# CONCEPTUAL PLAN / ENVIRONMENTAL MANAGEMENT PLAN
## (CONSTRUCTION OF RESIDENTIAL CUM COMMERCIAL BUILDING COMPLEX)

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CONCEPTUAL PLAN / ENVIRONMENTAL MANAGEMENT PLAN

1. INTRODUCTION

M/s. Adhesives and Chemicals, Chennai developed a Residential Cum Commercial Building Complex located in S.F. No. 129/3A, 130/1, 131/1B1, 132/1, 133 & 134/1A of Porur Village, Maduravoyal Taluk, Thiruvallur District, Tamil Nadu. The total land area available is 9,930 Sq.m and the Total built-up area is 38,574 Sq.m.

The project falls under 8(a) category as per MoEF&CC, EIA Notification on 14th September 2006. We have applied to State Environmental Impact Assessment Authority (SEIAA), Chennai and the file has been delisted by SEIAA as we have started the construction without obtaining prior EC.

As per the Hon’ble NGT, New Delhi direction and its vide reference Order dated 27.11.2017 in the matter of O.A. No. 570 of 2016 (Earlier Original Application No. 288 of 2016), O.A No. 576 of 2016 (M.A. No. 1444/2016) and O.A No. 579 of 2016 (M.A. No. 1443/2016) - M/s Adhesives and Chemicals resubmitting to SEIAA, TN for obtaining Environmental Clearance for the above said project. In order to obtain the Environmental Clearance from the SEIAA, the project proponent has engaged the services of M/s. Eco Services India Private Limited, Chennai for preparing Environmental Management plan for the above said residential cum commercial building complex.

2. PROJECT SITE DESCRIPTION

The site located adjacent to Arcot Road in Porur Village, Maduravoyal Taluk, Thiruvallur District, Tamil Nadu. The project does not include any environmental sensitive area. The environmental settings of the site are given below:

<table>
<thead>
<tr>
<th>Details of Environmental Setting</th>
</tr>
</thead>
<tbody>
<tr>
<td>S. No.</td>
</tr>
<tr>
<td>-------</td>
</tr>
<tr>
<td>1.</td>
</tr>
<tr>
<td>2.</td>
</tr>
<tr>
<td>3.</td>
</tr>
<tr>
<td>4.</td>
</tr>
<tr>
<td>5.</td>
</tr>
<tr>
<td>6.</td>
</tr>
<tr>
<td>7.</td>
</tr>
<tr>
<td>8.</td>
</tr>
</tbody>
</table>

3. PROJECT COMPONENTS

The proposal involves construction of Residential Cum Commercial Building Complex with a total built up area of 38,574 Sq.m. in a land area of 9,930 Sq.m. The detailed break-up of Land and Total Built-up Area are given below:
Break-up of Land Area for the Residential Building Complex:

Total Land Area:

<table>
<thead>
<tr>
<th>S. No</th>
<th>Description</th>
<th>Area in Sq.m</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Total Land Area</td>
<td>9,930</td>
</tr>
<tr>
<td>2</td>
<td>b) Total Ground Coverage Area of Buildings</td>
<td>3493</td>
</tr>
<tr>
<td>3</td>
<td>c) Roads and Pavements Area</td>
<td>2710</td>
</tr>
<tr>
<td>4</td>
<td>d) Surface Parking Area</td>
<td>919</td>
</tr>
<tr>
<td>5</td>
<td>e) STP, Solid Waste Disposal and Other Utilities Area</td>
<td>200</td>
</tr>
<tr>
<td>8</td>
<td>f) Greenbelt/Garden/Landscape Area (excluding OSR)</td>
<td>909</td>
</tr>
<tr>
<td>9</td>
<td>g) OSR Area</td>
<td>998</td>
</tr>
<tr>
<td>10</td>
<td>h) Gifted Road</td>
<td>701</td>
</tr>
</tbody>
</table>

Break-up of Total Built-up Area for the Residential Building Complex:

<table>
<thead>
<tr>
<th>Building Description</th>
<th>No. of floors</th>
<th>Dwelling Units</th>
<th>FSI area</th>
<th>Non FSI area</th>
<th>Parking area</th>
</tr>
</thead>
<tbody>
<tr>
<td>Residential Block</td>
<td>Basement 1 &amp; 2, Stilt + 11 Floors</td>
<td>-</td>
<td>17,158</td>
<td>1154</td>
<td>7,105</td>
</tr>
<tr>
<td>Commercial Block</td>
<td>Basement 1 &amp; 2, Ground Floor + 8 Floors</td>
<td>128</td>
<td>8,372</td>
<td>593</td>
<td>3,692</td>
</tr>
<tr>
<td>Service &amp; Utility Area</td>
<td>-</td>
<td>-</td>
<td>500</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Total Built-up Area</td>
<td>128 Nos.</td>
<td>25,530</td>
<td>2247</td>
<td>10797</td>
<td></td>
</tr>
</tbody>
</table>

4. WATER REQUIREMENT & WATER BALANCING

The total water requirement during operation phase is **74 KLD** and this will be met through the daily supply from **Chennai Metropolitan Water Supply & Sewerage Board (CMWSSB)**. The wastewater generation from the project is estimated to be about **129 KLD**, which will be treated in sewage treatment plant of capacity **135 KLD (90 KLD 1 no. & 45 KLD 1 no.)** and will be recycled for flushing, gardening and excess water will be discharged to **CMWSSB sewerage system**. The estimation of water requirement and the water balance chart is shown in table below: The details of proposed STP are enclosed as **Annexure - IX**.
## Water Demand Calculation

