RISK ASSESSMENT
&
DISASTER MANAGEMENT PLAN

Prepared for

Star Hotel
Proposed Hotel Building Project
at
Re.Sy.: 6, 6/2-3, 6/2-2, 6/2, Village: Alappuzha West
Taluk: Ambalapuzha,
Municipality: Alappuzha,
District: Alappuzha
Kerala

Prepared by :-
M/s Environmental Engineers & Consultants Pvt. Ltd.
Chapter: 1 Risk Assessment

1.0 Introduction:
The purpose of this report is to describe the methodology and findings from Risk Assessment (RA) conducted to assess the hazards and risks during construction and operation phase of proposed hotel project. The report outlines the assessment approach applied; including the key assumptions and data used.

Hazard, Risk, Risk Assessment, Vulnerability and Disaster:

Hazard is any source of potential damage, harm or adverse health effects on something or someone under certain conditions at work. Basically, a hazard can cause harm or adverse effects (to individuals as health effects or to organizations as property or equipment losses). General examples include any substance, material, process, practice, etc that has the ability to cause harm or adverse health effect to a person under certain conditions.

Risk is the chance or probability that a person will be harmed or experience an adverse health effect if exposed to a hazard. It may also apply to situations with property or equipment loss.
The level of risk depends upon:
• Nature of the hazard
• Vulnerability of the elements which are affected
• Economic value of those elements
A community/locality is said to be at ‘risk’ when it is exposed to hazards and is likely to be adversely affected by its impact. Whenever we discuss ‘disaster management’ it is basically ‘disaster risk management’. Disaster risk management includes all measures which reduce disaster related losses of life, property or assets by either reducing the hazard or vulnerability of the elements at risk.

Factors that influence the degree of risk include:

• how much a person is exposed to a hazardous thing or condition,
• how the person is exposed (e.g., breathing in a vapour, skin contact), and
• how severe are the effects under the conditions of exposure.

Risk assessment is the process to:

• identify hazards,
• analyze or evaluate the risk associated with that hazard, and
• determine appropriate ways to eliminate or control the hazard.

Disaster is a serious disruption of the functioning of a society, causing widespread human, material or environmental losses which exceed the ability of the affected community to cope up by using its own resources.

A disaster is a result from the combination of hazard, vulnerability and insufficient capacity or measures to reduce the potential chances of risk. A disaster happens when a
hazard impacts on the vulnerable population and causes damage, casualties and disruption. Fig: 1.1 would give a better illustration of what a disaster is. Any hazard – flood, earthquake or cyclone which is a triggering event along with greater vulnerability (inadequate access to resources, sick and old people, lack of awareness etc) would lead to disaster causing greater loss to life and property. For example; an earthquake in an uninhabited desert cannot be considered a disaster, no matter how strong the intensities produced. An earthquake is disastrous only when it affects people, their properties and activities. Thus, disaster occurs only when hazards and vulnerability meet. But it is also to be noted that with greater capacity of the individual/community and environment to face these disasters, the impact of a hazard reduces. Therefore, we need to understand the three major components namely hazard, vulnerability and capacity with suitable examples to have a basic understanding of disaster management.

**Figure: 1.1**
Relation of Hazard, Vulnerability & Disaster

![Diagram of Hazard, Vulnerability & Disaster](image)

**Hazard and it’s classification:**

Hazards can be grouped into two broad categories namely natural and manmade.
1. Natural hazards are hazards which are caused because of natural phenomena (hazards with meteorological, geological or even biological origin).
2. Manmade hazards are hazards which are due to human negligence. Manmade hazards are associated with industries or energy generation facilities and include explosions, leakage of toxic waste, pollution, dam failure, wars or civil strife etc. The list of hazards is very long. Many occur frequently while others take place occasionally.
Table 1.1 classification of Hazards

