100 ltrs capacity with wheels and provision of hooks for locking arrangements	0.28
8	Personal Protective equipments	0.03
	<b>Sub Total 3</b>	<b>11.65</b>
<b>D</b>	<b>Landfill Facility</b>	
8	Construction of RCC Retaining Wall	40.32
9	Upgrading the existing site land for New Landfill	0.59
11	Liner system, drainage & leachate collection system	12.32
12	Leachate Treatment Plant	8.30

13	Toilet Block	0.83
14	Security Cabin	0.45
15	Chainlink Fencing, Main Entrance Gate & Compound Wall	1.41
16	Storm water Drain all around,	0.52
17	Vehicles & Equipment for Landfill operation	7.11
18	Electrical Works	5.42
19	Personal Protective equipments	0.19
	<b>Sub Total 4</b>	<b>77.48</b>
<b>E</b>	<b>Miscellaneous</b>	
20	Office cum workers room	0.98
21	Approach road improvements and New Roads	1.32
22	Watersupply	0.42
23	Green Belt, Monitoring Well	0.09
	<b>Sub Total 5</b>	<b>2.81</b>
	<b>Base Cost of the Project</b>	<b>108.79</b>
	<i>Physical Contingencies (3%)</i>	2.19
	<b>Grand Total</b>	<b>110.98</b>

As per the direction of CPHEEO, the requirements are estimated for five years (Phase I) only and accordingly an estimate for the year 2012- 2017 an amount of Rs 110.98 Million is required for SWM works. The Original allocation for SWM under the NERCCDIP, was Rs. 75.75 Million and further extended to INR 140 million. The detailed item wise cost estimates are presented as Attachment I.

### 8.2 Non Duplicity Certificate:

The above DPR with cost estimates was presented to the Chief Engineer, UDHD, Government of Sikkim and also the Project Director of SIPMIU who is also the Joint Secretary of UDHD, Govt. of Sikkim had issued a certificate for the proposed works for Solid Waste Management in Gangtok which are included in the Detailed Project Report, has verified and there is no duplication of any component of the proposed project with any other project being proposed or sanctioned under any other scheme (Appendix 18).

### 8.3 Operation & Maintenance Cost

The various O & M cost for SWM activity are detailed into following heads;

1. Primary Collection of Waste from Household
2. Secondary Collection & Transportation
3. SWM facilities (Compost Plant and Landfill)



Table 8.2: Summary of O &amp; M Cost for Primary Collection of Waste from Household

Head	Sl. No	Particulars	Units	Qty	Rates/ Unit (Rs)	Amount (Rs) per Month	Amount (Rs) for year
(A) Staff Salary/ Wages	1	Drivers for Mini Tipper	No.	17	5,000	85,000	1,020,000
	1	Helpers	No.	28	4,000	112,000	1,344,000
		<b>Sub total A</b>		<b>45</b>		<b>197,000</b>	<b>2,364,000</b>
(B) Personnel Protective Equipments	3	Rain Coat	Set/year	56	700	39,200	470,400
	4	Gloves	Pairs/year	56	40	2,240	26,880
	5	Gumboots	Pairs/year	56	150	8,400	100,800
	6	Goggles	No./year	56	75	4,200	50,400
	7	Protective caps	No./year	56	50	2,800	33,600
	8	Masks	No./year	56	50	2,800	33,600
		<b>Sub total B</b>				<b>59,640</b>	<b>715,680</b>
(C) Annual Repairs & maintenance	9	Annual Maintenance cost		17		140,250	1,683,000
	10	Depreciation Cost (15% per year)		17		210,375	2,524,500
		<b>Sub total C</b>				<b>350,625</b>	<b>4,207,500</b>
(D) Fuel		Diesel for Mini Tipper Truck	Lts/month	2,550	40	102,000	1,224,000
		<b>Sub total D</b>				<b>102,000</b>	<b>1,224,000</b>
		<b>Total cost/ annum for Primary Collection of MSW (Rs.)</b>				<b>709,265</b>	<b>8,511,180</b>

Table 8.3 : Summary of O &amp; M Cost for Secondary Collection &amp; Transportation of Waste in Gangtok

Head	Sl. No	Particulars	Units	Qty	Rates/ Unit (Rs)	Amount (Rs) per Month	Amount (Rs) for year
(A) Staff Salary/ Wages	1	Drivers for Compactor	No.	5	8,000	40,000	480,000
	2	Helpers for Compactor	No.	10	4,000	40,000	480,000
		<b>Sub total A</b>		<b>15</b>		<b>80,000</b>	<b>960,000</b>
(B) Personnel Protective Equipments	3	Rain Coat	Set/year	30	700	21,000	252,000
	4	Gloves	Pairs/year	30	40	1,200	14,400
	5	Gumboots	Pairs/year	30	150	4,500	54,000
	6	Goggles	No./year	30	75	2,250	27,000
	7	Protective caps	No./year	30	50	1,500	18,000
	8	Masks	No./year	30	50	1,500	18,000
		<b>Sub total B</b>				<b>31,950</b>	<b>383,400</b>
(C) Annual Repairs & maintenance	9	Annual Maintenance cost		5		158,330	1,899,960
	10	Depreciation Cost (15% per year)		5		237,500	2,850,000
		<b>Sub total C</b>				<b>395,830</b>	<b>4,749,960</b>
(D) Fuel		Diesel for Compactor	Lts/month	4,500	40	180,000	2,160,000
		<b>Sub total D</b>				<b>180,000</b>	<b>2,160,000</b>
		<b>Total cost/ annum for Secondary Collection &amp; Transportation of MSW (Rs.)</b>				<b>687,780</b>	<b>8,253,360</b>

Table 8.4 : Summary of O &amp; M Cost for Solid Waste Compost Plant and Landfill in Gangtok

Head	Sl. No	Particulars	Units	Qty	Rates/ Unit (Rs)	Amount (Rs) per Month	Amount (Rs) for year
(A) Staff Salary/ Wages	1	Plant Manager/ Engineer	No.	1	25,000	25,000	300,000
	2	Asst. Manager	No.	1	15,000	15,000	180,000
	3	Quality Control Asst.	No.	1	10,000	10,000	120,000
	5	Office attender	No.	1	6,000	6,000	72,000
	6	Skilled Labour	No.	3	8,000	24,000	288,000
	7	Weigh Bridge Operator	No.	1	10,000	10,000	120,000
	8	Electrical Operator	No.	1	10,000	10,000	120,000
	9	Mechanical Operator	No.	1	10,000	10,000	120,000
	10	Front end loader /Bull Dozer operator	No.	2	10,000	20,000	240,000

	11	Drivers with in plant	No.	1	8,000	8,000	96,000
	12	Helpers	No.	8	6,000	48,000	576,000
	13	Security	No.	6	6,000	36,000	432,000
		<b>Sub total A</b>		<b>42</b>		<b>222,000</b>	<b>2,664,000</b>
<b>(B) Power charges</b>	14	Equipments and Bore well. Lighting	units	10000	7	70,000	840,000
		<b>Sub total B</b>				<b>70,000</b>	<b>840,000</b>
<b>(C) Consumables / Personnel Protective Equipments</b>	15	Microbial Culture	ton/month	2.5	#####	250,000	3,000,000
	16	Uniforms (apron)	Set/year	30	700	21,000	252,000
	17	Gloves	Pairs/year	50	40	2,000	24,000
	18	Gumboots	Pairs/year	50	150	7,500	90,000
	19	Goggles	No./year	30	75	2,250	27,000
	20	Protective caps	No./year	30	50	1,500	18,000
	21	Masks	No./year	50	50	2,500	30,000
	22	Hose pipe	Rmt	1000	30	30,000	360,000
	23	Plastic Pots	No.	5	75	375	4,500
	24	Shovel	No.	15	150	2,250	27,000
	25	HDPE bags for Packing Manure	No.	5500	15	82,500	990,000
		<b>Sub total C</b>				<b>401,875</b>	<b>4,822,500</b>
<b>(D) Utilities</b>	26	Water supply (about 2000 lts/ day)@ Rs. 15/- per KL for commercial use	KL per month	230	15	3,450	41,400
	27	Soap, Detergents, Detergents for floor washing	Lumsum	1	1,000	1,000	12,000
	28	Nursery and Garden Maintenance	No.	1	4000	4,000	48,000
	29	Laboratory charges for testing compost quality (NPK)	No.	4	1,000	4,000	48,000
		<b>Sub total D</b>				<b>12,450</b>	<b>149,400</b>
<b>(E) Annual Repairs &amp; maintenance</b>	30	Civil items (considering 0.5% of total cost for civil works)				17,000	204,000
	31	Mechanical works/ per year (considering 2% cost of electrical work)				33,500	402,000
	32	Electrical works/ per year (considering 2% cost of electrical work)				9,500	114,000
		<b>Sub total E</b>				<b>60,000</b>	<b>720,000</b>
<b>(F) Diesel and oil for vehicles</b>	33	Diesel for Front End Loader / Dozer	Lts/month	600	40	24,000	288,000
	34	Tipper,	Lts/month	200	40	8,000	96,000
	35	Oil for Front End Loader / Dozer	Lts/month	30	80	2,400	28,800
	36	Oil for Tipper, 2 nos. water tanker 1 no.	Lts/month	6	80	480	5,760
		<b>Sub total F</b>				<b>34,880</b>	<b>418,560</b>
		<b>Total cost/ annum for Processing of MSW (Rs. In Lacs)</b>				<b>801,205</b>	<b>9,614,460</b>
		Compost Plant					7907466
		Landfill					1706994

The various O & M cost for SWM activity are detailed into four heads viz., Primary Collection of Waste from Household, Secondary Collection & Transportation, SWM facilities Compost Plant and Landfill. The O & M Cost for primary collection system is estimated to be 85.11 lakhs/year. The O & M Cost for Secondary collection and transportation is estimated to be 82.53 lakhs/year. The O & M Cost for Compost plant is estimated to be 79 lakhs/year. The O & M Cost for Landfill is estimated to be 17 lakhs/year.

#### 8.4 O & M of Compost Plant on Public Private Partnership.

The GMC had received a proposal from M/s Agrotech Cooperative Society Rumtek for carrying out the operation and maintenance of the Compost Plant at Martam. It is understood that they are presently carrying out the compost production in Rumtek by engaging the services of youth group by promoting social service and as well as for improving livelihood of youth. Together the firm is strengthened and supported by an eminent professor Dr. S. Bhattachary, who has experience in the field of bioculture/biotechnology specialized in agricultural organic manure. The firm also intends to take loan from the Bank for initial investment for Compost plant. By reviewing the proposal and credential, motivation of youths, GMC in principle, has decided that the firm shall be engaged for O & M of Compost plant at Martam and presently is in the process of inviting the firm for a discussion on relevant terms and conditions for O & M on Public Private Partnership (PPP) model and also discuss few minor revision in their financial proposal. A commitment letter from GMC for agreement with the firm is enclosed as Annexure 29.

#### 8.5 EMP Cost during O & M period

The Environmental Monitoring (EMP) cost for O&M Phase is furnished in the following Table.

Table 8.6:  
Summary of EMP cost during O & M period for SWM Facilities (Compost Plant & Landfill) in Gangtok

Item	Unit	Amount / Year (Rs.)
Ambient Air Quality Monitoring at Solid Waste disposal site	LS	104,000.00
Noise level monitoring at Solid Waste disposal site	LS	18,000.00
Ground water quality monitoring at Solid Waste disposal site	LS	64,000.00
Surface water quality monitoring at	LS	64,000.00

Solid Waste disposal site		
Monitoring of leachate quality after treatment	LS	96,000.00
Monitoring of quantity and quality of landfill gas	LS	156,000.00
		<b>502,000.00</b>

The Environmental Monitoring (EMP) cost for O&M Phase is estimated as Rs. 5.02 lakhs/year.

## 9 SWM PACKAGES AND IMPLEMENTATION PLAN

### 9.1 Details of Packages and implementation strategy

In view of the need for mobilization of community for house-to-house collection, it is recommended to procure the vehicles and equipment for collection and transportation in two phases. This allows, modification or improvement of the specifications (if required), based on the performance of the proposed equipment. All the vehicles and equipment required will be procured through centralized procurement process. Thus the procurement program for Gangtok will comprise the following:

- Procurement of goods, equipment and vehicles
- Item rate contracts for civil works in landfill,

### 9.2 Procurement Packages and Project commencement details;

The total contract packages for the SWM project for Gangtok are divided into three by splitting the procurement of goods into two packages (SWM-GTK-1 & SWM-GTK-3) and one civil works package (SWM-GTK-2). The details of the same are summarized below;

Table 9.1

	Packages		
	GTK-SWM-1	GTK-SWM-2	GTK-SWM-3
Name of Work	Procurement of Primary Collection Vehicles, Household Bins, Push Carts and Litter Bins of Various sizes for Solid Waste Management	Construction of Land fill, Leachate Treatment Plant, and associated Infrastructure,	Procurement of Secondary Collection Vehicles, 1100 ltrs capacity Bins, Landfill Vehicles & Equipments Personal Protection Equipments for Solid Waste Management
Cost	Rs. 16.79 Million	Rs.75.17 Million	Rs.19.01 Million
Type of Contract	LCB Item Rate	LCB Item Rate	LCB Item Rate
Construction Period	12 Months	24 Months	12 Months
Approval of SAR	5th Mar. 2011	5th Mar. 2011	5th Mar. 2011
Approval of DPR	10 <sup>th</sup> Oct. 2011	10 <sup>th</sup> Oct. 2011	10 <sup>th</sup> Oct. 2011
Issue of Bid documents	10 <sup>th</sup> Nov. 2011	10 <sup>th</sup> Nov. 2011	10 <sup>th</sup> Nov. 2011
Contract finalization	15th Jan. 2012	16th Jan, 2012	17th Jan, 2012
Completion of Work	14th Jan 2013	15 th Jan. 2014	16 <sup>th</sup> Jan. 2013

# ATTACHMENT – I

ABSTRACT OF COST			
SI	Name of Work	Rs. In Million	Reference (Page No)
<b>A</b>	<b>Primary Collection</b>		
1	Household bins for Segregation of waste	6.61	106; SI No. 1
2	Mini Garbage Tippers for Door step collection (1.5 cum capacity)	5.29	106; SI No. 2
3	Tipper Truck - 4.5 cum capacity for dry waste	3.23	106; SI No. 3
4	Personal Protective equipments	0.06	173; SI No. 8
	<b>Sub Total 1</b>	<b>15.18</b>	
<b>B</b>	<b>Street sweeping &amp; Road Side Bins</b>		
5	Push carts and Litter bins of various capacities	1.67	106; SI No. 4-8
	<b>Sub Total 2</b>	<b>1.67</b>	
<b>C</b>	<b>Secondary Collection &amp; Transportation</b>		
6	Closed Compactor Trucks	11.35	106; SI No. 4-8
7	Closed Galvanized Steel Bins - 1100 ltrs capacity with wheels and provision of hooks for locking arrangements	0.28	106; SI No. 4-8
8	Personal Protective equipments	0.03	173; SI No.16
	<b>Sub Total 3</b>	<b>11.65</b>	
<b>D</b>	<b>Landfill Facility</b>		
8	Construction of RCC Retaining Wall	40.32	107 to 109
9	Upgrading the existing site land for New Landfill	0.59	110 to 113
11	Liner system, drainage & leachate collection system	12.32	114 to 119
12	Leachate Treatment Plant	8.30	120 to 125
13	Toilet Block	0.83	127 to 132
14	Security Cabin	0.45	133 to 137
15	Chainlink Fencing, Main Entrance Gate & Compound Wall	1.41	139 to 143
16	Storm water Drain all around,	0.52	144
17	Vehicles & Equipment for Landfill operation	7.11	167
18	Electrical Works	5.42	168 to 172
19	Personal Protective equipments	0.19	173; SI No. 25
	<b>Sub Total 4</b>	<b>77.48</b>	
<b>E</b>	<b>Miscellaneous</b>		
20	Office cum workers room	0.98	145 to 160
21	Approach road improvements and New Roads	1.32	161 to 163
22	Watersupply	0.42	164 to 166
23	Green Belt, Monitoring Well	0.09	126
	<b>Sub Total 5</b>	<b>2.81</b>	
	<b>Base Cost of the Project</b>	<b>108.79</b>	
	<i>Physical Coningencies (3%)</i>	2.19	
	<b>Grand Total</b>	<b>110.98</b>	