### Water Requirement calculation:

<table>
<thead>
<tr>
<th>Project component</th>
<th>No. of units</th>
<th>Occupancy Rate @</th>
<th>Total Occupancy</th>
<th>Fresh water requirement (Lts/day)</th>
<th>Recycled water requirement (Treated Sewage) (Lts/day)</th>
<th>Total water Requirement (Lts/day)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Residential Block</td>
<td>128</td>
<td>5</td>
<td>640</td>
<td>90 LPCD</td>
<td>45 LPCD</td>
<td>86,400</td>
</tr>
<tr>
<td>Maintenance Staff and visitors</td>
<td>10% of total residential population</td>
<td>64</td>
<td>15 LPCD</td>
<td>30 LPCD</td>
<td>2,880</td>
<td></td>
</tr>
<tr>
<td>Club house</td>
<td>32</td>
<td>5</td>
<td>32</td>
<td>5 LPCD</td>
<td>10 LPCD</td>
<td>480</td>
</tr>
<tr>
<td>Swimming pool</td>
<td></td>
<td></td>
<td>1000</td>
<td>0</td>
<td>3000</td>
<td>3000</td>
</tr>
<tr>
<td>Green Belt Development</td>
<td></td>
<td></td>
<td></td>
<td>0</td>
<td>3000</td>
<td>3000</td>
</tr>
<tr>
<td></td>
<td>Sub-Total</td>
<td></td>
<td>59,720</td>
<td>Say 60 KLD</td>
<td>34,040</td>
<td>93760 Say 94 KLD</td>
</tr>
<tr>
<td>Commercial Block</td>
<td>1 person/ 10 sq.m.</td>
<td>862</td>
<td>15 LPCD</td>
<td>30 LPCD</td>
<td>38,790</td>
<td></td>
</tr>
<tr>
<td>Maintenance Staff and visitors</td>
<td>10% of total population</td>
<td>86</td>
<td>15 LPCD</td>
<td>30 LPCD</td>
<td>3,870</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Sub-Total</td>
<td></td>
<td>14,220</td>
<td>Say 14 KLD</td>
<td>28,440</td>
<td>42,660 Say 42 KLD</td>
</tr>
<tr>
<td></td>
<td>Grand Total</td>
<td></td>
<td>73,940</td>
<td>Say 74 KLD</td>
<td>62480</td>
<td>1,36,420 Say 136KLD</td>
</tr>
</tbody>
</table>
**Water Balance Chart: Residential Block**

- **Fresh Water Requirement**: 60 KLD
  - Domestic (NF): 59 KLD
  - Flushing: 31 KLD
  - Green Belt Development: 3 KLD
  - Swimming pool: 1 KLD
  - Disposed to CMWSSB Sewer: 50 KLD
  - STP Capacity: 90 KLD

**Water Balance Chart: Commercial Block**

- **Fresh Water Requirement**: 14 KLD
  - Domestic (NF): 14 KLD
  - Flushing: 28 KLD
  - Disposed to CMWSSB Sewer: 11 KLD
  - STP Capacity: 45 KLD
Over all Water Balance Chart:

Swimming Pool Treatment Arrangements:
The proposed project consists of one swimming pool and the daily top up water requirement for swimming pool is 1000 liters/day. Swimming pool is provided with micron and sand filtration system for pretreatment and algaecides, fungicides is used to prevent fungal and algal contamination in the swimming pool, the residual chlorine at concentration of 1ppm will be maintained in the swimming pool.

5. SOLID WASTE MANAGEMENT

The solid waste from the development will comprises of biodegradable wastes like domestic food waste, horticultural waste and recyclable waste like plastics, paper etc. As per the manual on municipal solid waste prescribed by Central Public Health and Environmental Engineering Organization (CPHEEO), the quantity of solid waste generated varies between 0.2-0.6 kg / capita / day. Quantity of solid waste generated from the proposed residential building is given below:
Quantity of solid waste generated from the project is given below:

<table>
<thead>
<tr>
<th>Sl. No.</th>
<th>Project Components</th>
<th>Total Apartments</th>
<th>Occupancy Load</th>
<th>Per Capita generation</th>
<th>Total solid Waste generation Kg/day</th>
<th>Total Bio Degradable Waste generation Kg/day</th>
<th>Total Non Bio Degradable Waste generation Kg/day</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Residential Block</td>
<td>128</td>
<td>640</td>
<td>0.6</td>
<td>384</td>
<td>230</td>
<td>154</td>
</tr>
<tr>
<td>2</td>
<td>Maintenance &amp; Visitors population (10% of Resident population)</td>
<td>64</td>
<td>0.2</td>
<td>13</td>
<td>8</td>
<td>5</td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>Club house (5% of Resident population)</td>
<td>32</td>
<td>0.1</td>
<td>3</td>
<td>2</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>STP Sludge</td>
<td></td>
<td></td>
<td></td>
<td>9</td>
<td>9</td>
<td>-</td>
</tr>
</tbody>
</table>

Sub-Total Waste Generation in Kg/day = 409 + 249 + 160 = 818 Kg/day

Details of Generation of solid waste and E-waste from the commercial buildings (Retail shops & Office Buildings):

**Retail shops: (2 floors):**
- Total floor area: 8,000 Sq.ft. x 2 floors = 16000 Sq.ft
- No. of working population: 100 peoples
- Quantity of biodegradable solid waste generation: 200 Kg/day (@2kg/percapita/day)
- Quantity of non-biodegradable solid waste generation: 100 Kg/day (@1 kg/percapita/day)

**Office Space: (7 floors):**
- Total floor area: 8,000 Sq.ft. x 7floors = 56000 Sq.ft
- No. of working population: 560 peoples
- Quantity of biodegradable solid waste generation: 120 Kg/day (@0.2kg/percapita/day)
- Quantity of non-biodegradable solid waste generation: 40 Kg/day (@0.07 kg/percapita/day)
- E-waste generation: 432 Kg/Annum (1.2 kg/day)

<table>
<thead>
<tr>
<th>S. No</th>
<th>Description</th>
<th>Quantity (Kg/day)</th>
<th>Mode of treatment / disposal</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Biodegradable waste (Fruits, Vegetables, food)</td>
<td>320</td>
<td>Treated in Organic Waste Converter (OWC) and manure will be used for Green</td>
</tr>
</tbody>
</table>
Wastes generated from the households will be segregated into Bio degradable waste and non-biodegradable waste in the source itself (by the occupants) in separate bins. The wastes from such bins are collected separately on daily basis and taken to a separate centralized collection facility by the agency dealing in collection and disposal of garbage. The Bio degradable waste will be collected, segregated and treated in Organic Waste Converter (OWC) and manure used for green belt development. Non bio degradable waste will be handed over to authorized recyclers or local bodies for disposal.

