

1.0 INTRODUCTION

M/s Satvika Nexgen Empire has proposed to develop a residential building project at project at Plot No 589,556,557 & 558 Khata No. 222, 133, 131 & 142, Mouza Sikandarpur, Thana no-17, Thana Danapur, Patna, Bihar. Project involves development of 5 residential tower along with green area and other ancillary facilities. Project site is spread over area of 20243.20sq m and has built-up area of 93,014.46sq m.

1.1 APPLICABLE LEGAL FRAMEWORK

As per EIA Notification, 2006, projects listed in schedule of the said notification requires prior environmental clearance. Project involves development of residential project as defined above. Built-up area of the project is 93,014.46 sq. Project having built-up area more between 20,000 sq m and 1,50,000 sq m falls under activity 8 (a) and Category B of the schedule of said notification and thus, prior environmental clearance is required for the proposed project from SEIAA, Bihar. The acts and rules applicable to the project includes following:

- Environment protection Act, 1986
- EIA Notification, 2006 as amended
- MSW Rules, 2016
- Construction & Demolition Waste Management Rules, 2016
- Plastic waste Management Rules, 2016
- Hazardous & Other waste Management Rules, 2016
- E-Waste Rules, 2016
- Air Act, 1981
- Water Act, 1974
- Local By Laws
- Forest Act 1927 & 1980

1.2 CONNECTIVITY ANDSURROUNDINGS OF PROJECT SITE

Project site lies at Mauja – Sikandarpur, Thana No – 207, Thana – Danapur, Patna, Bihar. Geographical coordinates of the center of project site are 25°37'31.75"N and 85° 4'6.77"E. Details of coordinates of project site and project boundary is represented in Table 1 and Figure 1 below. Location Map of project site is given in Figure 2 below. Project site is connected through Digha Bridge Link Road (abuts, E). Patipur Railway Station is at approx. 100 m from the site in SE direction. Jay Prakash Narayan Airport is at approx. 4.1km, SE direction of project site. Surroundings of project site is given in Table 2 below.

Table 1: Geographical Coordinates of Project Site

Point in Image	Latitude	Longitude
1	25°37'31.52"N	85° 4'3.47"E
2	25°37'30.10"N	85° 4'3.61"E
3	25°37'29.78"N	85° 4'3.67"E
4	25°37'30.10"N	85° 4'3.38"E
5	25°37'29.66"N	85° 4'6.79"E
6	25°37'30.54"N	85° 4'6.88"E
7	25°37'31.50"N	85° 4'8.00"E
8	25°37'33.40"N	85° 4'8.15"E
9	25°37'30.43"N	85° 4'9.77"E

Table 2: Surroundings of Project Site

S. No.	Features	Description
1.	Nearest Habitation	• Danapur Cantonment (2.9 km, NW) • Yadav Colony (2.04 km, N) • Vivek Vihar Colony (0.59 km, W) • Luv Kush Nagar (0.59 km, SW) • Kusumpura Colony (0.87 km, S) • Rukanpura (1.11 km, SE) • Ashiana Nagar Phase I (1.01 km, E) • Jagat Vihar Colony (1.07 km, SE)
2.	Nearest City	• Patna (project site is located in Patna city)
3.	Nearest School/College	• Rose Valley School (0.97 km, W) • Mother Glory Preparatory School (1.53 km, NW) • Vidya Sarovar School (2.02 km, SW) • St Francis School (1.83 km, SE) • Arms School (1.54 km, SE) • West Point Public School (1.77 km, NE)
4.	Nearest Hospital	• Advance Orthopedic & Maternity Centre (0.26 km, E) • Vivantes Hospital & Research Institute (0.4 km, N) • Raj Trauma Centre (1.32 km, W)

1.3 PROJECT COST

Total cost of the project is INR 130.0 Crores

1.4 LAND REQUIREMENT AND AREA SUMMARY

The total plot area of the project site is 20243.20sq m. Project involves development of 5 towers having built-up area of 93,014.46sq m. Out of these 5 towers, Tower 1 is both commercial & residential; Tower 2, 3 & 4 are residential and Tower 5 is being developed for EWS section