*J. Sub...*  
SWM Specialist  
DSMC, Gangtok

*J. D. BHUTIA*  
PROJECT DIRECTOR  
SWM (NERCCDIP)  
GOVERNMENT OF BHUM  
GANGTOK



## List of SWM Vehicles &amp; Equipments

Sl.	Details of Works/Services	Phase I Requirement 2012-17	Unit	Rate (Rs)	Amount (Rs. in Million)		Reference
					Phase I	Phase I	
A	Vehicles & Equipment						
1	Household Bins for Segregation (Green & Blue) 25 liter capacity - Top 242mm, Bottom 212mm, Height 340mm	47200	Nos	140	6.61	6.61	Cost of Household Bins for Shillong rates are suggested by CPHEEO/PMMC for Gangtok
2	Mini Garbage Tipper for Door step collection - 1.5 cum capacity	11	Nos	480464	5.29	5.29	Quotation from Shillong obtained as suggested by CPHEEO/PMMC
3	Tipper Truck for Door step collection -- 4.5 cum capacity	3	Nos	1077000	3.23	3.23	Cost suggested by CPHEEO/ PMMC
4	Push carts for Street Sweeping - 100 ltrs capacity	100	Nos	7055	0.71	0.71	Quotation
5	Push cart with two bins of 60 ltrs capacity each for collecting garbage from permanent structure by tilting	2	Nos	21598	0.04	0.04	Cost suggested by CPHEEO/ PMMC - Supreme Industries Guwahati
6	Litter Bins - Permanent Structure Twin Bin Tilting Type - 60 ltrs capacity	20	Nos	2120	0.04	0.04	
7	Litter Bins of 120 ltrs capacity HDPE with wheels and provision of hooks for locking arrangements	101	Nos	2317	0.23	0.23	
8	Litter Bins of 160 ltrs capacity HDPE with wheels and provision of hooks for locking arrangements	114	Nos	5616	0.64	0.64	
9	Providing Closed Compactor Trucks of 7 cum Container capacity Rear end refuse Compactor with a Universal Bin Lifting arrangement	5	Nos	2269281	1.67	1.67	Quotation
10	Closed Galvanized Steel Bins - 1100 ltrs capacity with wheels and provision of hooks for locking arrangements	8	Nos	34831	0.28	0.28	Quotation
	<b>Sub Total I</b>				<b>28.41</b>	<b>28.41</b>	

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## Abstract estimate for providing retaining wall at SWM site at Gangtok

Sl No	Description	Unit	No	L(m)	B(m)	D(m)	Qty	Rate (₹)	Amount (₹)
1	Clearing jungle including uprooting of rank vegetation, grass, bush wood, tress and saplings of girth upto 30 cm measured at a height of about 1m above ground level and removal of rubbish with all lead and lift as per direction of Engineer etc., complete. (PWD SR SIKKIM, P-1, I-2.1)	Sqm	1	271	15	0.2	813.00	2.4	1952
2	Earthwork excavation in different kind of soils in foundation trenches including dressig of all sides, watering and ramming including disposal of excavated earth with all lead and lift, disposed earth to be levelled and neatly dressed as per direction of Engineer-in-charge etc., complete. (PWD SR SIKKIM, P-2, I-4.1 & 4.2)								0
	For foundation								0
	Ch 0.00 to 69.43		1	70	3.50	1.50	367.50		0
	Ch 69.43 to 82.43		1	13	5.75	2.00	149.50		0
	Ch 82.43 to 161.28		1	79	7.25	2.00	1145.50		0
	Ch 161.28 to 199.04		1	38	9.50	2.00	722.00		0
	Ch 199.04 to 247.35		1	41	11.75	2.00	963.50		0
	Ch 247.35 to 269.16		1	30	9.50	2.00	570.00		0
									0
	For PCC 1:3:6 (Qty sme as I.no.4)						315.23		
	Earth work for levelling - 1856 cum included below						4233.23		0
	In all kind of soil (Also included Qty of 1856 cum taken for Earth work for levelling)	Cum					3550	125.05	443928
	Soft rock without blasting	Cum					1694	220.19	373002
	Hard rock requiring chiselling	Cum					847	437.35	370436
3	Filling with available earth in trenches, plinth and size of foundation in building works with layers not exceeding 20 cm in depth including consolidation of each layer by ramming, watering etc., all complete. (PWD SR SIKKIM, P-3, I-6.2)								0
	Ch 0.00 to 69.43								0
			18	1.5	3.7	1.15	111.69		0
	Ch 69.43 to 82.43		4	2.45	3.5	1.5	51.45		0
	Ch 82.43 to 161.28		20	3.45	3.35	1.35	312.05		0
	Ch 161.28 to 199.04		10	5.2	3.2	1.20	199.68		0
	Ch 199.04 to 247.35		11	6.25	3.2	1.20	264.00		0
	Ch 247.35 to 269.16		8	5.2	3.2	1.2	159.74		0
	filling for levelling						299.00		0
							1397.62		0
		Cum			Say		1398.00	67.97	95023

4	Providing and laying Plain Cement Concrete in 1:3:6 of thickness 150 mm for the entire foundation area. (PWD SR SIKKIM, P-6, I-9.1.b)								0
	Ch 0.00 to 69.43	1	70	3.80	0.15	39.90			
	Ch 69.43 to 82.43	1	13	6.05	0.15	11.80			
	Ch 82.43 to 161.28	1	79	7.55	0.15	89.47			
	Ch 161.28 to 199.04	1	38	9.80	0.15	55.86			
	Ch 199.04 to 247.35	1	41	12.05	0.15	74.11			
	Ch 247.35 to 269.16	1	30	9.80	0.15	44.10			
						315.23	2984.77	940897.77	
5	Providing and laying in position M20 grade of reinforced cement concrete excluding the cost of form work, finishing and reinforcements with all lead and lift as per specification and direction of Engineer etc., complete. (PWD SR SIKKIM, P-6, I-9.1.b)								0
	For raft								0
	Ch 0.00 to 69.43	1	70	3.50	0.35	85.75			0
	Ch 69.43 to 82.43	1	13	5.75	0.50	37.38			0
	Ch 82.43 to 161.28	1	79	7.25	0.65	372.29			0
	Ch 161.28 to 199.04	1	38	9.50	0.80	288.80			0
	Ch 199.04 to 247.35	1	41	11.75	0.80	385.40			0
	Ch 247.35 to 269.16	1	30	9.50	0.80	228.00			0
	For retaining wall								0
	Ch 0.00 to 69.43	1	70	0.30	4.75	99.75			0
	Ch 69.43 to 82.43	1	13	0.30	9.10	35.49			0
	Ch 82.43 to 161.28	1	79	0.50	11.95	472.03			0
	Ch 161.28 to 199.04	1	38	0.50	14.80	281.20			0
	Ch 199.04 to 247.35	1	41	0.50	17.80	364.90			0
	Ch 247.35 to 269.16	1	30	0.50	14.80	222.00			0
	For counterfort								0
	Ch 0.00 to 69.43	17	4.15	0.30	0.75	15.87			0
	Ch 69.43 to 82.43	4	8.50	0.40	1.225	16.66			0
	Ch 82.43 to 161.28	20	11.35	0.50	1.725	195.79			0
	Ch 161.28 to 199.04	10	14.20	0.60	2.6	221.52			0
	Ch 199.04 to 247.35	11	17.20	0.60	3.125	354.75			0
	Ch 247.35 to 269.16	7	14.20	0.60	2.6	155.06			0
		Cum	69		Say	3833.00	4596.23	17617350	
5	Providing, fixing and removing formwork for casting RCC items as indicated below with locally available timber								0
5	For raft (PWD SR SIKKIM 2006, P-18, I-15.2.b)								
	Ch 0.00 to 69.43	1	140		0.35	49.00			
	Ch 69.43 to 82.43	1	26		0.50	13.00			
	Ch 82.43 to 161.28	1	158		0.65	102.70			
	Ch 161.28 to 199.04	1	76		0.80	60.80			
	Ch 199.04 to 247.35	1	82		0.80	65.60			
	Ch 247.35 to 269.16	1	60		0.80	48.00			
		Sqm	542			340.00	309.78	105326	

5	For retaining wall and counterfort (PWD SR SIKKIM 2006, P-18, I-15.2.f)								
	For retaining wall								0
	Ch 0.00 to 69.43	2	70	4.75	665.00				0
	Ch 69.43 to 82.43	2	13	9.10	236.60				0
	Ch 82.43 to 161.28	2	79	11.95	1888.10				0
	Ch 161.28 to 199.04	2	38	14.80	1124.80				0
	Ch 199.04 to 247.35	2	41	17.80	1459.60				0
	Ch 247.35 to 269.16	2	30	14.80	888.00				0
	For counterfort				0.00				0
	Ch 0.00 to 69.43	34	4.15	0.75	105.83				0
	Ch 69.43 to 82.43	8	8.50	1.23	83.30				0
	Ch 82.43 to 161.28	40	11.35	1.73	783.15				0
	Ch 161.28 to 199.04	20	14.20	2.60	738.40				0
	Ch 199.04 to 247.35	22	17.20	3.13	1182.50				0
	Ch 247.35 to 269.16	14	14.20	2.60	516.88				0
		Cum		Say	9673.00	406.76	3934590		
6	Supplying, bending and placing in position for steel reinforcement in all R.C.C works including cost of bidding wires, all complete. @ 80 kg/cum (PWD SR SIKKIM, P-27, I-19.2)	MT			307.00	53554.2	16441125		
						<b>Total</b>	<b>40323629.8</b>		<b>40.32</b>

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**PART D LANDFILL**  
**SECTION 1. BILL OF QUANTITIES FOR LANDFILL**  
**A. Bill of Quantities for Civil Works for Upgrading the Surface for New Landfill at Martam, Gangtok**

Sl.	Description	Unit	No.	Area, sq.m	Depth, m	Quantity	Rate (Rs.)	MR Amount (Rs.)	SR Amount (Rs.)
	<b>Upgradation the surface for new landfill</b>								
1	Clearing jungle including uprooting of rank vegetation grass,bush wood,trees and saplings of girth up to 30cm.measured at a height of about 1m above ground level and removal of rubbish up to a distance of 50m outside the periphery of the area cleared,all complete. (PWD SR SIKKIM 2006, P-1, I-2.1)	Sqm.				3,000	2.40		7,200
2	Clearing of grass and removing of rubbish up to a distance of 50m outside the periphery of the area cleared. (PWD SR SIKKIM 2006, P-1, I-2.2)	Sqm.				4,500	1.23		5,535

Sl.	Description	Unit	No.	Area, sq.m	Depth, m	Quantity	Rate (Rs.)	MR Amount (Rs.)	SR Amount (Rs.)
3	Felling trees of girth (measured at a height of 1m above the ground level) including cutting of trunks and branches, removing the root and stacking of the serviceable materials and disposal of the unserviceable materials. (PWD SR SIKKIM 2006, P-1, I-2.3)								
		Beyond 30cm and up to 60cm girth	No.s	17			74.59		1,268
		Beyond 60cm and up to 120cm girth	No.s	13			328.10		4,265
		Beyond 120cm and up to 240cm girth	No.s	2			1,524.93		3,050
4	Digging trial pits of 2 m x 2 m size to a maximum of 3 m depth to assess existing conditions. The excavation shall be done carefully by manual means, so as to collect the details of the strata, including dewatering and/or shoring, if necessary, disposal of excavated material as directed, labour, tools and plant, etc., A log of the trial pit shall be furnished with Reduced Level of the existing ground and Reduced Levels of the various strata. The work shall be carried out as directed by the Engineer. (Ref RA-2.3)								
5	Preparation of subgrade by excavating earth to an average depth of 2.5 cm depth, dressing to camber and consolidating with 8/10 ton road roller including making good the undulations etc. and disposal of surplus earth lead upto 50 m. (PWD Sikkim SOR, 2006, Page 44, Item 26.3)	Each	4				1900.72		7,603
		sq m	1	5,069		5,069	32.23		163,359



## RA for Civil Works for Upgrading the Existing Disposal Site at Martam, Gangtok

SI No.	Description of Item	Unit	Rate	Remarks		
RA - 6	Preparation for closure of old gabage by covering Filling inside plinth in building works with 23cm layers, consolidated to 15cm including watering, ramming etc. all complete.	cum	118.47	Item No.6.1, pg No.3 of 2006 PWD SR, Govt. of Sikkim.		
	Add 30% extra over 2006 PWD SR rate to account Fluctuation in rate		35.55			
	Subtotal 1	Rs.	154.02			
	Consolidation of subgrade with road roller of 8 to 10 tonne capacity including making good the undulations etc. with earth and re-rolling the subgrade.	sqm-	2.65	Item No.26.4, pg No.44 of 2006 PWD SR, Govt. of Sikkim.		
	Add 30% extra over 2006 PWD SR rate to account Fluctuation in rate		0.795			
	Subtotal 2	Rs.	3.45			
	Total		157.47			
SI No.	Description	Unit	Qty	Rate (Rs.)	Amount (Rs.)	Remarks
RA - 3	Digging Trial Pits					
1	Earthwork excavation	Cum	12	125.05	1500.6	(PWD SR SIKKIM 2006, P-2, 1-4.1 & 4.2)
2	Add 20% additional for dewatering				300.12	
3	MISC	LS			100	
	Total			Total	1900.72	
RA - 4	Formation of land from waste					
1	Excavation of waste and pushing the waste to site	Sq.m	1	65.92	65.92	
2	Rolling with power roller	Cum	1	7.23	7.23	
3	Watering charges	Cum	1	2.22	2.22	
	Total			Total	75.37	

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## C. Bill of Quantities for Liners for New Landfill Site at Martam