<table>
<thead>
<tr>
<th>Types</th>
<th>Hazards</th>
</tr>
</thead>
<tbody>
<tr>
<td>Geological Hazards</td>
<td>1. Earthquake</td>
</tr>
<tr>
<td></td>
<td>2. Tsunami</td>
</tr>
<tr>
<td></td>
<td>3. Volcanic eruption</td>
</tr>
<tr>
<td></td>
<td>4. Landslide</td>
</tr>
<tr>
<td></td>
<td>5. Dam burst</td>
</tr>
<tr>
<td></td>
<td>6. Mine Fire</td>
</tr>
<tr>
<td>Water &amp; Climatic Hazards</td>
<td>1. Tropical Cyclone</td>
</tr>
<tr>
<td></td>
<td>2. Tornado and Hurricane</td>
</tr>
<tr>
<td></td>
<td>3. Floods</td>
</tr>
<tr>
<td></td>
<td>4. Drought</td>
</tr>
<tr>
<td></td>
<td>5. Hailstorm</td>
</tr>
<tr>
<td></td>
<td>6. Cloudburst</td>
</tr>
<tr>
<td></td>
<td>7. Landslide</td>
</tr>
<tr>
<td></td>
<td>8. Heat &amp; Cold wave</td>
</tr>
<tr>
<td></td>
<td>9. Snow Avalanche</td>
</tr>
<tr>
<td></td>
<td>10. Sea erosion</td>
</tr>
<tr>
<td>Environmental Hazards</td>
<td>1. Environmental pollutions</td>
</tr>
<tr>
<td></td>
<td>2. Deforestation</td>
</tr>
<tr>
<td></td>
<td>3. Desertification</td>
</tr>
<tr>
<td></td>
<td>4. Post Infection</td>
</tr>
<tr>
<td></td>
<td>5. Food poisoning</td>
</tr>
<tr>
<td></td>
<td>6. Weapons of Mass Destruction</td>
</tr>
<tr>
<td>Biological</td>
<td>1. Human / Animal Epidemics</td>
</tr>
<tr>
<td></td>
<td>2. Pest attacks</td>
</tr>
<tr>
<td>Chemical, Industrial and</td>
<td>1. Chemical disasters</td>
</tr>
<tr>
<td>Nuclear Accidents</td>
<td>2. Industrial disasters</td>
</tr>
<tr>
<td></td>
<td>3. Oil spills/Fires</td>
</tr>
<tr>
<td></td>
<td>4. Nuclear</td>
</tr>
<tr>
<td>Accident related</td>
<td>1. Boat / Road / Train accidents / air crash</td>
</tr>
<tr>
<td></td>
<td>Rural / Urban fires</td>
</tr>
<tr>
<td></td>
<td>Bomb /serial bomb blasts</td>
</tr>
<tr>
<td></td>
<td>2. Forest fires</td>
</tr>
<tr>
<td></td>
<td>3. Building collapse</td>
</tr>
<tr>
<td></td>
<td>4. Electric Accidents</td>
</tr>
<tr>
<td></td>
<td>5. Festival related disasters</td>
</tr>
<tr>
<td></td>
<td>6. Mine flooding</td>
</tr>
</tbody>
</table>

**Vulnerability** may be defined as “The extent to which a community, structure, services or geographic area is likely to be damaged or disrupted by the impact of particular hazard, on account of their nature, construction and proximity to hazardous terrains or a disaster prone area.” Vulnerabilities can be categorized into physical and socio-economic vulnerability.

**Physical Vulnerability:** It includes notions of who and what may be damaged or destroyed by natural hazard such as earthquakes or floods. It is based on the physical condition of people and elements at risk, such as buildings, infrastructure etc; and their proximity, location and nature of the hazard. It also relates to the technical capability of building and structures to resist the forces acting upon them during a hazard event.

**Socio-economic Vulnerability:** The degree to which a population is affected by a hazard will not merely lie in the physical components of vulnerability but also on the socioeconomic conditions. The socio-economic condition of the people also determines the intensity of the impact. For example, people who are poor and living in the sea coast don’t have the money to construct strong concrete houses. They are generally at risk and loose their shelters whenever there is strong wind or cyclone. Because of their poverty they too are not able to rebuild their houses.
1.1 Project description:

The proposed building project Star Hotel will be set-up at Re.Sy.: 6,6/2-3, 6/2-2, 6/2, Village: Alappuzha West Taluk: Ambalapuzha, Municipality: Alappuzha, District: Alappuzha Kerala. Project details is given below:

<table>
<thead>
<tr>
<th>Sl. No.</th>
<th>Particulars</th>
<th>Remarks</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Site area in sq. m</td>
<td>1944 Sq. m. (0.1944 ha.)</td>
</tr>
<tr>
<td>2</td>
<td>FAR Proposed</td>
<td>3604 Sq. m.</td>
</tr>
<tr>
<td></td>
<td>FAR Permissible</td>
<td>7776 Sq. m.</td>
</tr>
<tr>
<td>3</td>
<td>Total Built-up Area:</td>
<td>4231.1 Sq. m.</td>
</tr>
<tr>
<td>4</td>
<td>Total Hotel Rooms Proposed</td>
<td>42 Nos.</td>
</tr>
<tr>
<td>5</td>
<td>Maximum Height proposed. (Basement+ Ground +5 Floors)</td>
<td>20.6 m.</td>
</tr>
<tr>
<td>6</td>
<td>Total Cost of Project</td>
<td>Rs. 11 Crores.</td>
</tr>
<tr>
<td>7</td>
<td>Total Parking proposed:</td>
<td>35 Cars + 40 Two Wheelers</td>
</tr>
<tr>
<td>8</td>
<td>Total Power Requirement</td>
<td>200 KW</td>
</tr>
<tr>
<td>9</td>
<td>Total DG Sets Proposed</td>
<td>200 KVA (1 Nos)</td>
</tr>
</tbody>
</table>

1.2 Location Of project:

The proposed hotel building will be located at Latitude “09°49’03.71”N, Longitude “76°32’05.00 E. The proposed site is situated almost 9 meters above Mean Sea Level. Appropriate protection measures will be taken to protect the water body. CRZ Map showing project location and high tide line is attached as Figure 1.4. Location of project in district map is shown in figure 1.2 district map.
Figure 1.2 District Map:

Source: Website- Maps of India
Star Hotel Project, Alappuzha
1.3 Project and surrounding area:

Figure 1.3: Project and surrounding area Map

Location of proposed project
Figure: 1.4 Project and surrounding area
1.4 CRZ Map imposed on layout plan/Conceptual Plan of proposed Project

The CRZ Map/Conceptual Plan of the proposed project is provided at Figure 1.5.