Table 3 a: Area Summary

S. No.	Description	Area (sq m)
1.	Plot Area	20243.20
2.	Road Widening Area	11.86
3.	Net Plot Area	20231.34
4.	Ground Coverage	5362.16
5.	FAR (@3.249)-Residential plus commercial	65,782.16
	Residential	59911.16
	Commercial including commercial area in basement (3086)	5871.00
6.	Parking (Basement + Ground)	17364.98

Proposed Residential Building at Plot No 589,556,557 & 558 Khata No. 222, 133, 131 & 142, Mouza Sikandarpur, Thana no-17, Thana Danapur, Patna, Bihar.

7.	EWS FAR	9867.32
8.	Built-up Area (including EWS)	93,014.46
9.	Green Area (@32.33% of net plot area)	6542.00
10.	Nos. of Dwelling units	435
11.	Nos. of LIG/EWS	166
12.	No of shops	54
13.	Height (m)	58.26

Table 3 b: Details of Towers

Tower	Floors	Remarks
1	B+G+15	B & G are commercial 1-15 are residential
2	G+17	Residential
3	G+17	Residential
4	G+16	Residential
5	G+17	Residential (EWS)

1.5 ESTIMATED POPULATION

Population estimated at the site is 3712 which includes commercial, residential and floating population.

Detailed calculation is given in **Table 4**.

Table 4: Estimated Population

S. No.	Category	No of DU/Area (sq m)	Standard	Population
A Residential				
1.	Residents	601	5 person/unit	3005
2.	Staff	--	@2%	60
3.	Visitors	--	@2%	60
Total Residential Population				3125
B Commercial				
1.	Total population	5871 sq m	1 person/10 sq m	587
a	Staff		@20%	117
b	Visitors		@80%	470
Total Population				3,712

1.6 WATER REQUIREMENT

Water requirement during construction phase is approx. 10-20 KLD. Source of water during construction phase will be private water tankers. Source of water during operation phase will be Municipal supply supplemented with ground water. Total water requirement, estimated during operation phase is 460 KLD out of which fresh water requirement is 296 KLD. Water calculation detail is given in **Table 5&6**. Water balance diagrams are provided in **Figure 3 & 4**.

1.7 SEWAGE GENERATION

Sewage generation from the site is expected to be 430 KLD which will be treated in STP of capacity 450 KLD. Dual plumbing system is provided at site to re-use the treated water for flushing, gardening and other purpose. STP is provided with MBBR Technology.

Table 5: Calculations for Total Daily Water Demand

Category	Population/Area (sq m)/Capacity	Standard (LPCD)	Water Requirement- KLD	Fresh Water Requirement- KLD	Recycled Water requirement- KLD
Domestic					
Residents	3005	135	406	284	122
Staff	177	45	8	6	2
Visitors	530	15	8	6	2
Total Domestic Water Demand			422	296	126
Landscape	6542 sq m	0	33	0	33
Road Washing & Misc	--	--	5	0	5
Total	--	-	460	296	164

Table 6: Wastewater Calculations

Category	Total Quantity (KLD)
Fresh water Req.	296
Flushing water Req.	126
Sewage generation (@90% of the fresh water consumption + 100% flushing water)	430
Capacity of STP	450
Recovered water from STP (80% of Waste water)	340
1. Flushing	126
2. Landscaping	33
3. Road Washing & Misc	5
4. Discharge to Sewer	176