Sl. No.	Description	Unit	No.	Area (sqm)	Depth (m)	Qty	Rate (Rs.)	MR Amount (Rs.)	SR Amount (Rs.)
	<b>Impermeable Layer</b>								
1	Providing and laying Wet Clay or soil amended with bentonite or other agents, having coefficient of permeability not greater than $1 \times 10^{-7}$ cm/sec, laid in layers of 150 mm thickness, tamped and the top surface smooth finished, including cost of all materials, labour, lead and lifts, as per standard specifications, specifications of MSW Rules and as directed by the Engineer.	Cum	1	10,097	0.90	9,087	791.67	7194143	
2	Providing, supplying and fixing membrane (liner) of minimum of 1.5 mm thick HDPE membrane, with the lowest individual thickness not less than 90% of the specified thickness and the minimum sheet density of 0.94 g/cc measured as per ASTM D1505, yield tensile strength greater than 115 N/cm, break elongation > 250% as per IS 1969 (1985) and the carbon black content between 2-3 % with dispersion cat 1 or 2 as per ASTM D 5596. All including material cost, labour for laying, cutting, jointing, etc., complete, transportation and taxes as applicable, and installed as per the standard specifications and procedures and as directed by the Engineer in charge. Payment will be made only to the extent of area of HDPE Geomembrane in the final position. No separate payment will be made for area of lappage.								
	MR	Sqm	1	11,251		11,250.75	221.74	2494741	

3 Providing Sand Bedding for Drainage Layer including watering and consolidation etc., with all lead and lift, including cost of all material, transport, labour and carriage etc.. complete as per specification and as directed by the Engineer. (PWD SR SIKKIM 2006, P-3, I-6.3)	Cum	0.5	10,097	0.10	504.85	401.70	202798
4 Providing and laying 20mm to 25mm size graded coarse aggregates (For filter bed) as per drawing, specifications with all leads and lifts complete etc., as directed by the Engineer, all including cost of material, transportation, laying and compacting with all labour etc., (For drainage layers) (PWD SR SIKKIM 2006, P-1, I.2 C)	Cum	0.5	10,097	0.20	1,009.70	678.12	684697
5 Supplying and laying in standard lengths of High Density Polyethylene (HDPE) Pipes, conforming to IS:4984 / 14151 / 12786 / 13488 with necessary jointing material like mechanical connector i.e. thread/ insert joint/ quick release coupler joint / compression fitting joint or flanged joint, including all local and central taxes, transportation and freight charges, loading / unloading charges, conveyance to the departmental stores / site & stacking the same in closed shade duly protecting from sunrays & rains, etc, complete. (For perforated pipes the area of perforations shall be a minimum of 40% of the total surface area of the pipe.)							
<b>Sub Main - 110 mm dia - OD - PE 100 PN6 pipe</b>	Rmt	1.00			690.00	453.68	313036

Feeder Main - 160 mm dia - OD- PE 100 PN6 pipe	Rmt	1.00	365.00	960.83	350701
6 Providing Geosynthetic Clay Liner on Hill side sloping or vertical side of Landfill wall with Geosynthetic clay liner comprising of uniform layer of bentonite encapsulated between nonwoven and scrim nonwoven geo textile with 7 mm thick comprising to required permeability of 10 -7 cms/sec as per MSW Rules 2000			1,269	377.77	479437
	Sub Total				10832058
	Rs. In Million				10.83
	Rate per sq.m				1,072.80
					887495
					0.89
					11.72

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## Rate Analysis for BoQ 3 : Liners for New Landfill Site at Kollam

I. no.	Description	Unit	Qty	Rate (Rs.)
1	Providing and laying Wet Clay or soil having coefficient of permeability not greater than $1 \times 10^{-7}$ cm/sec, laid in layers of 150 mm thickness, tamped and the top surface smooth finished, including cost of all materials, labour, lead and lifts, as per standard specifications, specifications of MSW Rules and as directed by the Engineer.	Cum	1	700
	<b>Bentonite</b> Volume of 1 bag of bentonite is $1 \times 0.3 \times 0.5 = 0.15$ cum No of bags for 1 cum of bentonite = $1/0.15 = 6.67$ bags Total weight of 6.67 bags of bentonite = $6.67 \times 50 = 333.33$ kg Total qty of bentonite required is 428.76 cum @ 5% of 8575 cum Total weight of bentonite is $428.76 \times 333.33 = 142920$ kg Cost of bentonite is Rs.5.5 per kg Total cost of bentonite is $5.5 \times 142920 = 786060$ Cost of bentonite for 1 cum of clay is $786060 / 8575 = 91.67$			
				91.67
				<b>Rate per cum of wet clay lining</b>
				<b>791.67</b>
2	Providing, supplying and fixing membrane (liner) of minimum of 1.5 mm thick HDPE membrane, with the lowest individual thickness not less than 90% of the specified thickness and the minimum sheet density of 0.94 g/cc measured as per ASTM D1505, yield tensile strength greater than 115 N/cm, break elongation > 250% as per IS 1969 (1985) and the carbon black content between 2-3 % with dispersion cat 1 or 2 as per ASTM D 5596. All including material cost, labour for laying, cutting, jointing, etc., complete, transportation and taxes as applicable, and installed as per the standard specifications and procedures and as directed by the Engineer in charge. Payment will be made only to the extent of area of HDPE Geomembrane in the final position. No separate payment will be made for area of lappage.	Sqm	1	199.00
	Supply of 1.5mm HDPE Geo-membrance			3.98
	Add 2% CST			17.00
	Installation charges			1.76
	Add service tax @ 10.3%			221.74
				<b>Rate per sqm</b>
				<b>221.74</b>

6.666667  
333.3333142920  
786060  
786060

8575





**Abstract of Estimate - Providing Sewerline from collection well near windrows to Leachate pit in Marthom Solid Waste Disposal Site, East Sikkim**

SI No	Description	Unit	Quantity	Rate	Amount
T	<b>NEW WORKS</b>				
A	<b>CIVIL ITEMS</b>				
1.0	Earth Work Excavation				
	Earthwork in excavation in following kind of soils in foundation trenches including dressing of all sides, watering and ramming including disposal of excavated earth with all lead and lift, disposed earth to be leveled and neatly dressed as per the direction of Engineer-in-Charge all complete. (PWD SIKKIM SR 2006, P-2, 1-4.1 & 4.2)				
1.1	In all soils mixed with boulders of 30 cms.size upto and exclusive of disintegrated rock.				
	In all soils mixed with boulders of 30 cms.size upto and exclusive of disintegrated rock.	Cum	240.00	125.05	30012
	In disintegrated rock, soft rock, soft shale and medium hard rock comprising of Lime stone, sand stone hard shale, schiest, fissured rock without resorting to blasting	Cum	73.00	220.19	16074
	Provision for hard rock excavation at any stage by chiselling	Cum	35.00	437.35	15308
2.0	Filling with available excavated earth in trenches, plinth and side of foundation in building works with layers not exceeding 20cm in depth including consolidation of each layer by ramming watering etc., all complete. (PWD SIKKIM SR 2006, P-3, I-6.2)	Cum	273.00	67.97	18556
2.1	Filling with borrowed earth in trenches, plinth and side of foundation in building works with layers not exceeding 20cm in depth including consolidation of each layer by ramming watering etc., all complete. (PWD SIKKIM SR 2006, P-3, I-6.1)	Cum	49.00	154.02	7547
3.0	Carting; Conveyance of earth, sand and gravel, including barricading, danger lighting, loading, unloading and stacking by all means with all lead and lift.	Cum	75.00	161.97	12148
5.0	Providing & Laying in position cement concrete of specified grade including compacting curing etc all complete. 1:3:6 mix.(1 cement, 2 coarse sand, 4 graded stone aggregate of 20mm nominal size) for plinth protection and flooring etc., complete. For cill (PWD SIKKIM SR 2006, P-4, I-8.1.e)	Cum	23.00	3276.1	75351
	Sub Total For Civil Works				174996
B	<b>MATERIALS</b>				
9.0	Supplying, lowering, laying, jointing, testing and commissioning of Glazed Stone Ware pipes (GSW) conforming to IS 651:1992 with latest amendements, of sizes including conveying of pipe to worksite and caulking with hemp dipped in tar and jointing with C.M. 1:1½ perfect linking and curing for 10 days, and testing with water with all lead and lift including cost of jointing materials as directed etc., complete. (contractor will make his own arrangements for procuring water for testing).				
	100 mm dia	m	237.74	228.00	54206

11.0	Providing and fixing of 100 mm dia CI soil pipe for ventilating shaft 5 metres high with specials and cowl and with suitable grips in C.C. 1:2:4 pillar using 10mm to 20mm graded hard granite/trap/basalt or any other approved metal with 15 cms thick C.C. around upto 1.22 meters above the G.L. and with a foundation base of 90x90x90 cms plastered with 12mm thick CM 1:3 to all exposed faces and linking the shaft to the manhole by means of 150 mm dia GSW pipes and specials, jointing, with tar dipped hemp 1:1½ C.M. caulking, curing, with all lead & lifts. for all materials earth work excavation and refilling in all strata, and disposal of surplus earth as directed with all lead and lifts, etc. complete. (PWD SR SIKKIM, P-42, I-25.24.c)	No	1.00	245.67	246
	Sub Total For Materials				54452
C	DETAILED ESTIMATE FOR SEWER APPURTENANCES				
12.0	Providing and constructing of RCC Precast Manhole chambers Circular in shape as directed, watering, curing, barricading, danger lighting, pouring tar over MH frame and cover, cost of tar, shoring, strutting, dewatering, engraving manhole number on the inner surface etc as per the drawing with all lead and lift, complete. (0.90 m dia - upto 1.65 m deep, 1.20 m dia - above 1.65 and upto 2.30 m deep, 1.50 m dia - above 2.30 m and upto 9.00 m deep as per CPHEEO Manual)				
12.1	Earthwork in excavation in following kind of soils in foundation trenches including dressing of all sides, watering and ramming including disposal of excavated earth with all lead and lift, disposed earth to be leveled and neatly dressed as per the direction of Engineer-in-Charge all complete. (PWD SIKKIM SR 2006, P-2, I-4.1 & 4.2)				
	In all soils mixed with boulders of 30 cms.size upto and exclusive of disintegrated rock.	Cum	60.00	125.05	7503
12.3	In disintegrated rock, soft rock, soft shale and medium hard rock comprising of Lime stone, sand stone hard shale, schiest, fissured rock without resorting to blasting	Cum	22.00	220.19	4845
	Provision for hard rock excavation at any stage by chiselling	Cum	10.00	437.35	4874
13.0	Providing & Laying in position cement concrete of specified grade including compacting curing etc all complete. 1:2:4 mix.(1 cement, 2 coarse sand, 4 graded stone aggregate of 20mm nominal size) for plinth protection and flooring etc., complete. For DPC (PWD SIKKIM SR 2006, P-4, I-8.1.c)	Cum	8.00	4013.66	32110
14.0	Providing & Laying in position cement concrete of specified grade including compacting curing etc all complete. 1:1:2 mix.(1 cement, 1 coarse sand, 2 graded stone aggregate of 20mm nominal size) for plinth protection and flooring etc., complete. For DPC (PWD SIKKIM SR 2006, P-4, I-8.1.a & P-18, I-15.1.e)	Cum	10.00	7533.15	75832



15.0	Providing, transporting, fabricating and placing in position High Yield Strength Deformed Steel Reinforcement in Reinforced Cement Concrete works including straightening, cutting, bending, hooking, lapping and/or welding wherever required, placing in position, tying with binding wire of approved quality and gauge including the cost of binding wire and anchoring to the adjoining members, wherever necessary etc., complete as per design, specifications and directions with all lead and lifts. (PWD SIKKIM SR 2006, P-27, I-19.2)	MT	1.00	53554.15	53555
16.0	Providing and laying 1.5mm thick 30 cm wide FRP wrapping including final finish of gel coat using 450 CSM fibre glass mat with all lead and lift as per direction of Engineer-in-Charge etc., complete (MR)	m	30.00	77.46	2324
17.0	Supplying and fixing SFRC frame and cover (Heavy duty) including cutting slabs to the required size or the opening and fixing the cover in C.C. 1:2:4 and C.M. 1:3 plastering 20 mm thick to all exposed faces, curing for 10 days with all lead etc. complete.	No	9.00	1620.00	14580
18.0	Providing & Laying in position cement concrete of specified grade including compacting curing etc all complete. 1:2:4 mix.(1 cement, 2 coarse sand, 4 graded stone aggregate of 20mm nominal size) for plinth protection and flooring etc., complete. For grouting (PWD SIKKIM SR 2006, P-4, I-8.1.c)	Kg	525.00	46.75	24544
19.0	Transporting the manhole unit to site from plant including lifting the manhole unit with lifting device, placing it in the transportation vehicle, lowering the unit in the trench true to line and length including installation and fixing charges with all lead and lifts and as per direction of Engineer-in-Charge etc., complete. (Analysed rate)	No	9.00	1094.00	9846
21.00	Filling with available excavated earth in trenches, plinth and side of foundation in building works with layers not exceeding 20cm in depth including consolidation of each layer by ramming watering etc., all complete. (PWD SIKKIM SR 2006, P-3, I-6.2)	Cum	45.00	67.97	3059
22.00	Carting: Conveyance of earth, sand and gravel, including barricading, danger lighting, loading, unloading and stacking by all means with all lead and lift	Cum	38.00	161.97	6155
23.00	Supplying and fixing of plastic foot steps staggered at 30cms as per drawing and specification and direction of Engineer-in-Charge with all lead and lift etc., complete (MR)	No	75.00	100.00	7500
	Sub Total For Appurtenances				245727
28.0	Inspection Chambers	No			
28.1	Earth Work for construction of chambes				
	In all soils mixed with boulders of 30 cms.size upto and exclusive of disintegrated rock.	Cum	72.00	125.05	9004
28.2	Refilling pipeline trenches and foundation with selected available earth from trench excavation and foundation including watering, consolidation in layers of 15 cms., thickness including disposing off the surplus earth with all lead and lift.	Cum	25.00	67.97	700

28.3	Carting: Conveyance of earth, sand and gravel, including barricading, danger lighting, loading, unloading and stacking by all means with all lead and lift.	Cum	24.00	161.97	5888
28.4	Supplying HDPE pipes of dia 110 mm of class PE-100, PN-6 conforming to IS 4984:1995 with latest amendments and conveying to work site including loading and unloading at both destination and rolling, lowering into trenches, laying true to line and jointing of pipes and specials using electro fusion, (including cost of specials) giving hydraulic test as per relevant ISS with all lead and lift including encasing the pipe around to a depth of not less than 15cms with soft gravel or selected earth available from the excavation, testing and commissioning. The rate is inclusive of required specials and fittings wherever necessary like saddle Tee, Stub ends, flanged sets, bends, reducers etc., complete (Contractor will make his own arrangement for procuring water for testing)	m	72.00	283.08	20382
28.5	Constructing 0.60 x 0.60 x 0.90 m or 0.60 x 0.60 x 1.50 m inspection chambers made in 115 mm thick brick masonry in CM 1:6 and plastered inside and outside with 12 mm thick CM 1:4, constructed over a 150 mm thick PCC 1:3:6 bed, laid over a sand bed of 100 mm thk.. including fixing Heavy duty SFRC Frame and cover, shuttering, labour, HOM of machinery as per drawing, curing complete as per specifications with all lead and lifts as per direction of Engineer-in-Charge etc complete				0
	Type I (0.60 x 0.60 x 0.90 m)	No	17.00	4928.42	83784
	Type II (0.60 x 0.60 x 1.50 m)	No	1.00	8615.61	8616
					127374
	TOTAL FOR COLLECTION SYSTEM (I+A+B+C+D)				602549

0.602549

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## Abstract Estimate for Lechate Treatment Plant