Figure 1.5
CRZ Map of Proposed Project
1.5 **Objective of Risk Assessment Study:**

- Identification of Hazard during construction phase and operation phase of proposed project
- To identify type of major disaster which may occur after construction of project
- To collect data on type of natural disasters, which has happened already in the area, if any
- To prepare an Emergency Evacuation Action plan to handle disaster.

1.6 **Methodology**

- Collection of data/information with respect to facility, storage details related to construction material, fuel/hazardous chemicals etc.
- Collection of meteorological data through Automatic Whether Station.
- Identification of hazardous chemicals used as per the Manufacture, Storage and Import of Hazardous Chemicals (MSIHC) Amendment Rules -2000.
- Tabulation of chemical/fuel as well as physical properties alongwith storage details for each hazardous chemical.
- Identification of hazard associated with each chemical.
- Identification of release type and determine release rates.

1.7 **Hazards Identification**

1.7.1 **During Construction:**

Generally, housekeeping hazards outnumber other hazards on construction sites. Debris can accumulate very fast on any construction site, which leads towards major accidents through major hazards like:

- Increased risk of injury
- Fire Hazards
- Fall from height: Falls from ladders (fixed and portable), also tops the list of the hazards on the construction sites. Lack of correct usage of ladders usage, maintenance and storage leads to major slips and fall from them.
- Entangle hazards
- Due to vide range of eye hazards prevailing; such as:
  - Dust
  - Flying objects
  - Welding & cutting radiations
  - Acid splashes
  - Iron / sharp objects
- **Electrical Hazard**
  Most commonly existing conditions at any of the construction site is always overseen, which results into fatal, or serious accidents. Top five most frequent and common electrical hazards encountered at any construction sites are:
- Contact with power lines.
- Lack of ground-fault protection
- Equipment not used in the manner prescribed
- Improper use of extension cords or flexible cords
- Path to ground missing or disconnected

> Ergonomics
Looking to the working postures at the construction site, it becomes vital to talk about the Ergonomics. Ergonomics not only leads to the correct postures, but also enhances the working capabilities through healthy postures thus giving the productivity and profitability.

> Occupational health hazards
Occupational health hazards associated with the construction industry include various diseases, mental and physical stress, disability and injuries. The potentially damaging factors are:
  - Noise – this causes hearing loss and also effects the heart.
  - Vibration – causes Raynaud's syndrome, a potentially damaging disease affecting the fingers. It also causes physiological orders.
  - Dust – this mainly affects the respiratory system.
  - Radiation.
  - Improper sanitation.

1.7.2 Control measures proposed during construction phase

> Do's and Don't's while working on ladders (portable / fix)
> Grip the ladder adequately while ascending or descending
> Avoid usage and wrong postures while at work on ladders
> Secure the base of the ladder to avoid accidental movement
> Do not use ladders if they are defective
> Check for overhead powerlines

> Fall protection
While working on construction sites above ground level or above 6 feet high over ground, fall protection strategies should be implemented and followed strictly so as to avoid any fall accidents which may turn out to be fatal. Always wear a safety harness with the lanyard attached by a mechanical rope grab to a well anchored lifeline.

> Scaffolds
Erection of scaffolds is very important aspect, towards the control of the accidents due to scaffolds. Few key important points (but not limited) should be added to the checklist, while erection and usage of scaffolds, as under:
  - Provide firm base for the erection of scaffolds
  - Use the base plates, so as to firmly place the scaffolds
  - Provide guardrails
  - Provide temporary ladders, and avoid using extra projected planks as staircases to climb the scaffold
  - Always maintain 3-point contact while working
- Avoid moving scaffolds with the workers on board
- Check for overhead electrical wires

Dust Exposures
Use of dust masks, with specific protection factor shall help in reduction of the dust exposures to the workers. The protection factor as well as the selection of the dust mask can be made based on the data made available by the Industrial Hygiene Exposure Assessments.

Noise Exposures
Use of ear plugs, or, ear muffs, is the final option for the reduction of the noise exposures, if and only if, the noise levels are not been able to be reduced at the source, itself. Regular training should be provided for the usage of the ear plugs or ear muffs

Eye protection
- Spectacles with full side shields are the minimum eye protection recommended for most of the construction sites.
- Wear safety shoes and hard hats, all the time while on construction site.