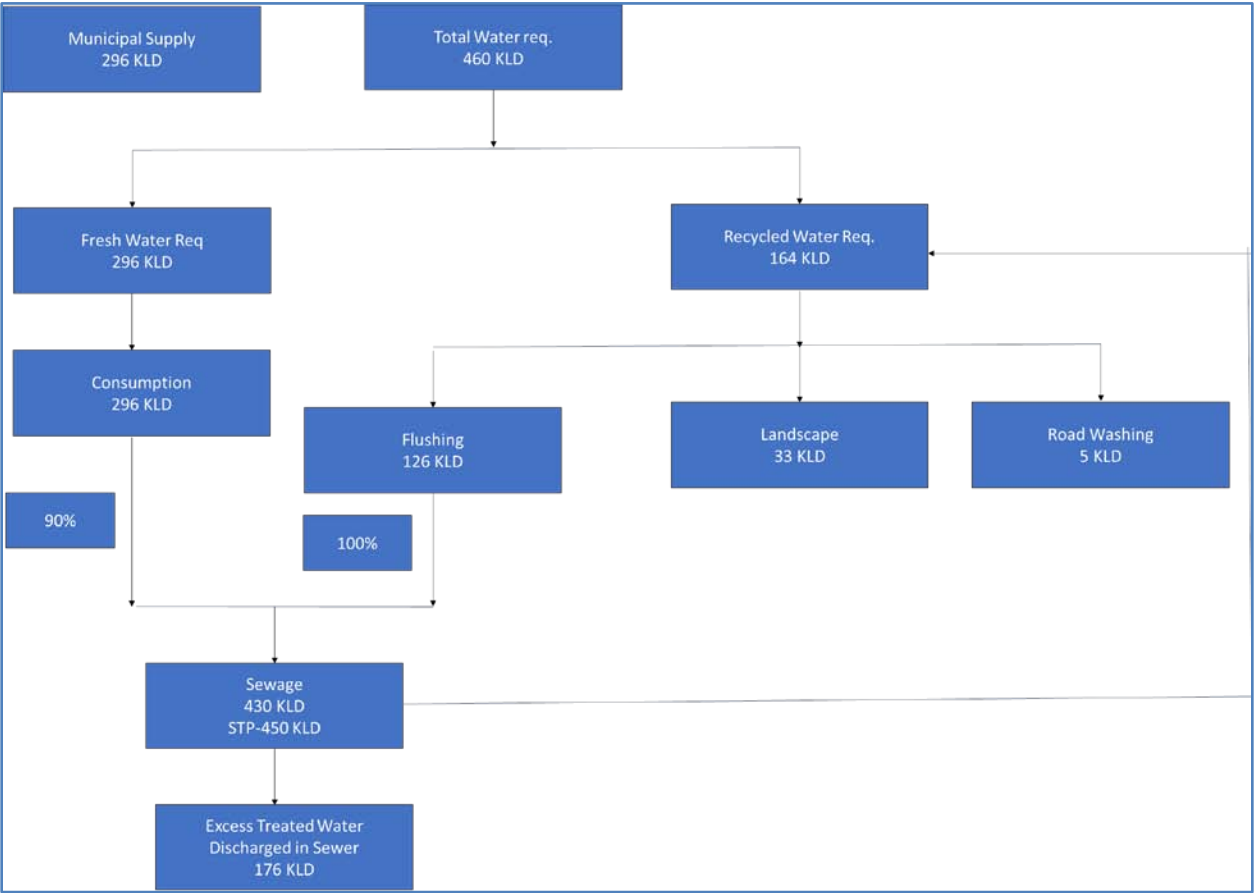


Figure3: Water Balance Diagram-Dry Season

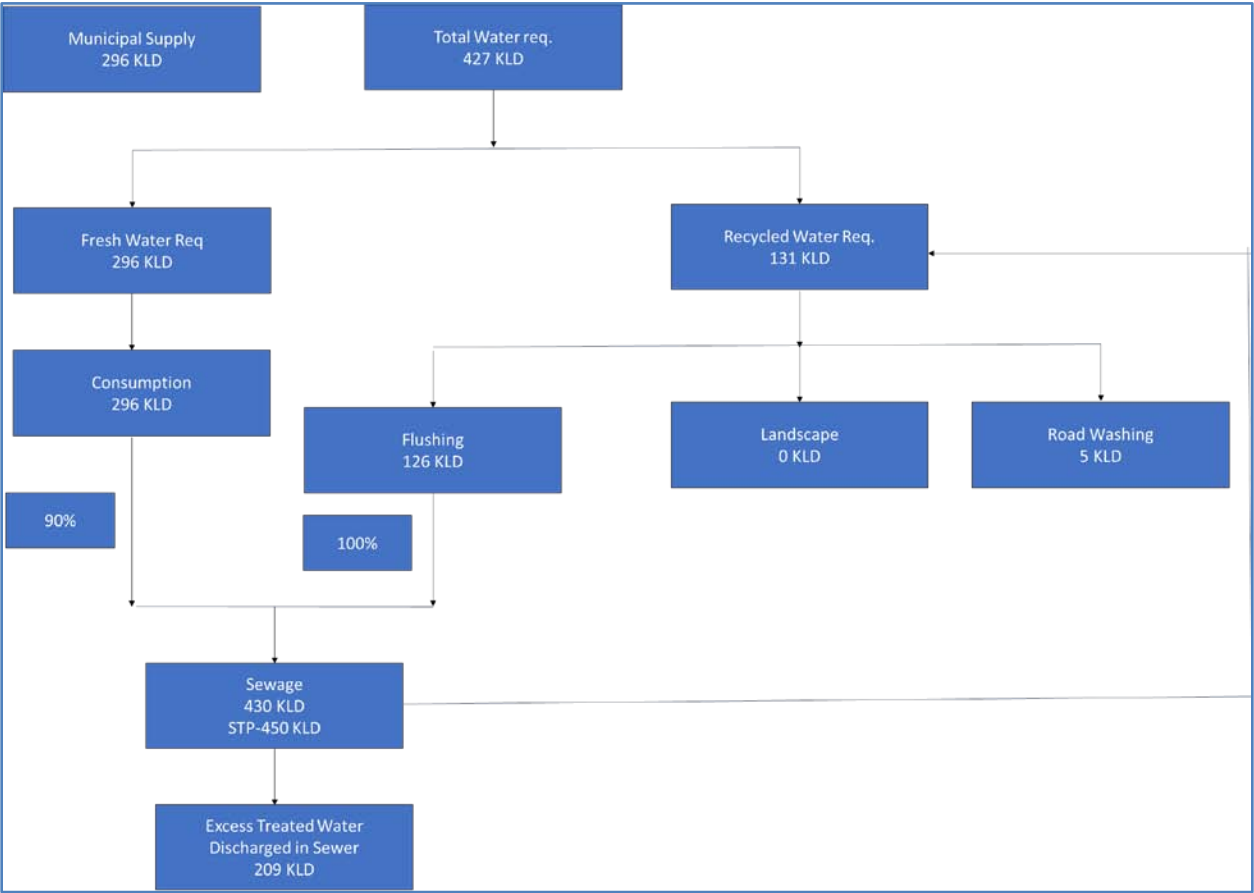


Figure 4: Water Balance Diagram-Monsoon Season

1.8 SEWAGE MANAGEMENT

STP of 450 KLD with MBBR technology is provided at the site. Detail of the treatment technology and sewerage system are given below

Sewerage System

An external sewage network shall collect the sewage from all units, and flow by gravity to the proposed sewage treatment plant.

Following are the benefits of providing the Sewage Treatment Plant in the present circumstances:

- Reduced net daily water requirements, source for Horticultural purposes by utilization of the treated waste water.
- Reduced dependence on the public utilities for water supply and sewerage systems.
- Sludge generated from the Sewage Treatment Plant shall be rich in organic content and an excellent fertilizer for horticultural purposes.

a.	<u>Wastewater Details</u>		
(a)	Daily load	:	450 KLD
(b)	Duration of flow to STP	:	24 hours
(c)	Temperature	:	Maximum 32°C