Sl No.	Description	Unit	No	L(m)	B(m)	D(m)	Qty	Rate (Rs.)	SR Amount (Rs.)
1	Clearing jungle including uprooting of rank vegetation. Grass, bush wood, trees and saplings of girth up to 30 cm. measured at a ht. Of about 1m above ground level and removal of rubbish up to a distance of 50m outside the periphery of the area cleared. (PWD SR SIKKIM 2006, P-1, I-2.1)	Cum	1	45	12	0.2	108	2.39	259
2	Earthwork in excavation in following kind of soils in foundation trenches including dressing of all sides, watering and ramming including disposal of excavated earth with all lead and lift, disposed earth to be leveled and neatly dressed as per the direction of Engineer-in-Charge all complete. (PWD SR SIKKIM 2006 P-2, I-4.1 & 4.2)		1	41	8.5	1.5	522.75		
	Add 10% for geometric correction						52.275		
		Cum					575.025		
	In ordinary soil	Cum					231	125.05	28867
	In disintegrated soil without blasting	Cum					288	220.19	63415
	In hard rock requiring chiselling	Cum					58	437.35	25367
3	Filling with available excavated earth in trenches, plinth side of foundation, in layers not exceeding 20cm in depth i/c consolidation of each layer by ramming, watering etc all complete. (PWD SR SIKKIM, P-3, I-6.2)		2	41	0.23	1.25	23.58		
			2	7.7	0.23	1.25	4.43		
							28.01		
		Cum					29	67.96	1971
4	Providing & laying in position specified grade of reinforced cement concrete of nominal mix excluding the cost of form work, finishing & reinforcements - 1:1.2 Mix (1cement, 1.5coarse sand 3 graded stone aggregate 20mm and down nominal gauge), including providing and fixing 20 mm thick compressible fibre board in expansion joint @ 2m interval along the breadth for leachate pit usin Sulphate resistant cement only. (PWD SR SIKKIM, P-6, I-9.1.a)								
	Base		1	41	8.1	0.25	83.03		
	Side wall defining periphery		2	41	0.35	5.5	157.85		
			2	8.1	0.35	5.5	31.19		
	Baffle wall		3	30	0.43	5.5	212.85		
	Total length of fibre board along breadth = 62.1 X 21 = 1304.1 m								
	Total concrete qty is 484.92 cum								
	Hence flexible board required per cum of concreet is 1304.1/484.92 = 2.70 : Add rate for flexible board @ Rs 128 / m for 2.70 m per cum of concrete (PWD SR 2010-11, Dwd Circle, P-211, I-31.3)								
	i.e., 128*2.70 = 345.6								
							484.92		
		Cum				Say	485	6660.33	3230261
5	Providing, fixing and removing formwork for casting RCC items as indicated below:								
	Foundation, footing, base column (PWD SR SIKKIM, P-18, I-15.2.b)	Sqm	1	98.2		0.25	25		
							25	309.78	7745
	Walls (PWD SR SIKKIM, P-18, I-15.2.c)								
	Side wall defining periphery		4	41		5.5	902		
			4	8.1		5.5	178.2		

Baffle wall		6	30	5.5	990		
					2070.2		
	Sqm				2071	356.78	738892
6 Supplying, bending and placing in position for steel reinforcement in all R.C.C works including cost of biding wires, all complete. (PWD SR SIKKIM, P-27, I-79.2) @ 120 kg/cum	Oil				582	5355.42	3116855
					<b>Sub total 1 : Total for civil works</b>		<b>7213652</b>
					<b>Add 15% for Civil and mechanical works</b>		<b>1082048</b>
					<b>Total</b>		<b>8295700</b>
					<b>In INR million</b>		<b>8.3</b>

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Sl No.	ITEM OF WORK	Unit	QTY	RATE	MR Amount (Rs.)	SR Amount (Rs.)
1	Development of Green Belt Planting of trees in 0.60m dia holes 1 m deep dug in the ground, mixing the soil with decayed farm yards / sludge manure, planting the saplings, backfilling the trench, watering, fixing the guard and maintaining the plants for one year complete as per specifications (PWD SR, Forest Department, East Sikkim)	Ha.	0.457	44290		20250
2	Monitoring well (Schedule of rate from Geology department, l.no.111 & 72 lit of diesel 46.25)	Each	1	67883		67883
				<b>Total</b>	<b>0</b>	<b>88133</b>
					<b>0</b>	<b>0.09</b>
						<b>0.09</b>

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## Abstract Estimate for Toilet Block

SI No.	Description	Unit	Qty	Rate (Rs.)	SR Amount (Rs.)
<b>A Toilet Block</b>					
1.1	Clearing jungle including uprooting of rank vegetation. Grass, bush wood, trees and saplings of girth up to 30 cm. measured at a ht. Of about 1m above ground level and removal of rubbish up to a distance of 50m outside the periphery of the area cleared. (PWDSR SIKKIM 2006, P-1, I-2.1)	Sqm	60.00	2.40	144
1.2	Earthwork in excavation in following kind of soils in foundation trenches including dressing of all sides, watering and ramming including disposal of excavated earth with all lead and lift, disposed earth to be leveled and neatly dressed as per the direction of Engineer-in-Charge all complete. (PWD SR SIKKIM 2006, P-2, I-4)	0	0.00		0
1.2.a	In ordinary soil	Cum	32.00	125.05	4002
1.2.b	In disintegrated soil without blasting	Cum	40.00	220.18	8808
1.2.c	In hard rock not requiring blasting	Cum	8.00	437.35	3499
1.3	Filling in basement from outside, in layers not exceeding 20 cm in depth with all lead and lift including cost of materials, consolidation of each layer by ramming, watering, etc., all complete. (PWD SR SIKKIM 2006, P-3, I-6.1)	Cum	10.00	154.02	1541
1.4	Sand filling in building works in layer not exceeding 20cm i/c watering, ramming etc all complete with all lead and lift. (PWD SR SIKKIM 2006, P-3, I-6.3)	Cum	9.00	401.70	3616
1.5	Providing & laying Random Rubble Stone Masonry wall with hammer dressed bond stone, through stone of size 150mm x 150mm x 450mm manufactured in 1:4:8 (1cement, 4 clean coarse sand, 8 clean hard stone aggregate of size 40 mm and down) clean hard selected stone, including centering aligning and slopes/curves etc, as per the direction of Engineer - in -Charge, all complete. (PWD SR SIKKIM, P-16, I-13.4)	Cum	9.00	721.66	6495

2	PCC / RCC	0	0.00		0
2.1	Providing & Laying in position cement concrete of specified grade including compacting curing etc all complete. 1:4:8 mix. (1 cement, 4 coarse sand, 8 stone aggregate of 40mm nominal size) for foundation base PWD SR SIKKIM 2006, P-4, I-8.1.g)	Cum	11.00	2558.73	28147
2.2	Providing & Laying in position cement concrete of specified grade including compacting curing etc all complete. 1:2:4 mix.(1 cement, 2 coarse sand, 4 graded stone aggregate of 20mm nominal size) for plinth protection and flooring etc., complete. PWD SR SIKKIM 2006, P-4, I-8.1.c)	Cum	7.00	4013.66	28096
2.3	Providing & laying in position specified grade of reinforced cement concrete of nominal mix excluding the cost of form work, finishing & reinforcements - 1:1.5:3 Mix (1cement, 1.5coarse sand 3 graded stone aggregate 20mm and down nominal gauge) for footing, plinth beam, column, lintel, roof beam and chejja etc., complete. PWD SR SIKKIM 2006, P-6, I-9.1.b)	Cum	25.00	4596.23	114906
2.4	Providing, fixing and removing formwork for casting RCC items as indicated below: PWD SR SIKKIM 2006, P-18)	0	0.00		0
2.4.a	Foundation, footing, base column (I-15.2.b)	Sqm	36.00	309.78	1153
2.4.b	Columns above plint level (I-15.2.f)	Sqm	17.00	406.76	6915
2.4.c	Beams : Plinth beam, lintel beam and roof beam (I-15.2.a)	Sqm	81.00	300.40	24333
2.4.d	Chejja through out (I-15.2.d)	Sqm	15.00	437.65	6565
2.4.e	Slab (I-15.2.d)	Sqm	31.00	437.65	3568
3	Steel				
3.1	Supplying, bending and placing in position for steel reinforcement in all R.C.C works including cost of biding wires, all complete. (PWD SR SIKKIM, P-27, I-19.2)	Qtl	30.00	5355.42	160663
4	Filling with available excavated earth in trenches, plinth side of foundation, in layers not exceeding 20cm in depth i/c consolidation of each layer by ramming, watering etc all complete. (PWD SR SIKKIM, P-3, I-6.2)	Cum	50.00	67.97	3399
5	BBM	0	0.00		0
5.1	Providing and laying first class brick work in one and half brick thick in superstructure of standard size bricks with 1:5 cement mortar (1cement and 5 clean coarse sand) as per the direction of Engineer in Charge including carriage of bricks up to work site. (PWD SR SIKKIM, P-8, I-11.3)	Cum	13.00	4791.28	62287
5.2	Providing and laying first class brick work in half brick thick in superstructure of standard size bricks with 1:4 cement mortar (1 cement and 4 course sand) including carriage of bricks up to work site, curing etc all complete. (PWD SR SIKKIM, P-8, I-11.1)	Sqm	25.00	557.57	13940

6	Plastering and painting	0	0.00		0
6.1	Providing and laying 12mm thick cement plaster in CM 1:6 of specified mix in single coat including finishing even and smooth and curing complete for internal plastering (PWD SR SIKKIM, 2006, P-6, I-10.1.d)	Sqm	171.00	77.07	13179
6.2	Providing and laying 20mm thick cement plaster in CM 1:4 of specified mix in single coat including finishing even and smooth and curing complete for external plastering (PWD SR SIKKIM, 2006, P-7, I-10.3.b)	Sqm	78.00	147.26	11487
6.3	Providing and painting with plastic emulsion paints two or more coats including primer coat brushing the surface clean of all dirt dust and smoothed by sand paper etc., complete. (PWD SR SIKKIM 2006, P-32 & 36 - I 23.1.a & 23.8.j)	Sqm	78.00	84.57	6597
6.4	Providing and distempering with oil bound washable acrylic distemper two or more coats of approved brand or manufacture over a coat of cement primer to give an even shade on new surface including preparation of surface etc., complete for internal wall (PWD SR SIKKIM 2006, P-35, I-23.8.d)	Sqm	171.00	40.63	6948
7	Flooring and daddooing	0	0.00		0
7.1	Providing and laying white glazed ceramic tiles of size 300 mm X 300 mm on floors etc., laid on a bed of 15 mm, CM 1:3 finished with flush pointing with white cement slurry etc., complete. (PWD SR SIKKIM, 2006, P-14, I-12.35)	Sqm	31.00	762.7	23644
7.2	Providing and laying white coloured ceramic glazed tiles of size 200 mm X 300 mm luster printed for daddooing on 12 mm thick cement plaster 1:3 bare and jointed with white cement slurry etc., complete. (PWD SR SIKKIM 2006, P-14, I-12.33)	Sqm	50.00	935.08	46754
8	Doors and ventilators	0	0.00		0
8.1	Providing, fitting and fixing 35 mm thick water proof flush door shutters, solid block hard core construction with frame of 1st class hard timber with well matched 3mm teak ply decorative type on one faces of the shutters including hinges with screw complete. (PWD SR SIKKIM 2006, P-22, I-17.4.a)	Sqm	14.00	2815.93	39424
8.2	Providing, fitting and fixing aluminium handles 100 mm size with necessary screws etc., complete (PWD SR SIKKIM, P-25, I-18.11.a)	Each	8.00	40.59	325
8.3	Providing and fixing brass mortise lock with dead bolt and a pair of leve handles for WC bath room with necessary screws etc., complete. (PWD SR SIKKIM 2006, P-26, I-18.15.a)	Each	2.00	1354.41	2709
8.4	Providing, fitting, and fixing steel windows and ventilators of standard rolled steel section joints metered and welded with iron lugs embedded in cement concrete 1:3:6 including providing fitting and fixing 3 mm thick glass pens with glazing clips and special metal putty complete with MS girls @ 150 mm c/c as per the direction of Engineer etc., complete. (PWD SR SIKKIM 2006, P-30, I-21.3)	Kgs	21.00	79.25	1665



9	Plumbing and sanitary work	0	0.00		0
9.1	Earthwork in excavation in all kind of soils in foundation trenches including dressing of all sides, watering and ramming including disposal of excavated earth with all lead and lift, disposed earth to be leveled and neatly dressed as per the direction of Engineer-in-Charge all complete. (PWD SR SIKKIM 2006, P-2, I-4.1)	Cum	50.00	125.05	6253
9.2	Providing, fitting and fixing white vitreous china water closet (W.C) squatting pan (Indian type) 530 mm size with 100 mm SCI (sand cast iron) P or S trap, 10 ltr low level flushing cistern with fittings, CI brackets, 32 mm flush pipe with fittings and clamps, 20 mm over flow pipe, cutting and making good the wall and floor etc., complete. Long type or Orissa type pan. Hindware CAT NO 20004 (PWD SR SIKKIM 2006, P-39, I-25.1)	Each	2.00	3795.32	7591
9.3	Providing, fitting and fixing white vitreous china flat back or wall corner type lipped front urinal basin of size 440X315X325 mm with 5 ltr automatic flushing cistern with CI brackets, GI flush pipe and spreaders with brass unions and GI clamps including cutting and making good the walls and floors as required all complete range of 1 urinal basin. (PWD SR SIKKIM 2006, P-40, I-25.9.a)	Each	1.00	4532.82	4533
9.4	Providing fitting and fixing white vitreous white china wash flat back wash basin of size 63 cm X 45 cm, one pillar cock) with CI brackets, painted, 15 mm CP brass pillar taps, CP brass chain with rubber plug, 32 mm CP brass waste pipe, lead or PVC connection 32 mm dia CP brass cap and unions, complete including cutting and making good the walls wherever required HINDWARE (PWD SR SIKKIM 2006, P-41, I-25.11.a.i)	Each	2.00	3173.77	6348
9.5	Providing fitting and fixing bib cock of 15 mm dia of approved quality etc., complete. (PWD SR SIKKIM 2006, P-38, I-24.9.a)	Each	6.00	417.58	2506
9.6	Inspection chamber with CI heavy cover with locking arrangement, (weight not less than 25 kg) (size of chamber 450mm X 600 mm inside upto 900 mm depth) 250 mm thick cement brick walls (1:6) for inside wall and 15 mm thick cement plaster (1:4) for outer walls including rounding corners. (WB SR 2010, P-8, I-10)	Each	4.00	7576	30304
9.7	Providing fitting and fixing of towel rail of chromium plated brass complete with brackets fixed to the timber cleats, CP brass screw complete 600 mm X 20 mm etc., complete. (PWD SR SIKKIM 2006, P-42, I-25.22.b)	Each	2.00	1123.97	2248
9.8	Providing fitting and fixing soil, waste and vent pipes including testing etc., complete 100 mm dia HCl soil pipe (PWD SR SIKKIM 2006, P-42, I-25.24.a)	Rmtr	50.00	553.04	27652
9.9	Providing, fitting and fixing GI pipe of medium class, trenching in size 45 cm wide 50 cm depth, refilling and compacting with available earth after laying of pipes including cost of fitting etc., complete. (PWD SR SIKKIM 2006, P-37, I-24.4 b & c: add 10% additional for fitting)	0	0.00		0
	65 mm GI pipe	Rmtr	25.00	844.83	2121
	50 mm GI pipe	Rmtr	15.00	695.11	10427
	40 mm GI pipe	Rmtr	15.00	508.76	7632