### 6. AIR POLLUTION CONTROL MEASURES

**Construction Phase:**

The impact on air quality during construction phase of the project due to the air emissions like PM$_{2.5}$, PM$_{10}$, CO, NOx and SO$_2$ due to material handling, vehicular movements and other site activities. The particulate matter was reduced by frequent sprinkling of water on the road surfaces and on other areas where dust arises due to material handling. Necessary steps has been taken to maintain all the equipments and vehicles used in the construction and transportation of materials was in proper condition to reduce the emissions and thereby prevent pollution. Low Sulphur diesel was used for the construction equipments.

The emissions from the DG sets used during construction were let out through the stacks installed with adequate heights to avoid the deposition of the particulate matters and other
pollutants by facilitating the dispersion of pollutants into the atmosphere. The stacking of all the construction materials were covered and confined within the proposed project site to avoid air emissions.

The noise generated from the construction equipments were reduced through proper maintenance of the equipments, confining the construction activities only during the day time and providing barricades all around the project area. The adverse impacts of noise on construction workers were reduced by providing ear mufffs to the workers in high noise zones. Noise and vibration control systems such as equipment foundation pads, dampeners, silencers and acoustic enclosures was adopted during construction phase.

**Operation Phase:**

Air emissions are observed during the operation phase of the project. The air emissions will be reduced by ensuring smoother flow of traffic within the premises by better traffic management plans. It is proposed to have trees all through the boundaries of the site and along the either side of the internal roads. This will reduce the particulate matters from being transported to the nearby areas. The air emissions from the Diesel Generators will be controlled by using low Sulphur content high speed diesels, periodic maintenance of DG sets as per the defined schedule of manufacturer and by providing adequate stack heights as prescribed by CPCB.

The main source of air emissions from the proposed residential development is the Generator Set, we are proposing the DG sets with capacity of 250 KVA : 1 no. & 750 KVA : 1 no., 160 KVA : 1 no. & 82.5 KVA : 1 no. for our project and the DG will be used only during TNEB power failure. To control the air emissions from these D.G sets, adequate stack height is provided to release the exhaust flue gases into the atmosphere at a height at which efficient dispersion takes place. Since the DG sets are operated only during power failure, the emission is not continuous and hence the impact due to these emissions is insignificant.

The stack height for the DG sets are calculated based on the CPCB guidelines as shown below;

Height of the Stack \( H \) = \( h + (0.2) (\text{KVA})^{0.5} \)

Where, \( h \) = Total height of stack in meters from ground level

\( h \) = height of the building in meters

(Ref: Environmental Standards for Ambient Air, Automobiles, Fuels, Industries and Noise, Chapter: 22.0 Diesel Generator sets : Stack Height by CPCB, MoEF July 2000)

**Residential Block:**

**Stack Height Design Calculation for 82.5KVA Generator Set**

\[
H = 38.70 + 0.2 (82.5)^{0.5} \\
= 38.70 + 0.2(9.08) \\
= 40.52 \\
Say 43
\]

Where, \( H \) = Total height of stack in meters from ground level

\( h \) = height of the building in meters
The stack height required as per CPCB norms is 41m. Stack height provided –43m

**Stack Height Design Calculation for 160 KVA Generator Set**

\[
H = 38.70 + (0.2) \times (KVA)^{0.5}
\]

\[
= 38.70 + 0.2 \times (160)^{0.5}
\]

\[
= 38.70 + 0.2 \times 12.65
\]

\[
= 41.23
\]

Say 43

Where, \(H\) = Total height of stack in meters from ground level

\(h\) = height of the building in meters

The stack height required as per CPCB norms is 41m. Stack height provided –43m

**Commercial Block:**

**Stack Height Design Calculation for 250 KVA Generator Set**

\[
H = 38.70 + (0.2) \times (KVA)^{0.5}
\]

\[
= 38.70 + 0.2 \times (250)^{0.5}
\]

\[
= 38.70 + 0.2 \times 15.81
\]

\[
= 41.87
\]

Say 44

Where, \(H\) = Total height of stack in meters from ground level

\(h\) = height of the building in meters

The stack height required as per CPCB norms is 42m. Stack height provided –44m

**Stack Height Design Calculation for 750 KVA Generator Set**

\[
H = 38.70 + (0.2) \times (KVA)^{0.5}
\]

\[
= 38.70 + 0.2 \times (200)^{0.5}
\]

\[
= 38.70 + 0.2 \times (750)
\]

\[
= 44.17
\]

Say 45

Where, \(H\) = Total height of stack in meters from ground level

\(h\) = height of the building in meters

The stack height required as per CPCB norms is 45m. Stack height provided –47m

7. **NOISE CONTROL AND MANAGEMENT**

**Construction Phase:**

The noise generated from the construction equipments was reduced through proper maintenance of all the equipments which was involved in construction activities, confined the construction activities only during the day time and provided barricades all around the project area. The adverse impacts of noise especially on workers has been reduced by providing ear muffs to the workers in high noise zones. Noise control systems such as equipment foundation pads, dampeners, silencers and acoustic enclosures was used for individual units as per the requirement to minimize the noise & vibration.
Operation Phase:

The increase in the ambient noise levels due to the vehicle transportation will be controlled by the development of the green cover all along the internal roads and by implementing better traffic management plans inside the site premises. The better traffic management plans will significantly reduce the noise generated due to the congestion caused by the movement of vehicles.

The generator noise is controlled by providing acoustic enclosures. Proper air ventilation system is designed to allow the maximum aspiration and cooling airflow required so that the engines do not overheat. Axial flow fan of required size & numbers provided for proper air ventilation. Acoustic louvers, splitter & insulated ducts are provided to suppress the noise where required.