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(d)	pH	:	6.5 to 8.5
(e)	Colour	:	Mild
(f)	T.S.S. (mg/l)	:	200-450 mg/l
(g)	BOD (mg/l)	:	300-400 mg/l
(h)	COD (mg/l)	:	600-800 mg/l
(i)	Oil & Grease	:	30-50 mg/l

b. Final discharge characteristics

(a)	pH	:	6.0 to 8.5
(b)	Oil & Grease	:	<5 mg/l
(c)	B.O.D.	:	<20 mg/l
(d)	C.O.D.	:	<100 mg/l
(e)	Total Suspended Solids	:	<10 mg/l

c. Treatment Technology

The technology is based on attached growth aerobic treatment followed by clarification by a tube settler. Lime will be dosed in for suppression of foaming tendencies. The clarified water will be filtered in a pressure sand filter after dosing of coagulant (alum) for removal of unsettled suspended impurities. This water will be passed through an activated carbon filter for removal of organics. The filtered water from ACF is then chlorinated & stored in the flushing tank.

The attached growth Moving bed bio reactor (MBBR) process combines the biological processes of attached & suspended growth. It combines submerged fixed film with extended aeration for treatment of the waste water.

The waste water after screening is collected in an equalization tank. The equalization tank is required for preventing surges in flow & facilitating equalization of characteristics over the entire quantity of effluent in a given time. A provision for pre-aeration is made in the equalization tank in order to ensure mixing & to prevent the sewage from going septic.

The equalized sewage is then pumped into the MBBR reactor for biological processing. The water enters the bottom of the reactor & flows up through the fixed film media which grossly enhances the hydraulic retention time & provides a large surface area for growth of biological micro – organisms. The MBBR reactor is aerated by fine pore sub – surface diffusers which provide the oxygen for organic removal. The synthetic media floats on the water & the air agitation ensures good water to micro-organism contact.

The MBBR treatment is an attached growth type biological treatment process where in, the majority of biological activity takes place on the surface of the PVC media. Continuous aeration ensures aerobic activity on the surface of the media. Micro – organisms attach themselves on the media & grow into dense films of a viscous jelly like nature. Waste water passes over this film with dissolved organics passing into the bio-film due to concentration gradients within the film. Suspended particles & colloid may get retained on this sticky surface where they are decomposed into soluble products. Oxygen from the aeration process in the waste water provides oxygen for the aerobic reactions at the bio-film surface. Waste products from the metabolic processes diffuse outward & get carried away by the waste water or air currents through the voids of the media.

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The aerated effluent passes into a tube deck settler for clarification. The theory of gravity tube settler system is that the carrier fluid maintains laminar flow in the settling media at specified maximum viscosity. These two parameters of a carrier fluid, flowing through a hydraulic configuration, will determine the velocity gradients of the flow, the height of boundary layer at the inclined surface and the residence time within the media.

The carrier fluid must be viscous Newtonian, exhibiting a Reynolds number of less than 1000 and preferably, a number under 400. The laminar flow, through the inclined tubes, will produce velocity gradients sufficiently large to form an adequate boundary layer, where the velocity of fluid approaches zero. Boundary layers are necessary in functioning tube settlers, to allow suspended solids to separate from the viscous carrier fluid. Under gravitational forces, they will settle to the hydraulic surface of the tube and subsequently from the clarifier media.

Since the tubes are inclined at 60 degrees, solids settled on the tubes are continually discharged down. This downward rolling action increases particle contact and hence further agglomeration, which increases the sludge settle ability. Studies show that these agglomerated sludge particles can have a settling rate in excess of ten times the settling rate of the individual floc particles in the influent. These heavy agglomerated masses quickly slide down the 60 degree inclined tube and settle at the bottom of the tank.

At the bottom of the Tube deck, where the sludge leaves the Tube surface, the larger agglomerated captures smaller particles in the upcoming stream. This solid contact phenomenon greatly enhances the capture efficiency.