1.7.3 During operation phase/after construction:

The major hazard associated with the building after complete establishment of the proposed project which possess risk to the occupants of building as well as surrounding area is listed below:
- Natural Gas Cylinders and Diesel will be used within the proposed site which falls under the category of Manufacturing, Storage and Import of Hazardous chemical Rules 1989, (MSIHC, 1989, Amended 2000).

1.7.3.1 Fire Hazard during operation phase:

- Fire in diesel storage area (for D. G. Sets)
- Fire in high tension/ high voltage area/Transformer Area
- Fire in building due to spark
- Natural gas(NG)cinder leak

<table>
<thead>
<tr>
<th>Sr. No.</th>
<th>Description</th>
<th>Diesel Storage Capacity</th>
<th>Location</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>D. G. Set No.: 1 (200 KVA)</td>
<td>App. 250liter</td>
<td>Basement</td>
</tr>
</tbody>
</table>

Fire and Explosion Hazard associated with Liquefied Natural Gas:
- GAS is extremely flammable, with no color, odor, or taste.
- Dangerous fire and explosion hazard when exposed to heat, parks or flame.
- Natural gas is lighter than air and may travel long distances to a point of ignition and flash back.
- Natural gas may explode in heat or fire.
Fire and Explosion Hazard associated with Diesel storage area:
- Vapors may be ignited rapidly when exposed to heat, spark, open flame or other source of ignition.
- When mixed with air and exposed to an ignition source, flammable vapors can burn in the open or explode in confined spaces.
- Being heavier than air, vapors may travel long distances to an ignition source and flash back.
- Runoff to sewer may cause fire or explosion hazard.

Properties of Liquefied Natural Gas

Liquefied Petroleum Gas (LPG) is an environment friendly fuel used widely in household, kitchens, industries and commercial establishments. A typical LPG installation consists of a cylinder, pressure regulator, LPG Hose and a gas stove. The density of the LPG is approximately half that of water and ranges from 525 to 580 kg/m³ @ 15°C. Domestic gas cylinder will be filled with 14.2kg. The pressure inside a LPG storage vessel / cylinder will be equal to the vapour pressure corresponding to the temperature of LPG in the storage vessel. The vapour pressure is dependent on temperature as well as on the ratio of mixture of hydrocarbons. Domestic LPG is a mixture of 60-70 % Butane and 30-40% Propane. The maximum pressure exerted by LPG at 65°C is 1.66 MPa. The details of the pressure, water capacity of cylinder and dimensions are as per Hindustan petroleum corporation Ltd.

<table>
<thead>
<tr>
<th>S.No.</th>
<th>Particulars</th>
<th>Propane</th>
<th>Butane</th>
<th>LPG</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Chemical Formulae</td>
<td>C3H8</td>
<td>C4 H10</td>
<td>60%Butane, 40%Propane Mix</td>
</tr>
<tr>
<td>2</td>
<td>Max. Vapour Pressure Saturated in Kg/Cm² At 65 deg C</td>
<td>22.66</td>
<td>6.32</td>
<td>16.87</td>
</tr>
<tr>
<td>3</td>
<td>Gross calorific value in Kcal/kg.</td>
<td>11900</td>
<td>11800</td>
<td>11840</td>
</tr>
<tr>
<td>4</td>
<td>Specific gravity (liquid) at 15 deg C Water =1</td>
<td>0.504</td>
<td>0.582</td>
<td>0.543</td>
</tr>
<tr>
<td>5</td>
<td>Specific gravity (vapour) at 15 deg C air =1</td>
<td>1.50</td>
<td>2.01</td>
<td>1.75</td>
</tr>
<tr>
<td>6</td>
<td>Ideal combustion Ratio (Air to Gas)</td>
<td>24 to 1</td>
<td>31 to 1</td>
<td>28 to 1</td>
</tr>
<tr>
<td>7</td>
<td>Flammability limits (Upper)</td>
<td>9.60%</td>
<td>8.60%</td>
<td>9.1%</td>
</tr>
<tr>
<td>8</td>
<td>Flammability limits (Lower)</td>
<td>2.15%</td>
<td>1.55%</td>
<td>1.90%</td>
</tr>
<tr>
<td>9</td>
<td>Ignition Temperature (°C)</td>
<td>493-504</td>
<td>482-537</td>
<td>488-502</td>
</tr>
<tr>
<td>10</td>
<td>Volume of gas produced per unit volume of liquid</td>
<td>274</td>
<td>233</td>
<td>250</td>
</tr>
<tr>
<td>11</td>
<td>Volume of air required to burn unit volume of gas</td>
<td>23</td>
<td>30</td>
<td>26</td>
</tr>
<tr>
<td>12</td>
<td>Volume of oxygen required to burn unit volume of gas</td>
<td>4.8</td>
<td>6.25</td>
<td>5.5</td>
</tr>
<tr>
<td>13</td>
<td>Max. flame temperature (°C)</td>
<td>1979.44</td>
<td>1990</td>
<td>1985</td>
</tr>
<tr>
<td>14</td>
<td>Volatility : evaporation temp. in 0°C for 95(°C) by vol. at 760 mm Hg pressure max.</td>
<td>-38</td>
<td>2</td>
<td>2</td>
</tr>
<tr>
<td>15</td>
<td>Boiling Points (°C)</td>
<td>-45</td>
<td>-2</td>
<td>-22</td>
</tr>
<tr>
<td>16</td>
<td>Percent Gas in air for Maximum Flame Temperature</td>
<td>4.4</td>
<td>3.5</td>
<td>3.9</td>
</tr>
<tr>
<td>17</td>
<td>Limits of Flammability (Lower)</td>
<td>2.0</td>
<td>1.9</td>
<td>1.95</td>
</tr>
<tr>
<td></td>
<td>(% Gas in Gas /Air Mixture) (Upper)</td>
<td>11.0</td>
<td>8.5</td>
<td>9.75</td>
</tr>
</tbody>
</table>