8. STORM WATER MANAGEMENT

Construction Phase:

The surface runoff during the construction phase was directed into the drains that has been created temporarily for this purpose. During operation phase of the project, it is proposed to undertake rainwater harvesting to the extent possible.

Operation Phase:

Keeping in mind the importance of water and its scarcity it is proposed to conserve water by rainwater harvesting by which the subsoil water condition during the operation phase of the project. It is proposed to harvest the runoff, from the roof top after suitable pretreatment and reused when required. The treatment system for the rainwater harvesting will consist of sand, gravel and boulders. The surface runoff would be directed through the drains and would be percolated to the subsurface by construction of percolation pits along the boundary of the project site. The extent of storm water runoff and its management are presented below.

*Design of capacity of recharge tank for commercial block*

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Surface area of roof top catchment (A)</td>
<td>833 Sq.m</td>
</tr>
<tr>
<td>Peak rainfall in 15 min (r)</td>
<td>40 mm</td>
</tr>
<tr>
<td>Runoff co-efficient</td>
<td>0.90</td>
</tr>
</tbody>
</table>

(In Chennai Region, peak hourly rainfall is 160 mm (2015) – IMD, Chennai)

\[
\text{Capacity of the tank} = A \times r \times C
\]

\[
= 833 \text{ Sq.m} \times 0.040 \text{ m} \times 0.90 \text{ m}
\]

\[
= 29.988 \text{ Cu.m} \quad \text{(Say 30 Cu.m)}
\]

Capacity of the tank required : 30 Cu.m
Capacity of the storage tank provided : 30 Cu.m
(Recharge tank to retain runoff for at least 15 minutes of rainfall of the peak intensity. (Ref. Chapter 4, Design of Storage / Settlement Tanks, Pg. no. 19 & 20, in Rain Water Harvesting and Conservation Manual by CPWD, GOI)

**Design of capacity of recharge tank for residential block**

Surface area of roof top catchment (A) : 1612 Sq.m  
Peak rainfall in 15 min (r) : 40 mm  
(In Chennai Region, peak hourly rainfall is 160 mm (2015) – IMD, Chennai)  
Runoff co-efficient : 0.90  
Capacity of the tank : A x r x C  
: 1612 Sq.m x 0.040 m x 0.90 m  
: 58.032 Cu.m (Say 60 Cu.m)  
Capacity of the tank required : 60 Cu.m  
Capacity of the storage tank provided : 60 Cu.m

(Recharge tank to retain runoff for at least 15 minutes of rainfall of the peak intensity. (Ref. Chapter 4, Design of Storage / Settlement Tanks, Pg. no. 19 & 20, in Rain Water Harvesting and Conservation Manual by CPWD, GOI)

**Estimation of Runoff**

Average annual rainfall for Chennai Region : 1100 mm/annum  
Based on the annual rainfall days, average daily rainfall is : 30 mm/day

<table>
<thead>
<tr>
<th>S. No.</th>
<th>Description</th>
<th>Area (Sq.m)</th>
<th>Runoff Coefficient</th>
<th>Rainfall Intensity (m/hr)</th>
<th>Runoff (Cum/day)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Rooftop Area</td>
<td>3,493</td>
<td>0.9</td>
<td>0.03</td>
<td>94</td>
</tr>
<tr>
<td>2</td>
<td>Roads &amp; Pavement</td>
<td>3,884</td>
<td>0.8</td>
<td>0.03</td>
<td>93</td>
</tr>
<tr>
<td>3</td>
<td>Landscape &amp; Garden Area</td>
<td>854</td>
<td>0.3</td>
<td>0.03</td>
<td>8</td>
</tr>
<tr>
<td></td>
<td><strong>Total</strong></td>
<td></td>
<td></td>
<td></td>
<td><strong>195</strong></td>
</tr>
</tbody>
</table>

**Design of recharge pits**  
Dimension of recharge pit (Diameter) : 1.2 m  
Surface area of recharge pit : 1.13 Sq.m  
Surface area of side wall : 0.36 Sq.m  
Total area available for recharge : 1.49 Sq.m  
Infiltration rate of sand : 1 – 5 m/day (Considering 3 m/day)  
Recharge capacity per pit : 1.49 Sq.m x 3 m/d  
: 4.47 Cu.m/d

(Normally 50 % of total quantum of rainfall in catchment area should be considered to beside the number and size of percolation tanks - Ref. Chapter 2, Rain Water Harvesting, Pg. no. 11, in Rain Water Harvesting and Conservation Manual by CPWD, GOI)
50% of total quantum of rainfall in catchment area: 98 Cu.m/d
No. of recharge pits required: 98 Cu.m/d / 4.47 Cu.m/d = 22 no. of pits.
No. of recharge pits already constructed: 17 nos.
No. of recharge pits to be constructed: 5 nos.

The depth of coarse sandy horizon is intersected at the depth of 4.75 m. The discharge pipe in the rainwater harvesting pipes has been penetrated upto the depth of 6.0 m. The depth of water table in the project site is 6.5 m during post monsoon period and the 7.1 m during pre monsoon period.