Stages of Treatment: The treatment process consists of the following stages:

- Equalization
- Bio- Degradation
- Clarification & Settling
- Filtration

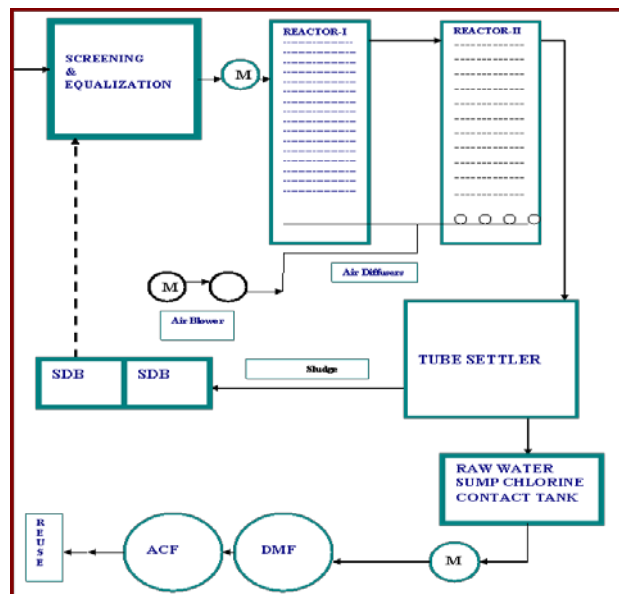


Figure 5: Schematic Diagram of STP

1.9 STORM WATER MANAGEMENT

Storm water drainage system is provided at the site for channelizing storm water and prevents local flooding. Covered storm water drains are provided at the site. Run-off from the site is collected and recharged into ground through 5 nos. of RWH pits. Recharge of the rainfall run-off to ground not only prevents the local flooding during rain but also helps in augmenting the ground water level of the aquifers. Ground water level in project area is approx. 1.5-1.8 m bgl as per soil investigation study. Diameter of the recharge bore will be approx 300 mm and depth will be approx. 5 m below water level. Run-off generation from site without development is approx. 4453.5 cum. This run-off increases due to generation of paved surfaces. Run-off available from the site annually after project development is calculated and is presented in the **Table 7**. Calculations for rainwater harvesting pits are given below in **Table 8**.

Table 7: Available Run-off from Site

S. No.	Catchment	Area (sq m)	Run-off Coefficient	Average Annual Rainfall (m)	Available Annual Run-off (cum)
1.	Roof top	5362.16	0.9	1.1	5309
2.	Green	6542.00	0.1	1.1	720
3.	Paved Areas	8,339.04	0.7	1.1	6421
Total Run-off					12449

Table 8: Calculation for RWH Pits

S. No.	Catchment	Area (sq m)	Run-off Coefficient	Peak Hourly Rainfall (m)	Available Annual Run-off (cum)
1.	Roof top	5362.16	0.9	0.06	289.6
2.	Green	6542.00	0.1	0.06	39.3
3.	Paved Areas	8,339.04	0.7	0.06	350.2
Total Run-off					679
Retention Time					15 min
Available Run-off in 15 min					170
Volume of RWH System -cum					34
Nos. of Pits Provided					5

1.10 VEHICLE PARKING FACILITIES

Adequate road network and parking facility is proposed to be provided at the site. Total parking area at the site (basement plus ground floor) is 17364.98sq m for residential and commercial area and 550.97 sq m area is provided for parking for EWS tower

1.11 POWER REQUIREMENT

Maximum power demand for the project during construction and operation phase is estimated to be 100 kVA and 2200 KVA respectively. Source of power will be Bihar State Electricity Bboard. DG set of 400 kVA will be provided as power back-up during power failure.

1.12 SOLID WASTE GENERATION AND MANAGEMENT

Construction Phase

Solid waste will be generated both during construction as well as during operation phase. Solid waste generated during construction phase was majorly excavated materials, cement bags, bricks, concrete, MS rods, tiles, wood etc. Construction waste was segregated into re-usable, recyclable and reject fraction. Re-usable waste was stored at site, recyclable material was sold to authorized vendor and rejected material was disposed-off at the designated areas by local body. Solid waste management plan followed is given in **Table 10**.