Source: Website: Indian Oil – Technical Specification
1.8 **Identification of Major Accident Scenarios**

- Release of flammable material – Natural Gas (Domestic gas cylinder).
- Release of fire
- Major structure failure
- Hazardous events in neighboring site.
- Human activity or error.
- Failure of hardware.
- Natural calamities and its effect on site.

1.9 **Type Of Hazard And Vulnerability Analysis**

As described in the Kerala State Disaster Management Plan, the is vulnerable to a multitude of hazards and is categorized as a multiple-hazard prone state. The state experiences various kinds of disasters of recurrent nature that results in loss of life, livelihood and property, and disruption of economic activity, besides causing immense hardship to the affected population. The specific vulnerability of the state is given below:

- Kerala has a long coast line of 590kms out of which, 322 km is prone to severe sea erosion

- The density of population is 819 persons per sq.km which is the second highest density in the country.

- About 96.9% of the total area in the state lies in the 140.4km/h wind zone which is classified as Moderate Damage Risk Zone by the BMPTC Atlas while the remaining area lies in 118.8km/h wind zone.

- The mean maximum storm surge height in the state is 3.5m and minimum is 2.3m. If the storm surge is during high tide, the maximum surge height in the state will be 4.2m and minimum storm height will reach up to 3m, as observed by the Meteorological Department, Thiruvanthapuram.

- The coastal belt of Kerala is one of the most densely populated regions in the country, which adds to its vulnerability.

1.9.1 **District Level:**

Alappuzha has a flat unbroken sea coast of 82 Km length which is 13.9 % of the total coastal line of the state. As per natural hazard zonation map prepared by Centre for Earth Science Studies (CESS) coastal belt of Alappuzha has risk of floods, high coastal erosion and storm surge/tsunami. Multi Hazard Zonation Map of Kerala is given in figure no.: 1.6. The study (CESS, 2010) shows that 5642.68 sq.km of area which is 14.52% of the total area of the state is prone to floods.

The Kerala coast located in the shadow zone with respect to the direction of propagation of the tsunami, encountered unexpected devastation on 26 December 2004. Although tsunami affected parts of Kerala coast, maximum devastation was reported in the low coastal land of Kollam, Alappuzha and Ernakulam districts, particularly a strip of 10 km
in Azhikkal, Kollam district. As per the details given at official website of Alappuzha District, Tsunami waves triggered by a massive undersea earth quake off Sumatra in Indonesia, caused the sea water rising over Arabian Sea, unlike the normal waves, invaded the land, wreaking havoc and destruction in coastal fishing hamlets. Fishermen, tourists and people living in the coastal area were unprepared for the waves that rose as high as 6 meters.

Coastal hazards

In Kerala, out of 14 districts, 9 districts are bordering the sea coast vulnerable to various disasters such as floods, cyclones, coastal erosion, etc. Details of Eroding sectors along the coast in each District, Taluk and Whole state is given below. Map of coastal hazard is attached as Figure 1.9