9.10	Providing, fitting and fixing GI pipe of medium class complete including cuttings and making good the walls etc., on concealed fittings including providing and painting with anticorrosive bituminous paint all complete for internal works including cost of fittings etc., complete. (PWD SR SIKKIM 2006, P-36, I-24.2: Add 10% for fittings)	Rmtr	15.00	253.13	3797
9.11	Providing fitting and fixing of chromium plated soap dish with necessary screw etc., complete. (PWD SR SIKKIM 2006, P-42, I-25.21)	Each	2.00	409.5	819
10	Septic Tank	0	0.00		0
10.1	Earthwork in excavation in all kind of soils in foundation trenches including dressing of all sides, watering and ramming including disposal of excavated earth with all lead and lift, disposed earth to be leveled and neatly dressed as per the direction of Engineer-in-Charge all complete. (PWD SR SIKKIM 2006, P-2, I-4.1)	Cum	10.00	125.05	1251
10.2	Filling with available excavated earth in trenches, plinth side of foundation, in layers not exceeding 20cm in depth i/c consolidation of each layer by ramming, watering etc all complete. (PWD SR SIKKIM 2006, P-3, I-6.2)	Cum	2.00	67.97	136
10.3	Providing and laying brick soling for septic tank including hand packing, labour, material with all lead and lift etc., complete. (PWD SR SIKKIM 2006, P-8, I-11.1: deduct cost of CM)	Sqm	5.00	457.39	2287
10.4	Providing and laying in position cement concrete of specified grade including compacting curing etc., complete 1:3:6 mix, (1 cement, 3 coarse sand, 6 stone aggregate of 40 mm and down size) (PWD SR SIKKIM 2006, P-4, I-8.1.f)	Cum	1.00	2984.78	2985
10.5	Providing and laying in position cement concrete of specified grade including compacting curing etc., complete 1:2:4 mix, (1 cement, 2 coarse sand, 4 stone aggregate of 20 mm and down size) (PWD SR SIKKIM 2006, P-4, I-8.1.c)	Cum	1.00	4013.66	4014
10.6	Providing & laying in position specified grade of reinforced cement concrete of nominal mix excluding the cost of form work, finishing & reinforcements - 1:1.5:3 Mix (1cement, 1.5coarse sand 3 graded stone aggregate 20mm and down nominal gauge) etc., complete. (PWD SR SIKKIM 2006, P-6, I-9.1.b)	Cum	1.00	4596.23	4597
10.7	Supplying, bending and placing in position for steel reinforcement in all R.C.C works including cost of biding wires, all complete. (PWD SR SIKKIM, P-27, I-19.2)	Qtl	1.00	5355.42	5356
10.8	Providing and laying first class brick work in one and half brick thick in superstructure of standard size bricks with 1:5 cement mortar (1cement and 5 clean coarse sand) as per the direction of Engineer in Charge including carriage of bricks up to work site. (PWD SR SIKKIM 2006, P-8, I-11.2)	Cum	4.00	4791.28	19166

10.9	Providing and laying first class brick work in half brick thick in superstructure of standard size bricks with 1:4 cement mortar (1 cement and 4 course sand) including carriage of bricks up to work site, curing etc all complete. (PWD SR SIKKIM, P-8, I-11.1)	Sqm	3.00	557.57	1673
10.10	Providing and laying 12mm thick cement plaster in CM 1:6 of specified mix in single coat including finishing even and smooth and curing complete for internal plastering (PWD SR SIKKIM 2006, P-6, I-10.1.d)	Sqm	20.00	77.07	1542
		0		Total	829047

Rs. In million

0.83

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## Abstract Estimate for Security Guard Cabin

Sl No.	Description	Unit	Qty	Rate (Rs.)	MR Amount (Rs.)	SR Amount (Rs.)
1.1	Clearing jungle including uprooting of rank vegetation, Grass, bush wood, trees and saplings of girth up to 30 cm. measured at a ht. Of about 1m above ground level and removal of rubbish up to a distance of 50m outside the periphery of the area cleared. (PWDSR SIKKIM 2006, P-1, I-2.1)	Sqm	80.00	2.40		192
1.2	Earthwork in excavation in following kind of soils in foundation trenches including dressing of all sides, watering and ramming including disposal of excavated earth with all lead and lift, disposed earth to be leveled and neatly dressed as per the direction of Engineer-in-Charge all complete. (PWD SR SIKKIM 2006, P-2, I-4)					
1.2.a	In ordinary soil	Cum	13.00	125.05		1626
1.2.b	In disintegrated soil without blasting	Cum	16.00	220.18		3523
1.2.c	In hard rock not requiring blasting	Cum	4.00	437.35		1750
1.3	Providing & laying Random Rubble Stone Masonry wall with hammer dressed bond stone, through stone of size 150mm x 150mm x 450mm manufactured in 1:4:8 (1cement, 4 clean coarse sand, 8 clean hard stone aggregate of size 40 mm and down) clean hard selected stone, including centering aligning and slopes/curves etc, as per the direction of Engineer - in -Charge, all complete. (PWD SR SIKKIM, P-16, I-13.4)	Cum	10.00	721.66		7217
1.4	Sand filling in building works in layer not exceeding 20cum i/c watering, ramming etc all complete with all lead and lift. (PWD SR SIKKIM 2006, P-3, I-6.3)	Cum	7.00	401.70		2812
2	PCC / RCC					
2.1	Providing & Laying in position cement concrete of specified grade including compacting curing etc all complete. 1:4:8 mix. (1 cement, 4 coarse sand, 8 stone aggregate of 40mm nominal size) for foundation base PWD SR SIKKIM 2006, P-4, I-8.1.g)	Cum	3.00	2558.73		7677
2.2	Providing & Laying in position cement concrete of specified grade including compacting curing etc all complete. 1:2:4 mix.(1 cement, 2 coarse sand, 4 graded stone aggregate of 20mm nominal size) for plinth protection and flooring etc., complete. PWD SR SIKKIM 2006, P-4, I-8.1.c)	Cum	5.00	4013.66		20069
2.3	Providing & laying in position specified grade of reinforced cement concrete of nominal mix excluding the cost of form work, finishing & reinforcements - 1:1.5:3 Mix (1cement, 1.5coarse sand 3 graded stone aggregate 20mm and down nominal gauge) for footing, plinth beam, column, lintel, roof beam and chejja etc., complete. PWD SR SIKKIM 2006, P-6, I-9.1.b)	Cum	11.00	4596.23		50569
2.4	Providing, fixing and removing formwork for casting RCC items as indicated below: PWD SR SIKKIM 2006, P-18)					

2.4.a	Foundation, footing, base column (I-15.2.b)	Sqm	17.00	309.78	5267
2.4.b	Columns above plint level (I-15.2.f)	Sqm	17.00	406.76	6915
2.4.c	Beams : Plinth beam, lintel beam and roof beam (I-15.2.a)	Sqm	65.00	300.40	19525
2.4.d	Chejja through out (I-15.2.d)	Sqm	9.00	437.65	3939
3	Steel				
3.1	Supplying, bending and placing in position tor steel reinforcement in all R.C.C works including cost of biding wires, all complete. (PWD SR SIKKIM, P-27, I-19.2)	Qtl	13.00	5355.42	69621
3.2	Supplying, fabricating, fitting and fixing steel tubular trusses including cutting, hoisting, fixing in position and applying a priming coat of approved steel primer, welded and bolted including special shape washer etc., as per the standard specification and design and direction of Engineer etc., complete. (PWD SR SIKKIM, P-30, I-21.1)	Kgs	281.00	60.92	17119
4	Filling with available excavated earth in trenches, plinth side of foundation, in layers not exceeding 20cm in depth i/c consolidation of each layer by ramming, watering etc all complete. (PWD SR SIKKIM 2006, P-3, I-6.2)	Cum	2.00	67.97	136
5	BBM				
5.1	Providing and laying first class brick work in one and half brick thick in superstructure of standard size bricks with 1:5 cement mortar (1cement and 5 clean coarse sand) as per the direction of Engineer in Charge including carriage of bricks up to work site. (PWD SR SIKKIM, P-8, I-11.3)	Cum	9.00	4791.28	43122
5.2	Providing and laying first class brick work in half brick thick in superstructure of standard size bricks with 1:4 cement mortar (1 cement and 4 course sand) including carriage of bricks up to work site, curing etc all complete. (PWD SR SIKKIM, P-8, I-11.1)	Sqm	7.00	557.57	3903
6	Plastering and painting				
6.1	Providing and laying 12mm thick cement plaster in CM 1:6 of specified mix in single coat including finishing even and smooth and curing complete for internal plastering (PWD SR SIKKIM, 2006, P-6, I-10.1.d)	Sqm	86.00	77.07	6629
6.2	Providing and laying 20mm thick cement plaster in CM 1:4 of specified mix in single coat including finishing even and smooth and curing complete for external plastering (PWD SR SIKKIM, 2006, P-7, I-10.3 b)	Sqm	86.00	147.26	12665
6.3	Providing and distempering with oil bound washable acrylic distemper two or more coats of approved brand or manufacture over a coat of cement primer to give an even shade on new surface including preparation of surface etc., complete for internal wall (PWD SR SIKKIM 2006, P-35, I-23.8.d)	Sqm	86.00	40.63	3495
6.4	Providing and painting with plastic emulsion paints two or more coats including primer coat brushing the surface clean of all dirt dust and smoothed by sand paper etc., complete. (PWD SR SIKKIM 2006, P-32 & 36 - I 23.1.a & 23.8.j)	Sqm	86.00	84.57	7274
7	Flooring				

7.1	Providing and laying 40 mm thick red oxide flooring with Recorn 35 polyester fiber (anti seepage / cracking) under layer 30 mm thick CC 1:2:4 and top layer of 10 mm thick plaster of red oxide and cement mix cement mortar 1:3 finished with a neat similar cement red oxide mix including cement slurry, rounding of edges and junctions, strips and curing etc., all complete. (PWD SR 2006 SIKKIM, P-15, I-12.38)	Sqm	17.00	400.11	6802
7.2	Providing and laying white glazed ceramic tiles of size 300 mm X 300 mm on floors etc., laid on a bed of 15 mm, CM 1:3 finished with flush pointing with white cement slurry etc., complete. (PWD SR 2006 SIKKIM, P-14, I-12.35)	Sqm	6.00	762.7	4577
7.3	Providing and laying white coloured ceramic glazed tiles of size 200 mm X 300 mm luster printed for daddooing on 12 mm thick cement plaster 1:3 bare and jointed with white cement slurry etc., complete. (PWD SR 2006 SIKKIM, P-14, I-12.33)	Sqm	30.00	935.08	28053
<b>8 Doors and ventilators</b>					
<b>8.1 Doors</b>					
8.1.a	Providing, fitting and fixing of dressed sal timber in all types of frames of complete (PWD SR 2006 SIKKIM, P-19, I-16.4.b)	Cum	0.05	33342.08	1668
8.1.b	Providing, fitting and fixing 38 mm flooring in sal timber over a frame of sal timber including the cost of polishing and including cost of one coat priming on the base frame complete with locally available timber (PWD SR 2006 SIKKIM, P-20, I-16.6.b)	Sqm	3.00	2037.29	6112
8.1.c	Providing, fitting and fixing 35 mm thick water proof flush door shutters, solid block hard core construction with frame of 1st class hard timber with well matched 3mm teak ply decorative type on one faces of the shutters including hinges with screw complete. (PWD SR 2006 SIKKIM, P-22, I-17.4.a)	Sqm	4.00	2815.93	11264
8.2	Providing, fitting, and fixing steel windows and ventilators of standard rolled steel section joints metered and welded with iron lugs embedded in cement concrete 1:3:6 including providing fitting and fixing 3 mm thick glass panes with glazing clips and special metal putty complete with MS girds @ 150 mm c/c as per the direction of Engineer etc., complete. (PWD SR 2006 SIKKIM, P-30, I-21.3)	Kgs	170.00	79.25	13473
8.3	Providing and fixing 100 mm mortise lock with 6 levers and pair of handles with necessary screw etc., complete. (PWD SR 2006 SIKKIM, P-26, I-18.14.a)	Each	1.00	1354.41	1355
<b>9 Plumbing and sanitary work</b>					
9.1	Earthwork in excavation in all kind of soils in foundation trenches including dressing of all sides, watering and ramming including disposal of excavated earth with all lead and lift, disposed earth to be leveled and neatly dressed as per the direction of Engineer-in-Charge all complete. (PWD SR 2006 SIKKIM, P-2, I-4.1)	Cum	38.00	125.05	4752

9.2	Providing, fitting and fixing white vitreous china water closet (W.C) squatting pan (Indian type) 530 mm size with 100 mm SCI (sand cast iron) P or S trap, 10 ltr low level flushing cistern with fittings, CI brackets, 32 mm flush pipe with fittings and clamps, 20 mm over flow pipe, cutting and making good the wall and floor etc., complete. Long type or Orissa type pan. Hindware CAT NO 20004 (PWD SR SIKKIM 2006, P-39, I-25.1)	Each	1.00	3795.32	3796
9.5	Providing fitting and fixing bib cock of 15 mm dia of approved quality etc., complete. (PWD SR 2006 SIKKIM, P-38, I-24.9.a)	Each	1.00	417.58	418
9.6	Inspection chamber with CI heavy cover with locking arrangement, (weight not less than 25 kg) (size of chamber 450mm X 600 mm inside upto 900 mm depth) 250 mm thick cement brick walls (1:6) for inside wall and 15 mm thick cement plaster (1:4) for outer walls including rounding corners. (WB SR 2010, P-8, I-10)	Each	1.00	7576	7576
9.7	Providing fitting and fixing of towel rail of chromium plated brass complete with brackets fixed to the timber cleats, CP brass screw complete 600 mm X 20 mm etc., complete. (PWD SR 2006 SIKKIM, P-42, I-25.22.b)	Each	1.00	1123.97	1124
9.8	Providing, fitting and fixing beveled gauge mirror of superior glass with 6mm AC sheets ground and fixed to timber cleats with CP screws, washer etc., complete. (PWD SR 2006 SIKKIM, P-42, I-25.18)	Each	1.00	1155.95	1156
9.9	Providing fitting and fixing soil, waste and vent pipes including testing etc., complete 100 mm dia HCl soil pipe (PWD SR 2006 SIKKIM, P-42, I-25.24.a)	Rmtr	50.00	553.04	27652
9.10	Providing, fitting and fixing GI pipe of medium class, trenching in size 45 cm wide 50 cm depth, refilling and compacting with available earth after laying of pipes including cost of fitting etc., complete. (PWD SR 2006 SIKKIM, P-37, I-24.4 b & c: add 10% additional for fitting)				
	65 mm GI pipe	Rmtr	25.00	844.83	21121
	50 mm GI pipe	Rmtr	15.00	695.11	10427
	40 mm GI pipe	Rmtr	10.00	508.76	5088