**Internal Storm Water Drain**

100% of total quantum of rainfall in catchment area is considered for calculation of drainage system to avoid flooding within the project site. (Ref. Appendix A 3.1, Computation of Storm Runoff and Design of Storm Sewer, in Part A:Engineering - Appendix, Manual on sewerage and sewage treatment systems)

Estimated runoff from project site: 195 Cu.m/d = 0.002257 Cu.m/sec
(The trench may be 0.5 to 1.0 m wide 1 to 1.5 m deep - Ref. Chapter 5, Re-Charge Structure and Its design, Pg. no. 23, in Rain Water Harvesting and Conservation Manual by CPWD, GOI)

Cross section of drainage system: 0.6 m x 0.5 m = 0.3 Sq.m
Carrying capacity of the open flow channel is based on Manning’s equation as follows:

\[ Q = A \times V, \]

Where,

- \( Q \) = Discharge in Cu.m/sec
- \( A \) = Area in Sq.m
- \( V \) = Velocity in m/sec

\[ V = \frac{2}{n} \times R^{2/3} \times S^{1/2} \]

where, \( n \) = Manning’s Coefficient (For concrete finished surface = 0.013)

- \( R \) = Hydraulic Radius in m (\( R = A/P \), where \( P \) = Wetted Perimeter in m)
- \( S \) = Channel slope in m/m

For the Residential Development,

- \( n = 0.013 \)
- \( A = 0.30\text{ Sq.m} \) (Width = 0.6 m, Depth = 0.5 m)
- \( P = 0.6 + (2 \times 0.5) = 1.6\text{ m} \)
- \( R = A/P = 0.3 / 1.6 = 0.1875\text{ m} \)
- \( S = 1/300 = 0.0033 \)

\[ V = \frac{2}{0.013} \times 0.1875^{2/3} \times 0.0033^{1/2} = 1.447\text{ m/sec} \]

\[ Q = A \times V = 0.30 \times 1.447 = 0.4341\text{ Cu.m/sec} \]

Thus, the provided internal storm water drainage system is adequate to handle to runoff from the project site.

The plan showing the storm water drainage and the rainwater harvesting system is enclosed herewith as **Annexure - VII.**
9. LANDSCAPE AND ECOLOGICAL MANAGEMENT

It is proposed to have a landscape area of around 909 Sq.m. It is also proposed to plant only the native species of plantations. In addition to augmenting present vegetation, it will also check soil erosion, make the ecosystem more diversified and functionally more stable, make the climate more conducive and restore balance.

The following species are proposed for the plantations in the site. Adequate numbers of these species will be planted in the Landscape and along the boundaries of the site and along the either sides of the internal roads.

<table>
<thead>
<tr>
<th>Botanical Name</th>
<th>Common Name</th>
<th>No. of Trees</th>
</tr>
</thead>
<tbody>
<tr>
<td>Azadirachta indica</td>
<td>Neem tree</td>
<td></td>
</tr>
<tr>
<td>Ficus religiosa</td>
<td>Peepal tree</td>
<td></td>
</tr>
<tr>
<td>Mimusops elengi</td>
<td>Bullet wood tree</td>
<td></td>
</tr>
<tr>
<td>Albizia lebbeck</td>
<td>Lebbek tree</td>
<td>250 Nos.</td>
</tr>
<tr>
<td>Pongamia pinnata</td>
<td>Pongam tree</td>
<td></td>
</tr>
<tr>
<td>Thespesia populnea</td>
<td>Portia tree</td>
<td></td>
</tr>
<tr>
<td>Calaphyllum inophyllum</td>
<td>Punnai tree</td>
<td></td>
</tr>
<tr>
<td>Millingtonia hortensis</td>
<td>Indian cork tree</td>
<td></td>
</tr>
</tbody>
</table>

10. SOCIO ECONOMIC DEVELOPMENT PLAN

Construction Phase:

Only locally available work force are used for the construction purpose. This was result in the improved economic condition of the people of that area during the construction period. Medical checkups has been done at regular intervals to all the employees working. Trained first aid personnel were made available round the clock throughout the construction phase. The safety procedures were made available with the respective shift in charges and pasted in the workplaces.

All the employees involved in the construction activities were provided with the necessary Personal Protective Equipments (PPE) and instated to use it. Occupational health and safety orientation training were given to all employees consisting of basic hazard awareness, site-specific hazards, safe working practices, and emergency procedures

Monthly safety assessment meetings were conducted to identify potential safety issues (e.g., site access, construction, work practices, security, transportation of heavy equipment, traffic management, emergency procedures and fire control and management) and measures to mitigate them.
Operation Phase:

The people of the locality, especially men & women would be employed in the Residential Construction Project as service providers/maintenance staffs. The project also stimulates the auxiliary developments around the project area. This will result in the development of necessary infrastructure and amenities at least around the project site. These will in-turn result in the improvement of economy in the locality which will increase the local living standards.

11. POWER REQUIREMENT & ENERGY CONSERVATION

The power requirement during operation is about 1800 KVA and it will be sourced from the nearby TNEB grid which will be distributed through the transformers within our premises. For emergency purposes, DG sets with individual stack along with inbuilt acoustic measures as per the CPCB/TNPCB requirements is provided. The stack height of DG sets is provided as per CPCB norms. Power requirement during construction phase will be sourced from TNEB through a temporary connection and backed by DG set of necessary capacity by the contractor.

ENERGY CONSERVATION

Energy conservation will be one of the focuses during the project planning and operation stages.

Energy Saving Practices

- Use of capacitor banks power factor improvement of EB power
- Use of low loss transformers (Copper Wound type)
- Solar lighting is considered partly for external lighting.

Energy Conservation Measures

Building Construction Data:

In accordance with Energy Conservation Building (ECBC) Code 2007 norms, Chennai comes under warm & humid climate zone. Hence, based on the ECBC norms, U Values considered are as follows:

Roofs & Opaque Walls:

Roofs and opaque walls shall comply with either the maximum assembly U-factor or the minimum insulation R-value. R-value is for the insulation alone and does not include building materials or air films. The roof insulation shall not be located on a suspended ceiling with removable ceiling panels.
The U-values of the roof and opaque wall of the building will meet the requirements as specified in the Energy Conservation Building Code (ECBC)

<table>
<thead>
<tr>
<th>ECBC Clause: (Reference)</th>
<th>Component</th>
<th>Permissible U-Value as per ECBC (W/m²°C)</th>
<th>Resultant Value due to the proposed configuration (W/m²°C)</th>
</tr>
</thead>
<tbody>
<tr>
<td>4.3.1</td>
<td>Roof</td>
<td>U-0.261</td>
<td>R-3.5</td>
</tr>
<tr>
<td>4.3.3</td>
<td>Wall</td>
<td>U-0.44</td>
<td>R-2.1</td>
</tr>
</tbody>
</table>

**Vertical Fenestration**

Vertical fenestration shall comply with the maximum area weighted U-factor and maximum area weighted SHGC requirement. Vertical fenestration area is limited to a maximum of 60% of the gross wall area for the prescriptive requirement.