<table>
<thead>
<tr>
<th>District</th>
<th>Length km</th>
<th>%</th>
<th>Length km</th>
<th>%</th>
<th>Length km</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>High (without sea wall)</td>
<td>Low</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>km</td>
<td>%</td>
<td>km</td>
<td>%</td>
<td>km</td>
<td>%</td>
</tr>
<tr>
<td>Thiruvananthapuram</td>
<td>11.9</td>
<td>15.86</td>
<td>15.66</td>
<td>20.88</td>
<td>30.84</td>
<td>41.11</td>
</tr>
<tr>
<td>Kollam</td>
<td>3.14</td>
<td>2.34</td>
<td>37.77</td>
<td>77.58</td>
<td>0.91</td>
<td>1.86</td>
</tr>
<tr>
<td>Alappuzha</td>
<td>28.98</td>
<td>37.84</td>
<td>3.75</td>
<td>4.67</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Ernakulam</td>
<td>33.39</td>
<td>60.02</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Thrissur</td>
<td>2.58</td>
<td>3.43</td>
<td>17.37</td>
<td>33.16</td>
<td>0.88</td>
<td>1.3</td>
</tr>
<tr>
<td>Malappuram</td>
<td>55.4</td>
<td>31.63</td>
<td>6.44</td>
<td>13.23</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Kollamkode</td>
<td>25.4</td>
<td>44.88</td>
<td>8.47</td>
<td>10.69</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Kannur</td>
<td></td>
<td></td>
<td>9.33</td>
<td>14.24</td>
<td>1.18</td>
<td>1.78</td>
</tr>
<tr>
<td>Kasaragod</td>
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<td>198.63</td>
<td>35.47</td>
<td>97.02</td>
<td>17.38</td>
</tr>
</tbody>
</table>

*Consult CESS, 2010, Plan Project 249 for taluk wise area*
Figure 1.6: Multi Hazard Zonation Map, Kerala

Source: 1. CESS  2. Kerala Disaster Management Authority
1.9.2 Project Specific Hazard analysis:

In order to delineate the tasks and needed response, it is essential to identify and characterize the vulnerable zones through inundation maps, the nature of damage potential and the characteristics of populations and structures on the downstream areas. Based on the characteristics of each hazard zone, the needed response could be delineated in the Disaster Management Plan.

1. **Flood**

Figure no.: 1.7 shows Flood Hazard Zonation Map developed by Centre for Earth Science Studies (CESS) and as described in state Disaster Management Plan of Kerala, Alappuzha District is falling into the category of high impact flood prone zone. Figure no.:1.7 shows that proposed project is falling in the flood prone area of district Alappuzha. However, Taluka wise flood hazard zonation map is under preparation by District Disaster Management Authority, Alappuzha, therefore for identification hazard zone state hazard zonation map is taken into consideration. The project site is located at village: Ambalapuzha, near coastal area. Location of project in map of flood prone areas of Alapuzha district is given in figure: 1.7.

2. **Landslide and lightning**

From the figure no.: 1.6 Multihazard Hazard Zonation Map provided by Centre of for Earth Science Studies (CESS) it is apparent that there is no history for occurrence of landslide/landslide prone area identified in and around proposed project site. incidents lightning in any of village of district Alappuzha. Therefore proposed project has no hazard from landslide and lightning.

3. **Earthquake**

In the regional seismic zonation map of India, Kerala has been placed in Zone III where the maximum expected intensity is VII in MM scale or 5.6 M in Richter scale. The locations of the earthquakes that have occurred in the Kerala region for which records are available are plotted on to the maps developed by CESS given in figure 2.3. Based on the magnitude they have been categorised into three classes viz. <3, 3-4 and >4. Structure design aspects as per the seismic codes – IS 1893 (2002), IS 13920 (1993) and IS 456 (2000) as applicable should be incorporated in project. No reported cloudburst in the area. Also there is no hilly area around project site, there is no chance of landslide. The district was also affected by the infamous Tsunami on 26th December 2004, triggered by the earthquake in Sumatra region. At 6:58 a.m. on December 26, 2004, a massive earthquake of magnitude 9.0 on the Richter scale it Indonesia off the West Coast of Northern Sumatra.
Figure: 1.7. Flood prone area of Kerala
Source: Kerala District Disaster Management Plan
Figure No.1.8: Kerala Earthquake Zones

Source: www.undp.org.in
Figure No.1.8: Kerala Earthquake Zones

Source: www.undp.org.in
Figure No.: 1.9 Kerala Coastal Hazard Zonation Map
Source: CESS
1.10 Hazard control measures for high rise building:

The focus is on design enhancement and techniques to reduce flood risk for high-rise. Reduced flood risk decreases building service interruptions and lowers risks to tenants. Critical building systems such as the mechanical, electrical, plumbing, gas installations, communications, and fire suppression) are essential to the functionality of a building. Mitigation measures include elevating critical building systems, flood proofing, and planning for power disruption. The mitigation of flood damage does not only depend upon the actions during floods but is a combination of pre-flood preparedness, operational flood management and post-flood review. It comprises of the following elements:

- **Pre-flood activities including flood risk management for all causes of flooding:** Disaster contingency planning, construction of flood defence infrastructure, land-use planning and management, discouraging of inappropriate development, public communication and education

- Operational flood management which can be considered as a sequence of four activities: Detection, forecasting, warning and response

- The post-flood activities may include (depending upon the severity of the event): Relief, reconstruction, recovery and review

1.10.1 Flood control measures

**Key Issues:**

1. Critical building systems such as the mechanical, electrical, plumbing, gas installations, communications, and fire suppression) are often placed on the lowest floors or subgrade (basement) levels in mid- and high-rise buildings due to building code requirements, policy mandates, costs, placement before consideration of flood hazards, or simply because the upper floors are more desirable for other uses.