Table 10: Solid waste management during construction phase

S. No.	Solid waste	Solid waste management
1.	Waste materials like MS Rods, bricks, concrete, broken tiles, wood pieces, cement bags etc.	Construction waste was segregated into recyclable/reusable and discarded material. Recyclable material was sold to authorize dealers. Re-usable material was stored under covered conditions at site and reject was disposed off at the designated locations by local body. Waste was transported in covered vehicles only.
2.	Excavated Soil	Top soil was stripped off and stored in covered condition. Excavated soil of 63770 cum will be reused at site for levelling, filling and landscaping works
3.	Domestic Waste	Domestic waste generated by labour at the site was disposed off through local agencies in the area on daily basis.

Operation phase

During operation phase, waste comprise of municipal waste. It is estimated that approx. 1660 kg per day (0.5 kg per capita per day for the residents& guests, 0.15 kg per capita per day for the visitor. 0.25 kg per capita per day for the staff members, whereas 0.2 kg/acre/day is considered for landscape waste) to be generated from project site. Estimations for solid waste generation during operation phase are given in **Table 11**. Waste management plan is given below.

Table 11: Calculation of Solid Waste Generation

S. No	Description	Occupancy/Area	kg/capita/day	Total Solid Waste Generation (kg/day)	Non-Recyclable (Kg/day)	Recyclable (kg/day)
1.	Residents	3005	0.5	1503	1052	451
2.	Staff	177	0.25	44	31	13
3.	Visitors	530	0.15	70	56	14

4.	Landscape waste	1.62 acres	0.2	0.32	0.32	0
7.	STP sludge	600 KLD Sewage	--	43	43	0
Total Waste Generated				1660.32 ~1660	1182.32 ~1182	478

(Source: For Waste Collection, Chapter 3, Table 3.6, Page no. 49, of Central Public Health & Environment Engineering Organization, Ministry of Urban Development, (Government of India, May 2000))

❖ **Collection, Segregation and treatment of waste**

- Door to door collection system is provided for collection of domestic waste
- Local vendors carry out waste collection, management and disposal
- Separate colored bins for compostable (wet waste), recyclables and rejected waste are provided to residents as well as in common and open areas

❖ **Disposal**

- Rejected fraction of the waste is collected and disposed by local agencies on daily basis at the locations designated by municipal authority. Recyclable waste is sold to authorized vendors by plot owners
- Used oil from DG sets is sold to authorized vendors

1.13 GREEN AREA

Total green area provided at the site is 6542sq m (25% of net plot area). Evergreen native species and ornamental tree species will be planted at the site.

1.14 CONSTRUCTION MATERIAL

Detail of different type of construction material used in the site with their U values is given in **Table 12**. List of machinery which will be used for construction is given below.

Table 12: List of Construction materials

Type of Construction	U values (in W/m ² °C)
Walls	
<i>Brick:</i>	
Plastered both sides	3.24
Solid unplastered	2.67
Plastered both sides	2.24
<i>Concrete, ordinary, Dense:</i>	
-152 mm	3.58
-203 mm	3.18
<i>Concrete block:</i>	
CLC Fly ash block	1.19
<i>Hollow Concrete block, 220 mm, single skin, outside rendered, inside plastered</i>	

CLC Fly ash block	1.70
Roofs Flat:	
Reinforced concrete slab, 100mm, scered 63-12 mm, 3 layers bituminous felt	3.35
Floors:	
Concrete on ground or hardcore fill	1.13
+ Grano, Terrazze or tile finish	1.13
+ Wood block finish	0.85
Exposure South Sheltered:	
Single glazing	3.97
Double glazing 6 mm space	2.67

1.15 LIST OF MACHINERY USED DURING CONSTRUCTION

- Dumper
- Concrete mixer with hopper
- Excavator
- Concrete Batching Plant
- Cranes
- Road roller
- Bulldozer
- Tower Cranes
- Hoist
- Labor Lifts
- Concrete pressure pumps
- Mobile transit mixer