9.11	Providing, fitting and fixing GI pipe of medium class complete including cuttings and making good the walls etc., on concealed fittings including providing and painting with anticorrosive bituminous paint all complete for internal works including cost of fittings etc., complete. (PWD SR 2006 SIKKIM, P-36, I-24.2: Add 10% for fittings)	Rmtr	10.00	253.13	2532
9.12	Providing fitting and fixing of chromium plated soap dish with necessary screw etc., complete. (PWD SR 2006 SIKKIM, P-42, I-25.21)	Each	1.00	409.5	410
<b>Total</b>					<b>454392</b>
<b>INR Million</b>					<b>0.45</b>

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Sl. No.	Description	Unit	No.	L(m)	B(m)	D(m)	Qty	Rate (Rs.)	SR Amount (Rs.)
1	Earthwork in excavation in following kind of soils in foundation trenches including dressing of all sides, watering and ramming including disposal of excavated earth with all lead and lift, disposed earth to be leveled and neatly dressed as per the direction of Engineer-in-Charge all complete. (PWD SR SIKKIM 2006, P-2, I-4)								
	Excavation for foundation for chain link fencing		420	0.50	0.50	0.50	52.50		
	Excavation for gate pillar		2	2.20	2.20	1.50	14.52		
	Add 10% MISC						6.70		
							73.72		
	<b>1a In all soil</b>	Cum					30.00	125.05	3752.00
	<b>1b In disintegrated rock</b>	Cum					37.00	220.19	8148.00
	<b>1c In hard rock by chiselling</b>	Cum					8.00	437.35	3499.00
2	Filling with available excavated earth in trenches, plinth side of foundation, in layers not exceeding 20cm in depth i/c consolidation of each layer by ramming, watering etc all complete. (PWD SR SIKKIM 2006, P-3, I-5,2)								
	Total excavation						73.72		
	PCC 1:4:8 for chain link fencing foundation						-52.50		
	PCC 1:4:8 for gate pillar						-0.97		
	Footing						-3.07		
	Pillar below GL		2	0.23	0.23	0.85	-0.09		
							17.09		
		Cum					18.00	67.96	1224.00
3	Providing & Laying in position cement concrete of specified grade including compacting curing etc all complete. 1:4:8 mix: (1 cement, 4 coarse sand, 8 stone aggregate of 40mm nominal size) for foundation base PWD SR SIKKIM 2006, P-4, I-8,1.g)								
	Foundation for chain link fencing		420	0.50	0.50	0.50	52.50		
	For gate pillar		2	2.20	2.20	0.10	0.97		
							53.47		
		Cum					54.00	2558.73	138172.00
4	Providing & Laying in position cement concrete of specified grade including compacting curing etc all complete. 1:3:6 mix:(1 cement, 2 coarse sand, 4 graded stone aggregate of 20mm nominal size) for plinth protection and flooring etc., complete. PWD SR SIKKIM 2006, P-4, I-8,1.e)								
			2	0.23	0.23	0.08	0.01		

5	Providing & laying in position specified grade of reinforced cement concrete of nominal mix excluding the cost of form work, finishing & reinforcements - 1:1.5:3 Mix (1 cement, 1.5 coarse sand 3 graded stone aggregate 20mm and down nominal gauge) for footing, column etc. complete. (PWD SR SIKKIM 2006, P-6, I-9.1.b)	Cum					1.00	3276.10	3277.00
	Gate pillar footing		2	2.00	2.00	0.30	2.40		
			2	1.15	1.15	0.25	0.67		
	Column		2	0.23	0.23	3.85	0.41		
							3.48		
		Cum					4.00	4596.23	18385.00
6	Providing, fixing and removing formwork for casting RCC items as indicated below:								
6.a	Foundation, footing, base column (I-15.2.b)		2	8.00		0.30	4.80		
			2	4.60		0.25	2.30		
			2	0.92		0.85	1.57		
		Cum					8.67		
		Cum	2	0.23	0.23	3.00	0.32	309.78	2789.00
	6.b Columns above plint level (I-15.2.f)						1.00	406.76	407.00
7	Supplying, bending and placing in position for steel reinforcement in all R.C.C works including cost of binding wires, all complete. (PWD SR SIKKIM, P-27, I-19.2)	Ch					12.00	5355.42	64266.00
8	Providing and laying 12mm thick cement plaster in CM-1.6 of specified mix in single coat including finishing even and smooth and curing complete for external plastering (PWD SR SIKKIM, 2006, P-6, I-10.1.d)	Sqm	2	0.92		3.00	5.52	77.06	463.00
9	Providing and painting with plastic emulsion paints two or more coats including primer coat brushing the surface clean of all dirt dust and smoothed by sand paper etc. complete. (PWDSR SIKKIM 2006, P-32 & 36 - I.23.1.a & 23.8.ii)	Sqm					6.00	74.59	448.00
10	Supplying, fitting, fixing, chain link fencing of approved quality with RCC posts or iron posts by means of galvanized "C" clips to grid of horizontal strands of galvanized high tensile spring steel wire of 12 SWG which have to be tensioned and fixed to the vertical posts by means of galvanized special clips, bolts and nuts etc. (The rate inclusive of the cost of posts) (WBSR 2010, P-387, I-21.iii)	Sqm	1	1050.00		2.00	2100.00	342.08	718368.00

11	Providing and fixing in position, welded tubular-framed hinged steel gate with grill work of mild steel bars & flats, as per design, drawings, specifications and directions of the Engineer with necessary ball-bearings, hinges, locking arrangements, holdfasts, the same being properly embedded in concrete, curing, etc., with two coats of synthetic enamel paint of approved shade, colour and quality over one coat metal primer including the cost of all material, labour, conveyance & carriage, lead and lifts (including cost of concrete / masonry) (WB SR 2010, P-153 [8]; consider 40kg/cum)	Kgs	1	3.00	40.00	3.00	360.00	57.50	20700.00
								Total	983898.00

SI No.	Description	Unit	No	L(m)	B (m)	D (m)	Qty	Rate (Rs.)	Amount (Rs.)
Compound wall estimation for SWM Gangjok									
1	Earthwork in excavation in following kind of soils in foundation trenches including dressing of all sides, watering and ramming including disposal of excavated earth with all lead and lift, disposed earth to be leveled and neatly dressed as per the direction of Engineer-In-Charge all complete. (PWD SR SIKKIM 2006, P-2, 1-4)								
	For columns		47.00	0.5	0.5	0.6	7.05		
	For compound wall		1.00	116.5	0.65	0.55	41.65		
	Add 10% geometric correction						4.87		
							53.57		
		Cum					27	125.05	3377
1.a	In ordinary soil	Cum					17	220.18	3744
1.b	In disintegrated soil without blasting	Cum					11	437.35	4811
1.c	In hard rock not requiring blasting	Cum							
2	Providing & laying in position cement concrete of specified grade including compacting curing etc all complete. 1:4:8 mix. (1 cement, 4 coarse sand, 8 stone aggregate of 40mm nominal size) for foundation base PWD SR SIKKIM 2006, P-4, 1-8, 1.g)								
	For columns		47.00	0.5	0.5	0.1	1.18		
	For compound wall		1.00	116.5	0.65	0.1	7.58		
		Cum					9	2558.73	23029
3	Providing & laying Random Rubble Stone Masonry wall with hammer dressed bond stone, through stone of size 150mm x 150mm x 450mm manufactured in 1:4:8 (1cement, 4 clean coarse sand, 8 clean hard stone aggregate of size 40 mm and down) clean hard selected stone, including centering aligning and slopes/curves etc, as per the direction of Engineer-In-Charge, all complete. (PWD SR SIKKIM, P-16, 1-13, 4)								
		Cum	1.00	129.19	0.65	0.1	8.4		
							9	721.66	6495



7	Providing and laying 20mm thick cement plaster in CM 1:4 of specified mix in single coat including finishing even and smooth and curing complete for external plastering (PWD SR SIKKIM, 2006, P-7, 1-10.3.b)	Sqm	1	140		4.23	593	147.26	87326
8	Providing and laying in position cement concrete of specified grade including compacting curing etc., complete 1:3:6 mix, (1 cement, 3 coarse sand, 6 stone aggregate of 40 mm and down size) for coping (PWD SR SIKKIM 2006, P-4, 1-8.1.f)	Cum	1	140	0.23	0.08	3	2984.78	8955
								Total	427806
									1411704.00
									1.411

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Estimate for Construction of Storm Water Drain in SWM Site at Martam, East

SI No	Description	Unit	Quantity	Rate (Rs.)	MR Amount (Rs.)	SR Amount (Rs.)
	1 Earthwork in excavation in all kinds of soils in foundation trenches including dressing of all sides, watering and ramming including disposal of excavated earth up to 30m lead and fill up to 1.5m, disposed earth to be levelled and neatly dressed as per the (PWD SR SIKKIM 2006, P-2, I-4)	cum	277	125.05		34639
	2 Providing and Laying in position cement concrete of specified grade including compacting curing etc all complete.					
	a 1:4:8 mix (1 cement, 4 coarse sand, 8 stone aggregate of 40mm & down size)					
	b 1:1.5:3 Mix (1 Cement, 1.5 coarse sand, 3 graded stone aggregate 20mm and down nominal gauge.)					
	3 Providing and laying in position specified grade of reinforced cement concrete excluding the cost of form work, finishing and reinforcements.					
	4 Filling with available excavated earth in trenches, plinth and side of foundation in building works with layers not exceeding 20cm in depth including consolidation of each layer by ramming, watering etc, all complete. (PWD SIKKIM SR 2006, P-3, I-6.2)	cum	28	67.96		1903
	5 Supplying, bending and placing in position for steel reinforcement in all R.C.C works including cost of biding wires, all complete. (PWD SR SIKKIM, P-27, I-19.2)	cum	9	5355.42		48199
	<b>Total</b>					<b>519537</b>
						<b>0.52</b>

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4	Providing & Laying in position cement concrete of specified grade including compacting curing etc all complete. 1:3:6 mix.(1 cement, 3 coarse sand, 6 graded stone aggregate of 20mm nominal size) for plinth protection and flooring etc., complete. For cill (PWD SIKKIM SR 2006, P-4, I-8.1.e)	Cum	1	42	0.23	0.08	0.8	3276.1	3277
5	Providing & Laying in position cement concrete of specified grade including compacting curing etc all complete. 1:2:4 mix.(1 cement, 2 coarse sand, 4 graded stone aggregate of 20mm nominal size) for plinth protection and flooring etc., complete. For DPC (PWD SIKKIM SR 2006, P-4, I-8.1.c)	Cum	1	42	0.23	0.1	1.0	4013.66	4014
6	Beam and lintel	Cum	1	46	0.23	0.18	1.9	4596.23	18385
6.1	Providing & Laying in position cement concrete of specified grade including compacting curing etc all complete. 1:1½:3 mix.(1 cement, 1½ coarse sand, 3 graded stone aggregate of 20mm nominal size) etc., complete. (PWD SIKKIM SR 2006, P-6, I-9.1.b)	Cum	1	46	0.23	0.15	1.6		
	Beams		1	46	0.23	0.15	3.5		
	Lintels		1	46	0.53		27.1		
6.2	Providing, fixing and removing form work for casting RCC items with locally available timber for beams (PWD SR SIKKIM 2006, P-18, I-15.2.a)	Cum	1	46	0.59		24.4		
			1	46	0.53		51.5		
							52.0	300.4	15621
7.0	Roof slab	Sqm							
7.1	Providing & Laying in position cement concrete of specified grade including compacting curing etc all complete. 1:1½:3 mix.(1 cement, 1½ coarse sand, 3 graded stone aggregate of 20mm nominal size) for roof slab etc., complete. (PWD SIKKIM SR 2006, P-6, I-9.1.b)		1	6.69	3.46	0.13	3.0		
	Above office and change room		1	10.73	3.46	0.13	4.8		
	Above store and toilet		1						









13.1	Providing and laying 40 mm thick red oxide flooring with recon 3S polyester fiber (anti seepage / cracking) under layer 30mm thick CC 1:2:4 and top layer of 10mm thick plaster of red oxide and cement mix cement mortar 1:3 finished with a floating coat of neat similar cement and red oxide mix including cement slurry, rounding of edges and junctions, strips and curing etc., all etc., complete. (PWD SIKKIM SR 2006, P-15, I-12.38)								
	Store room	1	3	3		9.00			
	Office	1	3	3		9.00			
	Change room	1	3	3		9.00			
	Lobby	1	3.77	1.5		5.66			
	Skirting								
	Store room	1	12			1.80			
	Office	1	12			1.80			
	Change room	1	12			1.80			
	Lobby	1	10.54			1.59			
	Steps	3	2	0.3		1.80			
		1	3.8			0.57			
		1	3.2			0.48			
		1	2.6			0.39			
						42.9			
						43.0			
						400.11			17205
13.2	Providing and laying Chequers tiles in on flooring over 12 mm thick cement plaster (1 cement : 3 Coarse sand) 1:3 bare and jointed with white cement slurry (PWD SIKKIM SR 2006, P-14, I-12.32)								
	Toilet	1	3	3		9.00			
						9.0			
13.3	Providing and laying white or coloured or ceramic glazed tiles of size 200 mm X 300 mm in luster printed for skirting rises of steps and dados on 12mm thick cement plaster in cement mortar 1:3 bare and jointed with white cement slurry (PWD SIKKIM SR 2006, P-14, I-12.33)								
	Toilet block	1	12.00			2.1			
	WC	1	3.30			6.93			
	Bath	1	3.90			8.19			
	External walls of bath and WC	1	2.75			5.78			
		1	1.73			3.64			
						632.25			5691



	Parapet wall		1	48				1.02	48.96				
	Chejja		2	9.66					24.73				
	Add 10% MISC		1	18.63				1.28	23.85				
									25.3				
									277.8				
									278.0			147.26	40939
14.3	Providing and laying 12 mm thk cement plaster of specified mix in single coat including finishing even and smooth and curing complete in CM 1:3 for internal plastering (PWD SIKKIM SR 2006, P-6, I-10.1.a)	Sqm											
	Store room		1	3					9.00				
	Toilet		1	3					9.00				
	Office		1	3					9.00				
	Change room		1	3					9.00				
	Lobby		1	3.77					5.66				
	Add 10% MISC								4.2				
									45.8				
									46.0			109.91	5056
14.4	Providing pointing in CM 1:3 raised or cut pointing to stone masonry (PWD SIKKIM SR 2006, P-6, I-10.9.b)	Sqm											
			1	48				0.5	24.00				
									24.0			1117.09	26811
14.5	Providing lime punning to internal walls 3 mm thickness in 1:1 proportion etc., complete (PWD SIKKIM SR 2006, P-8, I-10.10.a)	Sqm											
	Qty same as internal plastering	Sqm							144.0			50.13	7219
15.00	Painting												
15.1	Providing and washing with three or more coats of snowcem, durocem, cemcote etc., of approved quality and manufacture on exterior walls to give an even shade including preparation of surface on new surface including priming coat etc., complete. (PWD SIKKIM SR 2006, P-32 & 36, I-23.1.b & 23.8.f)	Sqm											
	Qty same as external plastering	Sqm							278.0			94.76	26344
15.2	Providing and painting with emulsion paints two or more coats on new surface of required shade to give an even shade including brushing the surface clean of all dirt, dust and smoothed by sand paper including primer coat etc., complete. (PWD SIKKIM SR 2006, P-32 & 36, I-23.1.b & 23.8.f)	Sqm											
	Qty same as internal plastering	Sqm							144.0			76.31	10989