<table>
<thead>
<tr>
<th>Description</th>
<th>WWR=40%</th>
<th>40% &lt;WWR&lt;=60%</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Maximum U-factor</td>
<td>Maximum SHGC</td>
</tr>
<tr>
<td>Glass</td>
<td>3.3</td>
<td>0.25</td>
</tr>
</tbody>
</table>

**Electrical & LV Systems**

a. Copper conductor cables are specified for sizes of 16 sq mm and below, this will reduce losses and improve reliability.

b. All lifts shall be provided with AC variable voltage, variable frequency drives (ACVVF).

c. Power factor shall be maintained 0.86 or higher. This will reduce electrical power distribution losses in the installation.

d. Timers and photo-electric sensors shall be used to switch ON / OFF external landscape and facade lighting.

e. Compact Fluorescent Lamps (CFL’s) with high frequency ballast shall be used for plant rooms, corridors and BOH areas.

f. Energy efficient fluorescent tube lights (T-5) shall be used for wherever fluorescent tube is required.

g. All fluorescent light fixtures are specified to incorporate electronic chokes which have less watt-loss compared to electro-magnetic chokes and result in superior operating power factor. This indirectly saves energy. Electronic chokes also improves life of the fluorescent lamps.

h. All fluorescent light fixtures are specified to incorporate high frequency ballast. Due to high frequency ballast fluorescent tube consume less energy.

i. Energy efficient fluorescent lamps & CFL lamps which give approx. 30% more light output for the same watts consumed and therefore require less nos. of fixtures and corresponding lower point wiring costs.

j. An APFC relay based on thruster switching is proposed to effect the power factor correction / improvement within a few cycles of deviation from the setting & also to reduce inrush currents.
k. Transformers shall have minimum no load losses as compared to conventional transformers.

l. All cables shall be derated to avoid heating during use. This also indirectly reduces losses and improves reliability.

**Plumbing & Fire Fighting:**

a. Efficient condensate return & recovery system for domestic hot water.
b. Pumps & equipment selected on “best” energy efficiency point.

**Energy Conservation Measures:**

<table>
<thead>
<tr>
<th>Sl. No.</th>
<th>Description</th>
<th>Using Conventional Light Fixtures</th>
<th>Using Energy Saving Light Fixtures</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Total load in watts</td>
<td>Total load in watts</td>
</tr>
<tr>
<td>1</td>
<td>Car parking area</td>
<td>10000</td>
<td>6000</td>
</tr>
<tr>
<td></td>
<td></td>
<td>10000</td>
<td>6000</td>
</tr>
<tr>
<td>2</td>
<td>Electrical room lighting</td>
<td>320</td>
<td>279</td>
</tr>
<tr>
<td>3</td>
<td>Total floor corridor lighting</td>
<td>21600</td>
<td>17008</td>
</tr>
<tr>
<td>4</td>
<td>Total staircase, lift well &amp; head room.</td>
<td>2400</td>
<td>2040</td>
</tr>
<tr>
<td></td>
<td></td>
<td>400</td>
<td>344</td>
</tr>
<tr>
<td></td>
<td></td>
<td>2560</td>
<td>2200</td>
</tr>
<tr>
<td>5</td>
<td>Club house, security &amp; motor room</td>
<td>400</td>
<td>350</td>
</tr>
<tr>
<td></td>
<td></td>
<td>3200</td>
<td>2820</td>
</tr>
<tr>
<td></td>
<td></td>
<td>4200</td>
<td>3350</td>
</tr>
<tr>
<td>6</td>
<td>Total garden light &amp; gate light.</td>
<td>2940</td>
<td>2558</td>
</tr>
<tr>
<td></td>
<td></td>
<td>1200</td>
<td>1030</td>
</tr>
<tr>
<td></td>
<td></td>
<td>400</td>
<td>325</td>
</tr>
<tr>
<td>7</td>
<td>Renewable Energy (Solar)</td>
<td>-</td>
<td>910</td>
</tr>
<tr>
<td>8</td>
<td>Total Energy Consumption</td>
<td>56660</td>
<td>45214</td>
</tr>
<tr>
<td></td>
<td></td>
<td><strong>Percentage of Energy saving</strong></td>
<td><strong>20.2 %</strong></td>
</tr>
</tbody>
</table>

**12. PARKING REQUIREMENT & TRAFFIC ANALYSIS**

**Parking:**
Following are the details of car parking and two wheeler parking proposed to be provided. This satisfies the prevailing parking norms of Chennai Metropolitan Development Authority (CMDA)

<table>
<thead>
<tr>
<th>Location</th>
<th>Two wheeler Parking (Nos.)</th>
<th>Car Parking (Nos.)</th>
<th>Parking Area (Sq.m)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Surface &amp; Stilt</td>
<td>101</td>
<td>102</td>
<td>1396</td>
</tr>
</tbody>
</table>
Traffic Analysis:

Traffic assessment of the road abutting the project site (i.e., Arcot Road) was carried out to estimate the peak traffic load. The existing traffic load during the morning and evening peak hours were studied and the vehicle counts were categorized under different heads. The different categories of vehicular load were converted to PCU equivalents by applying the respective “M” factors. The peak traffic load in terms of PCUs was arrived and the incremental traffic due to the project was worked out. This projected traffic load (incremental) was compared with the standard carrying capacity of the existing road. It was observed that the ratio between Volume and Capacity (V/C ratio) was well within the limits. Hence the impact of the traffic due to the proposed project is insignificant. The detail of the traffic assessment is presented below.