2. Building systems located on lower floors are more vulnerable to flood damage. When critical building systems are damaged, building service is typically interrupted. Tenant risks significantly increase as a result of dark hallways, lack of elevator service, limited fire communication and suppression equipment, and lack of power to other systems.

3. To prevent flood damage and avoid interruption in building service, critical systems within the facility should be elevated above the base flood elevation (BFE) or protected from flood damage.

**Protecting Critical Building Systems**

The location of building systems is a critical factor in the continuing performance of mid-to high-rise buildings during a flood event. Even when flooding does not cause structural damage to a building, the inundation of lower floors can impair critical building systems, causing the building to be closed for weeks or months. The preferred method for protecting critical building systems is elevating them or relocating them to a floor with an elevation higher than the BFE or design flood elevation (DFE).
• Elevating Critical Building Systems

Approaches for elevating utilities, controls, and equipment in existing and new facilities include:

✓ Installing platforms on the floor to elevate the equipment in place
✓ Relocating systems from below-grade or the first floor to a higher floor (or even the rooftop)
✓ Relocating systems to a higher elevation in a different building
✓ When elevating equipment, both the appropriate elevation height and the codes and design restrictions that may affect their placement should be considered, as described in this section.

• Floodproofing

If elevating is not practical, critical equipment can be protected by floodproofing. Floodproofing is any combination of structural and non-structural additions, changes, or adjustments to a building that reduces flood damage. Floodproofing measures can reduce the length of time a building is unoccupied following a flood; however, they are not intended to help maintain building occupancy during a flood event. Dry floodproofing measures typically include strengthening the foundation, floors, and walls to resist hydrostatic loads and the application of waterproof coatings, impermeable membranes, backflow prevention valves, and flood shields over windows and doors. Some water may accumulate in the protected area, however, so an internal drainage collection system is required. The drainage system typically includes a sump pit, sump pump, emergency power to the pumps, and a discharge point above the DFE.

**Dry floodproofing involves:**

Conducting a detailed building evaluation to identify potential floodwater points of entry (such as pipe and conduit openings, doors, vents, and windows), collect flood hazard and load data, identify flood warning time, and consider residual risk.

Designing the dry floodproofing system to prevent water from entering up to the DFE. Measures may include:

✓ Installing or constructing substantially impermeable walls and floors
✓ Sealing wall penetrations, such as pipe, conduit, vent, and other openings
✓ Installing flood shields to close openings
✓ Reinforcing the structure to resist lateral and uplift flood loads
✓ Installing backflow prevention valves
✓ Adding internal drainage systems along with a discharge point above the DFE
✓ Providing emergency power for critical system components (sump pumps)
✓ Developing an operations and maintenance plan
1.11 Risk Reduction Measures

1.11.1 Handling and Storage of LNG Cylinder

**About the rubber tubing**

- It must be of approved quality, (ISI mark).
- It should be as short as possible. Maximum length should be about 1.5 meters.
- It should be easily accessible for inspection.
- Keep it away from heat and fire.
- Push it so as to cover the full length of the nozzle.
- Make sure it does not get heated by the burner, or is looped/twisted.
- Clean it with wet cloth only. Don't use soap to ease the tube over the nozzle.
- Check it regularly for cracks, holes, softness, and porosity especially at the ends.
- Replace tubing every 2 years if not earlier.
- Do not cover rubber tubing by any other object or sleeve.

**Pressure Regulator**

It is connected to the outlet of the cylinder valve. Its function is to regulate the pressure of the gas coming out of the cylinder and supply it at a constant pressure to the hot plate.

**If you smell gas**

- Do not operate electrical switches.
- Ensure that stove knobs are in OFF position
- Do not light a matchstick even to detect the leakage of LPG.
- Switch OFF the pressure regulator by turning the knob clockwise to the OFF position.
- Open all doors and windows
- If the smell persists, call your HP Gas distributor during office hours. For emergencies after office hours or on holidays please call up your nearest Emergency service cell.
- An experienced person can detach the regulator. Fix the safety cap on the valve.

**Disconnecting the empty cylinder**

- Put out all the flames and fires including incense sticks, candle, pooja lamp in the kitchen and adjoining rooms
- Close all the taps on the cooking stove
- Turn the switch knob of the regulator from ON position to OFF position
- Grip the regulator and pull the bush (black plastic locking ring) up and lift the regulator by giving a gentle swivel. Regulator will thus get detached from the valve on the cylinder
- Place the delrin (plastic) safety cap on the valve of the cylinder. Press the cap firmly down until a distinct click is heard. Now the empty cylinder can be removed

**Connecting the filled Cylinder**

- To remove the safety cap, press it down, PULL the cord and keeping it pulled, LIFT the cap off the valve of the cylinder.
• Check whether sealing ring is in place inside the cylinder valve by feeling the same with the help of your little finger. Do not use the cylinder if the ring is missing, put back the safety cap and contact your distributor for replacement of cylinder.
• To mount the regulator on the filled cylinder, carry out the following steps:
  • Ensure the switch knob of the regulator is in the OFF position
  • Grip the regulator and pull up the plastic blush
  • Place the regulator vertically on the valve and press it down till its edge touches the hexagon of the valve on the cylinder with a gentle swivel. Release the black plastic bush and then press it down.(you may hear click sound)
  • The pressure regulator is now locked on the cylinder.