<p><b>2.2.1</b> Providing and fixing approved PVC waste/soil pipes of following sizes complete with PVC/G.I. fittings and clamps, including making holes, cutting chases and making good the walls, as directed, curing, etc., complete including cost of all material, labour and carriage with all lead and lifts. (WB SR 2010, P-12, I-19.1)</p>														
i) 32 mm dia.	Rmtr						2.00		210				420	
ii) 40 mm dia.	Rmtr						2.00		258				516	
iii) 65 mm dia.	Rmtr						10.00		504				5040	
iv) 80 mm dia.	Rmtr						2.00		655				1310	
v) 100 mm dia. (including external drainage)	Rmtr						20.00		927				18540	
vi) 150 mm dia. (including external drainage)	Rmtr						2.00		1718				3436	
<p><b>2.2.2</b> Providing and fixing in position centrifugally cast iron socket and spigot pipe of following sizes cut to required lengths with all necessary fittings, lead joints, two coats of approved bituminastic paint to all pipes and fittings including cost of all material, labour and carriage with all lead and lifts. (WB SR 2010, P-9, I-12.i &amp; 12.ii)</p>														
i) 80 mm dia.	Rmtr						5.00		1085				5425	
ii) 100 mm dia.	Rmtr						5.00		1315				6575	
<p><b>2.2.3</b> Providing and fixing 125mm x 75mm CI floor trap/urinal trap of approved quality of type including all materials and labour, complete setting or constructing cistern in 1:2:4 proportion at all heights and floors. Rate to include provision of 3mm thick chromium-plated brass gratings fixed with chromium-plated brass screws. (PWD SR DWD 2010-11, P-77, I-12.113.2)</p>							2		351				702	
<p><b>2.2.4</b> Providing PVC Cowl with cap of approved 1st quality and make, conforming to I.S.I. specifications and fixing in position as directed including cost of all material, labour and carriage with all lead and lifts.</p>														
i) 80 mm dia.	Each						1		150				150	
ii) 100 mm dia.	Each						1		200				200	
<b>2.3 Water Supply Work</b>														

<p><b>2.3.1</b> Providing, laying and jointing <b>G.I. pipes</b> of medium class following sizes conforming to I.S. specification of approved make with fittings such as collars, bends, elbows, tees, nipples, plugs with cut threads using white lead and thread for joints wherever necessary as per directions including all lead and lifts, etc., complete including testing of pipes, complete including cutting chases, wherever necessary, making holes and making good wall in cement mortar, curing, two coats of bitumastic paints to pipes, etc., complete. (PWD SR SIKKIM 2006, P-37, 1-24.3 &amp; 24.4)</p>														
<p>i) 15 mm dia. Rmtr</p>														
<p>ii) 25 mm dia. Rmtr</p>														
<p>iii) 32 mm dia. Rmtr</p>														
<p>iv) 50 mm dia. Rmtr</p>														
<p><b>2.3.2</b> Providing and fixing <b>Gun Metal Wheel valve</b> conforming to I.S. 778 of approved make as per directions including cost of all material, labour and carriage with all lead and lifts including testing of valves complete. (WB SR 2010, P-5, 1-5, iv &amp; 5.vi)</p>														
<p>i) 32 mm dia. Each</p>														
<p>ii) 50 mm dia. Each</p>														
<p><b>2.3.3</b> Providing and fixing <b>32mm dia. Gun Metal non-return valve</b> conforming to I.S. 778 Class-1 of approved make and tested quality including cost of all materials, labour and carriage with all lead and lifts including testing of valves complete (PWD SR DWD 2010-11, P-82, 1-13.53)</p>														
<p>Each</p>														
<p><b>2.3.4</b> Supplying and fixing <b>32mm dia. Ball valve</b> conforming to IS:1703 of approved make &amp; tested quality including cost of all materials and labour at all heights and levels. (PWD SR DWD 2010-11, P-38, 1-24.11)</p>														
<p>Each</p>														
<p><b>2.3.5</b> Inspection chamber with CI heavy cover with locking arrangement, (weight not less than 25 kg) (size of chamber 450mm X 600 mm inside upto 900 mm depth) 250 mm thick cement brick walls (1:6) for inside wall and 15 mm thick cement plaster (1:4) for outer walls including rounding corners. (WB SR 2010, P-8, 1-10)</p>														
<p>Each</p>														

2.3.6 Providing, fitting, fixing 2000 litres capacity plastic water storage tank of 'Sinlex' or equivalent make with operable top lid, etc. complete with all accessories, inlet, air lock vent, overflow & delivery pipe arrangement as per the directions of the Engineer in all lead & lifts (PWD SR SIKKIM 2006, P-38, I-24.10.c)	Each		1	20288.75	20289
Market Rate					
2.4 External Drainage Works					
2.4.1 Providing, fitting and fixing PVC pipes of approved make with all necessary accessories, specials, including cutting pipes, making threads, fitting, fixing, etc., complete in all respect including cost of all necessary fittings as required and with approved paint in any position above ground. (WB SR 2010, P-13, I-19.i)	Rmtr		10.00	887	8870
i) 100 mm dia S.W. pipes.	Rmtr		— 10.00	1669	16690
2.4.2 Inspection chamber with CI heavy cover with locking arrangement, (weight not less than 25 kg) (size of chamber 450mm X 600 mm inside upto 900 mm depth) 250 mm thick cement brick walls (1:6) for inside wall and 15 mm thick cement plaster (1:4) for outer walls including rounding corners. (WB SR 2010, P-8, I-10)	Each		1	7576	7576
2.4.3 CI cover and frame					
2.4.4 Earthwork excavation for pipeline trenches, sumps, underground tanks, septic tanks, soak pits, drains, etc., including depositing on bank upto a lead of 50mts including shoring and strutting and other works as per specifications including disposing of surplus soil after backfilling as directed in all kinds of soils. (PWD SIKKIM SR 2006, P-2, I-4.1 & 4.2)	Cum		60.00	125.05	7503

<p><b>2.4.5 Refilling the foundation and trenches with selected available earth from trench excavation including watering, consolidation, in layers of 15cm thickness including disposing of the surplus earth with all lead and lifts.</b> (PWD SIKKIM SR 2006, P-3, -1-6.2)</p>	Cum		35.00	67.97	1850	155714
		Subtotal 2 : Total for water supply and sanitation		Total	1850	982000
			Total in Million		0.0019	0.98

  
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## Roads

SI No.	Description	Unit	No	L(m)	B(m)	D(m)	Qty	Rate (Rs.)	Amount (Rs.)
1	Providing & Laying water bound macadam base course with stone aggregate, screenings & binding material, including screening, sorting & spreading of materials, watering, ramming to required template, carriage to be given extra. Thickness of compacted base to be 75mm of Grading II classification using stone metals of 63mm-45mm size & stone screenings of Type A (20mm down) & specified quality of binding materials @ 0.09 cum per sqm. Work to be done as per the directions of Engineer-in-Charge. (PWD SR 2006, Sikkim, P-44, 1-26.5.d)								
	New road	cum	1	470	3.5	0.075	124	1442.67	178892.00

ii	<p>Providing &amp; Laying water bound macadam surface-course with stone aggregate, screenings and binding material, including screening, sorting &amp; spreading of materials, watering, ramming to required template, carriage to be given extra. Thickness of compacted base to be 75mm of Grading III classification using stone metals of 53mm - 22.4mm size and stone screenings of Type B (10 mm down) and specified quality of binding materials @ 0.013 cum per sqm. Work to be done as per the directions of Engineer-in-Charge with consolidation using 3 wheeled 8-10 ton roller. (PWD SR 2006, Sikkim, P-45, I-26.7.3)</p>								188421.00
iii	<p>New road Providing and laying of Prime Coat using Cationic Emulsion Bitumen on prepared gravel based surface (high porosity case) surface with 12 kgs per 10 sqm of emulsion bitumen including cleaning and brushing of road surface to make free from dirt &amp; dust before application &amp; spraying of prime coat as per direction of Engineer in Charge. (PWD SR 2006, Sikkim, P-46, I-26.9.b)</p>	cum	1	470	3.5	0.075	124	1519.52	188421.00
	Existing road		1	570	3.5		1995		
	New road		1	235	- 3.5		823		
	Total	sqm					2818	53.33	150284.00



iv	Providing and laying of 20 mm thick premixed carpeting using firewood on new surfaces with 0.27 cum(per 10 sqm) of 10 mm down guage clean hard selected stone chips mixed with 14.60 kgs of 80 / 100 maxphalt bitumen heated to proper temperature [302 degree Fahrenheit] over a hot tack coat surface with 9.76 kg (per 10 sqm) of same grade bitumen, including cleaning & brushing of road surface to make free from dirt and dust before application of tack coat including seal coating with 0.091 cum (per 10 sqm) of specified grade crushed stone chippings/ clean coarse sand (6.7 mm size) mixed with 9.76 kgs of same grade bitumen as above heated to proper temperature as per approved specification and direction of Engineer in Charge, including watering the roller wheels to keep moist as required and directed by the Engineer in Charge) to give uniform and even surface as per required camber. (PWD SR 2006, Sikkim, P-48, 1.26.13 b)								
	Existing road	1	570	3.5	1995				
	New road	1	235	3.5	823				
	Total				2818	284.31	801186.00		
					Total	1318783.00			
					INR Million		1.32		

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RA for BoQ 13 : for Piping System for water Supply Distribution System in SWM Site

RA-5 Providing and laying water bound macadam sub base with stone aggregate, screening and binding material including screening, sorting and spreading of materials, thickness of compacted base to be 100 mm grading-1 in two layers with consolidation using 3 wheeled 8-10 ton roller and providing tack coat using cationic Emulsion Bitumen on prepared Water Bound Macadam (low porosity Case) surface with 4 kg. per 10 sqm of emulsion bitumen including cleaning and brushing of surface before spraying of Premix Carpet and finally providing and laying 20 mm thick premix carpeting using bitumen boiler and asphalt mixer on new surfaces with 27 cm per 10 sqm of 10 mm down gauge clean hard selected stone chips mixed with 14.60 Kg. of 80/100 maxphalt bitumen heated to proper temperature over hot tack coat surface with 9.76 kg. per 10 Sqm. of same grade bitumen all as per standard specifications and as directed by the Engineer-in Charge to give uniform and even surface as per required slope or flat consolidation using 3 wheeled 8/10 tonne

SI No.	Description	Unit	Rate (Rs.)	Ref
1	Providing and laying WBM with 3 wheeled 8-10 ton roller with 100 mm of grading 1, converting it to sqm by considering 75mm thick WBM	Sqm	110.82	P-44, 1-26.5.a
2	Tack coat using cationic emulsion	Sqm	26.68	P-47, 1-26.11.a
3	20 mm thick premixed carpeting with 3 wheeled 8-10 ton roller	Sqm	260.07	P-48, 1-26.14.b
			397.57	

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## Detailed Estimate for Piping System for water Supply Distribution System in SWM Sile

Sl. No.	Item Description	Unit	No.	Length (m)	Breadt h (m)	Depth (m)	Quantity	Rate (Rs)	MIR Amount (Rs.)	SR Amount (Rs.)
1	Excavation in trenches as per typical section of required width & depth in black top road, pavement, all kinds of soil etc. all complete upto required depth and also disposal of surplus excavated earth upto 100m lead and lift upto 2.5 m (PWD SR SIKKIM 2006, P-2, 1-4)									
a	For 32 mm dia GI Medium Duty Pipes	Cum	1	440.00	0.63	1.03	286.98			
b	For 20 mm dia GI Medium Duty Pipes	Cum	1	22.00	0.62	1.02	13.91			
c	For 15 mm dia GI Medium Duty Pipes	Cum	1	60.50	0.62	1.02	37.77			
							338.66			
a	Mixed soils	Cum					338.66	125.05		423.50
2										
	Filling with available excavated earth in trenches, plinth side of foundation, in layers not exceeding 20cm in depth i/c consolidation of each layer by ramming, watering etc all complete (PWD SIKKIM SR 2006, P-3, 1-6.2)									
a	Deductions									
	For 32 mm dia GI Medium Duty Pipes	Cum	1	440		0.0008	0.35			

b	For 20 mm dia GI Medium Duty Pipes	Cum	1	22	0.0003	0.01			
c	For 15 mm dia GI Medium Duty Pipes	Cum	1	60.5	0.0002	0.01			
		Sub-Total				0.37			
	Total	Cum				338.29	67.96		22990
3	Providing fitting and fixing ISI marked GI pipe (Medium duty) etc. complete with commissioning and testing of pipes, specials with joints as per specifications with all lead and lift. (PWD SR SIKKIM 2006, P-37, 1-24.3 & 24.4)								
a	For 32 mm dia GI Medium Duty Pipes	Per Mtr.	1	440.00		440.00	415.73		182922
b	For 20 mm dia GI Medium Duty Pipes	Per Mtr.	1	22.00		22.00	232.55		5117
c	For 15 mm dia GI Medium Duty Pipes	Per Mtr.	1	60.50		60.50	188.80		11423
4	Supplying and conveying of required GI specials like Tees, Bends, Reducers, End caps etc for all the proposed pipelines including transportation charges, etc complete as per standard specifications and as directed by the Departmental Engineer							20% of pipe cost	39892



Sl.	Details of Works/Services	Requirement 2012-17 (Phase I)	Unit	Rate (Rs)	Amount (Rs. in Million)
3	Vehicles & Equipment - Landfill & Compost Plant				
3.1	Chain wheeled Hydraulic excavator		1 Nos	1985500	1.99
3.2	Bull Dozer powered by diesel engine for compacting the waste		1 Nos	5120500	5.12
	<b>Sub Total</b>				<b>7.11</b>

1.0	Chain wheeled Hydraulic Excavator powered by KOEL diesel engine, developing 43 KW(57 hp) FHP at 2000 RPM	1900000
	Add CST @ 2%	38000
	Add transportation, handling, storage, insurance, freight, octroi etc., @ 2.5%	47500
	<b>Total</b>	<b>1985500</b>

4.0	Bull Dozer powered by diesel engine for compacting the waste, developing flywheel power of 67 kW(90 FHP) @ 1750 rpm and fitted with Angle Dozer blade.	4900000
	Add CST @ 2%	98000
	Add transportation, handling, storage, insurance, freight, octroi etc., @ 2.5%	122500
	<b>Total</b>	<b>5120500</b>