<table>
<thead>
<tr>
<th>Existing Traffic Load in SH-121 Road PCUs/Hr</th>
<th>Increase in Vehicular Population due to the Proposed development</th>
<th>Estimated Future Traffic Volume (V) (Two sides Entry)</th>
<th>Capacity of Existing Road in PCUs per Hour as per IRC 106-1990 (C)</th>
<th>V/C Ratio</th>
</tr>
</thead>
<tbody>
<tr>
<td>MP- 1535, EP-1680</td>
<td>379 PCUs/Hr</td>
<td>MP- 1914, EP-2059</td>
<td>2900 PCU</td>
<td>0.66</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>0.71</td>
</tr>
</tbody>
</table>

Legend:
PCU - Passenger Car Unit
MP - Morning Peak hour Traffic Volume in PCU
EP - Evening Peak hour Traffic Volume in PCU

13. FIRE PROTECTION MEASURES

Basis / Concept of Design

The fire fighting arrangement is designed as per the requirement of local guidelines, NBC & Engineering Design Standard. The entire fire fighting installation is compliant with the most
stringent codes / standard for the entire building to ensure the highest safety standard and uniformity of system. Further, before property is opened to public, the fire fighting system shall be fully operated and tested under simulated conditions to demonstrate compliance with the most stringent standards, codes and guidelines.

Following functional system is proposed to be provided; strictly in compliance with the listed reference standards:

<p>| | | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>a.</td>
<td>Piping System</td>
<td>Piping system confirming to IS: 1239 (Class-B), IS: 3589 (4.85mm thk for pipe size &gt; 150NB) &amp; IS 10221 M.S. Medium Class for Hydrant and sprinkler system.</td>
</tr>
<tr>
<td>b.</td>
<td>Fire water static Storage</td>
<td>Fire water static storage has been provided in accordance to NBC requirement.</td>
</tr>
<tr>
<td>c.</td>
<td>Fire Pumping system</td>
<td>Pumping system comprising of independent pumps for hydrant, sprinkler &amp; jockey application has been provided.</td>
</tr>
<tr>
<td>d.</td>
<td>Hydrant system</td>
<td>External &amp; internal hydrant complete with hose reel.</td>
</tr>
<tr>
<td>e.</td>
<td>Sprinkler system</td>
<td>Sprinkler rating and type shall be selected for respective areas</td>
</tr>
<tr>
<td>f.</td>
<td>Hand held fire Extinguishers</td>
<td>Strategically placed at designated areas.</td>
</tr>
</tbody>
</table>

14. DISASTER/RISK ASSESSMENT AND MANAGEMENT PLAN

A well - defined Risk Management Plan is made as follows:

**STEP 1: Define the Projects/Tasks**

- *Site Clearing*
- *Excavation*
- *Raft*
- *RCC slab*
- *Block work / plastering*
- *External plastering*
- *Joinery - frame fixing*
- *Flooring*
- *Interior works*
- *Windows fixing*
- *Flooring*
- *False ceiling*
- *Painting*
- *Services*

I Electrical
II Plumbing
III Fire fighting
- **Equipments**

  Elevator  
  STP /WTP  
  Hard and land scape

**STEP 2: Identify the Hazards**

**a) Are you using (Tick boxes)**

- [ √ ] plant/equipment  
- [ √ ] portable electrical equipment  
- [ x ] pressure vessels/boilers  
- [ x ] hazardous substances  
- [ √ ] scaffolding  
- [ √ ] ladders  
- [ √ ] lifts/hoists/cranes/dogging/ripping/load shifting machinery

**b) Does the project/task involve (Tick boxes)**

- [ √ ] using tools/equipment with moving part(s)  
- [ √ ] using tools/equipment that vibrate  
- [ x ] working with x-rays, lasers  
- [ √ ] electrical wiring  
- [ x ] asbestos removal  
- [ √ ] welding  
- [ x ] hazardous waste  
- [ √ ] excavation / trenches (>1.5m)  
- [ √ ] working around electrical installations  
- [ √ ] working near traffic  
- [ √ ] working at a height (>3m)  
- [ √ ] working in isolation  
- [ √ ] working in a confined space  
- [ √ ] manual handling  
- [ √ ] repetitive or awkward movements  
- [ x ] lifting or moving awkward or heavy objects

**c) Is there (Tick boxes)**

- [ √ ] noise  
- [ √ ] dust/fumes/vapours/gases  
- [ x ] extreme temperatures  
- [ x ] risk of fire/explosion  
- [ √ ] slippery surfaces/trip hazards  
- [ x ] poor ventilation/air quality  
- [ x ] a poorly designed work area for the project/task

**STEP 3: Assess the Risk**

**During Construction Phase:**

<table>
<thead>
<tr>
<th>Activities</th>
<th>Air Pollution</th>
<th>Water Pollution</th>
<th>Noise Pollution</th>
<th>Soil Pollution</th>
<th>Occupational Hazard</th>
</tr>
</thead>
<tbody>
<tr>
<td>A. Material Handling:</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Cement</td>
<td>+M</td>
<td>-</td>
<td>-</td>
<td>+M</td>
<td>+M</td>
</tr>
<tr>
<td>Steel</td>
<td>-</td>
<td>-</td>
<td>+</td>
<td>-</td>
<td>+M</td>
</tr>
<tr>
<td>Sand</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Stone</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>+L</td>
</tr>
</tbody>
</table>
### Risk Factor:

+ : Positive  
- : Negative  
L : Low  
M : Medium  
H : High

For any projects/tasks that present a high or extreme risk, a Safe Work Method Statement must be completed.

#### STEP 4: Control the Risk

Note how you will control the risk following the priorities listed to the right. This may include controls like redesigning the workplace, using guards or barriers, ventilation, using lifting equipment or personal safety equipment.

- Eliminate the Hazard
- Keep the Hazard and People Apart
- Change the Work Methods
- Use Personal Protection

Note any specific risk assessments required for high-risk hazards. Check whether any hazards noted in step 2 require further assessment or action.

- [ ] hazardous substance risk assessment  
- [ √ ] confined spaces risk assessment  
- [ √ ] test and tag electrical equipment

a) Note Permits/Licenses/Registration required

- [ x ] Demolition work  
- [ x ] Friable asbestos removal  
- [ √ ] Electrical wiring  
- [ x ] Ionizing radiation sources  
- [ x ] Pressure vessels  
- [ √ ] registers for chemicals, Personal protective Equipment, training, ladders, lifting gear

b) Note certificates of competency/licenses for operators
STEP 5: Actions Required to Control the Risk

A. During construction to reduce pollution:

- Manual water sprinkling during dust excavation
- Using RMC to reduce air pollution
- Dust cover for Trucks
- New Construction Machinery
- Equipment will work intermittently
- Rotary drillers instead of acoustic drillers
- Vehicular trips will not be at peak traffic hour
- Ear Plugs to workers
- No noise polluting work in night shifts

B. Safety & Hygienic Measures:

- Adequate drinking water, toilet and bathing facilities
- There will be free medical camps and first aid rooms for workers
- Safety equipments like helmets, safety shoes etc. to personnel and visitors
- Personnel protective equipments like leather gloves, goggles and ear muffs when required
- Personnel working on heights will wear safety equipments and will not work alone
- To prevent any accidents, the entire area under construction will be cordoned off with tin sheets and safety tape is run outside this fence
- Regular pest control will be done
- Adequate fire fighting equipments will be provided

Operational Phase:

Risks in the complex will be due to natural calamities like earthquake, flooding and others such as fire and accidental hazards. All precautions will be taken to control these risks. Fire fighting system shall be provided as per regulations of Chief Fire Officer. For earthquake resistance, the structural design shall be as per is certified as per IS code 875 and IS- 1893-2002 for Seismic Zone 3 of Chennai.
15. HEALTH AND SAFETY MEASURES

15.1 DURING OPERATION PHASE
Following Health and Safety measures are proposed during the construction phase of the project.

a) The impacts on noise levels during operation phase will be primarily due to the vehicular movement and this will be controlled by adopting better traffic management. Acoustic enclosures in DG sets will mitigate the noise.

b) Storm water drain system provided to improve the ground water conditions and the roof runoff will be stored in the sump and reused for household.

c) Pretreatment will be provided to removal suspended solids, Oil & Grease for surface runoff before recharge.

d) The impacts on water quality during the operational phase will be due to sewage generation which will be controlled by sewage treatment plants (STP) provided.

e) Adequate ventilation will be provided to avoid accumulation of gases such as H2S, CH4 and online flow metering system will be installed both inlet and outlet of STP.

f) The impacts on soil will be due to generation household wastes. This will be controlled by adopting proper waste management system.

g) Separate wet and dry bins will be provided at ground level for facilitating segregation of waste.

h) Provision will be made for collection plastic waste, electronic waste and will be disposed to the authorized recyclers.

16. ENVIRONMENTAL MONITORING PLAN

Environmental monitoring plan is a vital process of any management plan of the development project. This helps in signaling the potential problems that resulting from the proposed project and will allow for prompt implementation of effective corrective measures. The environmental monitoring will be required for the operational phases. The main objectives of environmental monitoring area:

To assess the changes in environmental conditions,
To monitor the effective implementation of mitigation measures,
Warn significant deteriorations in environmental quality for further prevention action.

The environmental monitoring plan would be as indicated in the table below:

<table>
<thead>
<tr>
<th>S. No.</th>
<th>Description</th>
<th>Frequency of Sampling and Analysis</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>Ambient Air Quality</td>
<td>Once in three months</td>
</tr>
<tr>
<td>2.</td>
<td>Stack Emissions from DG Set</td>
<td>Once in three months</td>
</tr>
<tr>
<td>3.</td>
<td>Ambient Noise Level</td>
<td>Once in three months</td>
</tr>
</tbody>
</table>
4. Treated Sewage
   Once in a week

5. Ground Water
   Once in three months

17. BUDGETARY ALLOCATION FOR ENVIRONMENTAL MANAGEMENT

The budgetary allocation for environmental management is indicated below:

**Operation Phase:**

<table>
<thead>
<tr>
<th>Description</th>
<th>Capital Expenses (Rs. In Lakhs)</th>
<th>Operational &amp; Maintenance Expenses (Per Annum)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sewage Treatment &amp; Recycling System</td>
<td>70</td>
<td>15</td>
</tr>
<tr>
<td>Rain Water Harvesting System</td>
<td>10</td>
<td>3</td>
</tr>
<tr>
<td>Solid Waste Management</td>
<td>19</td>
<td>4</td>
</tr>
<tr>
<td>Environmental Monitoring</td>
<td>-</td>
<td>2</td>
</tr>
<tr>
<td>Energy Conservation</td>
<td>20</td>
<td>3</td>
</tr>
<tr>
<td>Greenbelt Development</td>
<td>6</td>
<td>1</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>125</strong></td>
<td><strong>28</strong></td>
</tr>
</tbody>
</table>

18. BUDGETARY ALLOCATION FOR CSR ACTIVITIES:

The budgetary allocation for CSR activities 0.5% of the total project cost is furnished below for your kind perusal.

<table>
<thead>
<tr>
<th>Proposed CSR Activity</th>
<th>Description of CSR Activity</th>
<th>Budgetary Allocation (in Lakhs)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Government Boys Higher Secondary School, Porur, Chennai, Tamil Nadu - 600116.</td>
<td>Laboratory equipment’s for Physics and Chemistry Lab</td>
<td>20</td>
</tr>
<tr>
<td></td>
<td>Providing Computers and printers</td>
<td>4</td>
</tr>
<tr>
<td></td>
<td>Painting &amp; maintenance works for buildings</td>
<td>15</td>
</tr>
<tr>
<td></td>
<td><strong>Total</strong></td>
<td><strong>39</strong></td>
</tr>
</tbody>
</table>

In the above proposal, we have already provided computers and printers to the school for the amount of 4 lakhs and the laboratory equipment’s has been ordered. The photographs showing the same is enclosed as Annexure – XV.