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	PART - A	Qty	Unit	Estimate from SIPMIU		As per Energy & Power Dep	
				Rate	Amount	Rate	Amount
	<b>LINE CONSTRUCTION</b>						
1	Construction of over head LT 3 phase line with street main using 9 m latticed structure/PSC / RCC poles and AAC ANT & GNAT conductor including the cost of hardware fittings insulators strain insulators,Providing DP structure wherever required earthing etc., complete from the transformer yard along the road upto security gate, complete as per specification of Electricity authority and direction of site Engineer	2	KM	395,000.00	790,000.00	599,827.00	1,199,654.00
	<b>Total</b>				<b>790,000.00</b>		<b>1,199,654.00</b>
	<b>LT portion</b>						
1	<b>Electrical</b>						
1	Supply, delivery and installation of floor mounting type vermin, weather and dust proof factory made Main panel board fabricated with 400A rated aluminium bus bar with PVC sleeved with the following accessories complete with incomer and outgoing feeders complete with ACB, MCCB, selector switch, energy meter, fuses including cost for LT cubical panel board with bus bar, interlock arrangement with castle key to possible of charging Generator and Transformer seperatly.The panel shall be constructed as per IE rules,including parapet 2x0.61x0.35x0.61 with 12 mm thick plastered.	1	set	150,000.00	150,000.00	219,787.52	219,787.52
	<b>INCOMING</b>						
	400A 4P 50KA FP MCCB-1 Nos,(1 Transformers and 1 Generator)						
	Suitable C.Ts 200/5A - 2 sel.						
	Ammeter with Selector Switch - 1 no.						
	Voltmeter with selectorswitch -1 no.						
	KWH Meter - 1 no.						
	PF Meter - 1 no.						
	<b>OUTGOING</b>						
	200A,TP, 35kA MCCB -1 no. (For Motor Control Panel)						
	100A,TP, 35kA, MCCB - 3Nos.(APFC,lights,&spare)						
	63A,TP, 35kA, MCCB - 1 no. (spare)						
1	Supply delivery erection ,testing and commisioning of 100 KVA capacity Diesel Generator set 3 ph, 50 Hz,415 V, consisting of deisel engine capable of delivering continuous brake horse power with standard fittings,water cooled radiators,acoustic closure to restrict the noise level as per the KPCB norms,residential silencer with exhaust pipe arrangement (insulated with glass wool inside thwe building ) upto outside of the roomabove roof level,suitable alternator (brushless),self excited,self regulated, suitable for continuous operallon.Standard control panel, consisting of ameter with CTs and selector switch, Voltmeter with selector switch, MCCB, energymeter,earth fault relay,indicating lamps,fuses and required 1.1 KV grade PVC armoured aluminium cable from alternaor to alternator control panel, 12/24 Vbattery, batteryleads, battery chrger ,etc. Coupling with gaurd ,fuel tank (8Hrs. capacity) common rigid MS channel baseframe, antivibration mounting pad etc ..complete	1	No	825,000.00	825,000.00	825,000.00	825,000.00
1	Supply, erection and commisioning of 20Kvar 10stepped APFC control panel made out of 2mm thick CRCA sheet modular compartmentalised free standing floor muntling Iron hinzed doors for indoor used removable bottom gland plates for incoming cable dust and vermin proof(IP-42 Protection) with TP Al. Bus bar connection internal wiring name plates painting etcl; complete	1	No	75,000.00	75,000.00	116,875.00	116,875.00
	<b>Total</b>				<b>1,050,000.00</b>		<b>1,161,662.52</b>
2	<b>Cables</b>						
	Supplying and laying of 1.1 KV grade ARMURED Aluminium Conductor Cable conforming to IS:1554 Part-I with ISI marking in a trench to be excavated at a depth of 2.5 feet putting 6" layer of sand and covering the cable with brick and sand refilling the earth to make good						
	3.5C x 50 sq.mm PVC ARMURED LT UG CABLE (For pump cables)	400	Rmtr	375.00	150,000.00	576.00	230,400.00
	3.5C x 25 sq.mm PVC ARMURED LT UG CABLE (For capacitor cables)	250	Rmtr	125.00	31,250.00	385.00	96,250.00

	4C x 4 sq.mm PVC armoured LT UG cables for spare and lighting	200	Rmtr	40.00	8,000.00	160.00	32,000.00
	<b>Total</b>				<b>189,250.00</b>		<b>358,650.00</b>
<b>3</b>	<b>Cable terminallions</b>						
	Supplying and fixing of heavy duty cable gland and connecting the cable using crimping lugs for the following cables including earth connection.						
a	3.5C x 50 sq.mm PVC ARMoured LT UG CABLE	12	No.	280.00	3,360.00	318.00	3,816.00
b	3.5C x 25 sq.mm PVC ARMoured LT UG CABLE (For capacitor cables)	6	No.	182.00	1,092.00	297.00	1,782.00
	4C x 4 sq.mm PVC armoured LT UG cables for spare and lighting	10	No	45.00	450.00	160.00	1,600.00
	Supplying and fixing of heavy duty cable gland for the following PVC UG cable and with earth connection						
	<b>Total</b>				<b>4,902.00</b>		<b>7,198.00</b>
<b>4</b>	<b>Earthing</b>						
	Providing twin copper / GI earthing by using suitable size of electrolytic grade copper strips for the newly erected pumpsets starters, MV panel and also constructing earth pits with required civil works, providing suitable length of CI / GI earth electrode pipes with copper plate arrangement at bottom with funnel, Chemical earthing etc., as per I.E rules.	8	No.	5,750.00	46,000.00	21,753.00	174,024.00
	Masonry work required for the earthing including the funnel pit for watering	10	No	1,750.00	17,500.00	3,570.48	35,704.80
	Provide materials and construct foundations in M15 concrete 600mm x600mmx 1.3m, 300mm height located above ground level for street light pole including fixing in position of Anchor Bolts.(Rate to include for excavation to receive the foundation and backfilling of pit after concreting.)	20	No			33,522.08	670,441.60
	STREET LIGHTING :Supplying and fitting 2X 40 W Fluorescent tube out door street light fittings with required fittings and clamps, in the existing 8 Mr RCC/PSC poles including the cost of lead wires to connect the street main with a single group controlled cut out	20	No	2,750.00	55,000.00	2,573.00	51,460.00
	<b>Total</b>				<b>118,500.00</b>		<b>931,630.40</b>
<b>5</b>	<b>Lighting</b>						
i	<b>Administrative Office</b>						
a	Supplying and fixing of box type 4' 40W single fluorescent fitting complete with TW round block and tube on ceiling or wall with connection.	7	Each	402.00	2,814.00	518.00	3,626.00
b	Supplying and fixing of water tight bulk head fitting suitable for 100W bulb with lamp guard and lamp	1	Each	359.00	359.00	657.00	657.00
c	150 W HPSV street light fixture with single piece, deep drawn aluminium reflector, copper wound ballast, capacitor, junction box, porcelain terminal box, 40mm class 2 GI pipe for fixture mounting, cleats etc. Complete in all respect	1	Nos.	3,488.50	3,488.50	6,186.00	6,186.00
d	Supply and fixing of Single Pole Neutral (SPN) MCB single door 8 way, suitable for lighting with suitable box	1	No.	494.00	494.00	696.00	696.00
e	Supplying and fixing of 48" sweep AC ceiling fan complete with regulator with 1m down rod (stem pipe) including supplying and fixing of fan clamp with side plates and cross arm.	3	Each	1,527.00	4,581.00	1,789.00	5,367.00
f	Supply and fixing of 12" sweep AC exhaust fan complete including providing necessary opening in the wall	1	Each	1,522.00	1,522.00	2,539.00	2,539.00




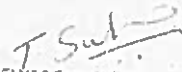
g	Wiring with 2 x 1.5 sqmm PVC insulated SC unsheathed copper conductor of 1100V grade in suitable PVC rigid pipe on wall and ceiling with PVC accessories and with teak wood switch box and 5A F.T. switch with painting of suitable colour with continuous earth wire connection of 14 SWG TC wire for open PVC light point / fan point	17	No.	889.20	15,116.40	1,360.00	23,120.00
h	Wiring with 2 x 1.5 sqmm PVC insulated SC unsheathed copper conductor of 1100 V grade in suitable PVC rigid pipe on wall and ceiling with PVC accessories and with 150 x 100 x 113 mm teak wood switch box for 5A 3 pins non interlocking CS plug with painting of suitable colour with continuous earth wire connection of 14 SWG TC wire for open PVC plug point	1	No.	472.20	472.20	1,451.00	1,451.00
ii	<b>Security Room</b>						
a	Supplying and fixing of box type 4' 40W single fluorescent fitting complete with TW round block and tube on ceiling or wall with connection.	2	Each	402.00	804.00	518.00	1,036.00
b	Supplying and fixing of wall bracket suitable for 100W bulb with lamp guard and lamp	2	Each	359.00	718.00	490.00	980.00
c	150 W HPSV street light fixture with single piece, deep drawn aluminium reflector, copper wound ballast, capacitor, junction box, porcelain terminal box, 40mm class 2 GI pipe for fixture mounting, cleats etc. Complete in all respect	1	Nos.	3,488.50	3,488.50	6,186.00	6,186.00
d	Supply and fixing of Single Pole Neutral (SPN) MCB single door 8 way, suitable for lighting with suitable box	1	No.	494.00	494.00	696.00	696.00
e	Supplying and fixing of 48" sweep AC ceiling fan complete with regulator with 1m down rod (stem pipe) including supplying and fixing of fan clamp with side plates and cross arm.	2	Each	1,527.00	3,054.00	1,612.00	3,224.00
g	Wiring with 2 x 1.5 sqmm PVC insulated SC unsheathed copper conductor of 1100V grade in suitable PVC rigid pipe on wall and ceiling with PVC accessories and with teak wood switch box and 5A F.T. switch with painting of suitable colour with continuous earth wire connection of 14 SWG TC wire for open PVC light point / fan point	6	No.	889.20	5,335.20	1,360.00	8,160.00
h	Wiring with 2 x 1.5 sqmm PVC insulated SC unsheathed copper conductor of 1100 V grade in suitable PVC rigid pipe on wall and ceiling with PVC accessories and with 150 x 100 x 113 mm teak wood switch box for 5A 3 pins non interlocking CS plug with painting of suitable colour with continuous earth wire connection of 14 SWG TC wire for open PVC plug point	1	No.	472.20	472.20	1,451.00	1,451.00
iii	<b>Toilet</b>						0.00
a	Supplying and fixing of box type 4' 40W single fluorescent fitting complete with TW round block and tube on ceiling or wall with connection.	3	Each	402.00	1,206.00	518.00	1,554.00
b	Supplying and fixing of wall mounted bracket fitting suitable for 100W bulb with lamp guard and lamp	8	Each	359.00	2,872.00	490.00	3,920.00
d	Supply and fixing of Single Pole Neutral (SPN) MCB single door 8 way, suitable for lighting with suitable box	1	No.	494.00	494.00	696.00	696.00
f	Supply and fixing of 12" sweep AC exhaust fan complete including providing necessary opening in the wall	2	Each	1,522.00	3,044.00	2,539.00	5,078.00
g	Wiring with 2 x 1.5 sqmm PVC insulated SC unsheathed copper conductor of 1100V grade in suitable PVC rigid pipe on wall and ceiling with PVC accessories and with teak wood switch box and 5A F.T. switch with painting of suitable colour with continuous earth wire connection of 14 SWG TC wire for open PVC light point / fan point	13	No.	889.20	11,559.60	1,360.00	17,680.00

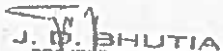
h	Wiring with 2 x 1.5 sqmm PVC insulated SC unsheathed copper conductor of 1100 V grade in suitable PVC rigid pipe on wall and ceiling with PVC accessories and with 150 x 100 x 113 mm teak wood switch box for 5A 3 pins non interlocking CS plug with painting of suitable colour with continuous earth wire connection of 14 SWG TC wire for open PVC plug point	1	No.	472.20	472.20	1,451.00	1,451.00
	<b>Total</b>				<b>62,860.80</b>		<b>95,754.00</b>
6	<b>SHED INTERNAL LIGHTING</b>						
	Wiring with 2 x 2.5 sqmm PVC insulated SC unsheathed copper conductor of 1100V grade in suitable PVC rigid pipe on wall and ceiling with PVC accessories and with standard switch box. 32 A DP switches shall be used to group control 5 Nos of lamps. Continuous earth wire connection of 14 SWG TC wire for open PVC light point .	30	No	1,350.00	40,500.00	1,940.00	58,200.00
	Supply, installation, testing and commissioning of following luminaires with all fixing arrangement on pole (Pole & brackets paid seperally). Lamp cover shall be vermin and dust proof						
	250W	6	No	3750	22,500.00	7,624.00	45,744.00
	150W	10	No	2500	25,000.00	6,186.00	61,860.00
	70 W	20	No	1500	30,000.00	4,232.00	84,640.00
	Supply and erection of Steel Tubular Poles of specified length including arms, accessories and incidentals as given below .a)Sole plate at bottom. B)Earthing arrangement as per IS Rules with 20 mm dia X2 Mr long GI earthing rod and 8SWG wire of 2 in a set.c) Junction box with terminal block and fuse protection for luminaries with gasket,railway type locking and 440 V statutory notice board.d) 2 X 1 core 2.5 sq.mm PVC insulated copper wire from Junction box to luminaries.e)Muffling of 300 mm above ground including 3 mm thick neat cement finish (6:3:1) f) providing suitable class B ,GI Pipe with long bend for passage of cables upto cable looping box. g) Identification marking in block letters or igits (40 mm size),one alphabet and 3 Nos.digits with black Japan paint with in circle. h) The cost includes for 10mm base plateand 4 Nos holding down J bolts,including all transportaion cost. i) All steel parts to be painled with a coat of approved anti corrosive primer and 2 coats of approved Aluminium paint						
	13 Mr pole with 3 arms	2	No	25000	50,000.00	43,000.00	86,000.00
	<b>Total</b>				<b>168,000.00</b>		<b>336,444.00</b>
	<b>Grand Total</b>				<b>2,383,512.80</b>		<b>4,090,992.92</b>
	<b>ADDITION WORK</b>						

7	Repair and replacement of GOS,DOF,LA,Fencing,Earthing,Painting,cablling,distribution board and its parapet of the existing 150 KVA distribution sub-station.	1	Job		0.00		506,325.00
	GRAND TOTAL				2,383,512.80		4,597,317.92
	INR Million				2.38		4.60
	Add 18% for updating to 2011 from 2008				0.43		0.83
	TOTAL on 2011 Price				2.81		5.42

NOTE: Most of the rates incorporated in this corrected items are based on approved scheduled of rate (2008) of the Department. However for some items, for which 2008 SOR is not available, those have been taken from SOR 2006, duly updated multiplied by 1.12, or based on Department's own estimate as on 2008 and referred as DOE.

  
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## PERSONAL PROTECTIVE MATERIALS

Sl		Particulars	Units	Qty	Rates/ Unit (Rs)	Amount (Rs) for year
1	PRIMARY COLLECTION	Rain coats	Set/year	56	700	39,200
2		Gloves	Pairs/year	56	40	2,240
3		Gumboots	Pairs/year	56	150	8,400
4		Goggles	No./year	56	75	4,200
5		Protective caps	No./year	56	50	2,800
6		Masks	No./year	56	50	2,800
7						59,640
8		<i>Rs. In Million</i>				0.06
9	SECONDARY COLLECTION	Rain coats	Set/year	28	700	19,600
10		Gloves	Pairs/year	28	40	1,120
11		Gumboots	Pairs/year	28	150	4,200
12		Goggles	No./year	28	75	2,100
13		Protective caps	No./year	28	50	1,400
14		Masks	No./year	28	50	1,400
15						29,820
16		<i>Rs. In Million</i>				0.03
17	Landfill	Rain coats	Set/year	22	700	184,800
18		Gloves	Pairs/year	22	40	880
19		Gumboots	Pairs/year	22	150	3,300
20		Goggles	No./year	22	75	1,650
21		Protective caps	No./year	22	50	1,100
22		Masks	No./year	40	50	2,000
23						193,730
24		<i>Rs. In Million</i>				0.2
25			<i>Total</i>			0.28

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