To light the burners

Turn the switch knob of the regulator anti-clockwise till it is in ON position Hold a lighted matchstick near the burner head of the stove and turn the knob of the stove to ON position

1.11.2 Safety measures LNG Cylinder

• Do not wear nylon garments or similar fabric when cooking
• Never leave the cooking appliance unattended when in use
• Never try to Repair, Adjust or Inspect any part of the HP Gas Installation or allow fake mechanics to do so. Allow authorized mechanic to inspect the installation once in two years
• Do not use long curtains on windows if your cooking appliance is near it. They can blow over the burner and catch fire
• Insist on redelivery check of the refill cylinder at the time of its delivery
• Do not install the cooking appliance on the floor. Do not use a wooden table without asbestos sheet over it
• HP Gas should never be used in a poorly ventilated room
• Never install a HP Gas cylinder below ground level or in cellars or basements
• No other heating device (like an electric oven or a kerosene stove) should be placed within one meter of a HP Gas appliance
• Do not use any cover on the rubber tube, rubber tube T joint connection or trolley for cylinder in your HP Gas installation
• Never leave the regulator in ON position after cooking is over or during night
• Always smell for leakage of LPG before lighting the stove
• Never use the rubber tube if it has cracks or is more than 2 years old
• The place where you install your gas installation is very important. If the following precautions are taken, it will by itself be an insurance against any mishaps occurring in your kitchen.
  • Always keep the cylinders in a vertical position with the valve on top. If cylinder is placed in any other position, liquid LPG may gush out of the open valve creating a dangerous situation.
  • Cylinders must be installed at ground level and never below ground level or in cellars or basements etc.
  • Not more than two cylinders should be stored in a room. To keep two cylinders, the kitchen should have minimum floor area of 10 sq. meters.
  • If cylinders are placed in cupboards, these cupboards should be provided with ventilation openings both at floor level and at top level. A half gap should suffice.
• Cylinders must not be installed in any position in which they may become overheated, e.g. alongside a sigree or any other heating appliance. If any heating appliance has to be used, it must be kept at above ground height and never on floor level.
• Avoid storing combustible articles close to cylinder and LPG installation.
• No other heating device such as an electric oven, kerosene stove, etc, should be placed within a metre of your gas appliance.
• Do not keep cylinder exposed to sun, rain, dust and heat.
• Do not keep any vessel / utensil / cloth etc. on the top of cylinder.
• Always keep the safety / security cap tied with the top ring stay plate, so that in the event of leakage through valve spindle the cap can be fixed on the top of valve for stopping the escape of gas.
• The installation should be kept at convenient place so that cylinder, Pressure Regulators knob and rubber tube is easily accessible.
• Do not keep empty or full cylinders without cap fitted on the valve.
• For operating the pressure regulator always follow the instruction given at the top sign plate of pressure regulators.
• Always use BIS approved rubber tube, check for BIS mark on the rubber tube. The length of tube should be between 1 to 1.5 mtrs. Please ensure that rubber tube is replaced after 24 months of use.
• Don’t conceal any part of rubber tube by any type of shut or cover, which obstructs the visual check along the total length of tube.
• Always use BIS marked hot plate/ appliances.
• Avoid keeping pooja lamp and Refrigerator in Kitchen.
• Get your cylinder checked by deliveryman at the time of receipt of refill.
• Do not install the cooking appliance on the floor. The appliance should always be on a table or slab placed at a convenient height so that cooking is possible in a standing position. Do not use a wooden top table. If the table is of wood, use an asbestos sheet on the table and place the stove on top of it.
• Do not place the appliance directly in front of the window. There is a chance that a strong breeze may put off the flame causing accumulation of LPG in the room.
• The appliance should be on a table or slab with one side touching a plain wall. The backside of your appliance should be facing towards this wall. There should be no shelves or spoon racks on this wall. There is a possibility that your apparel may catch fire leaning over a lighted stove to retrieve something placed or store on this wall.
• The room/ kitchen where LPG is used should be well ventilated and should have cross-ventilation. LPG should never be used in a room with windows and doors shut.
• Ensure that the nozzle of your appliance is of the same dimensions as the nozzle of your regulator and rubber tubing of the correct bore is used. Your dealer will advise you of the dimensions
• The appliance must be at least one meter away from electric wiring, switch or plug points. Keep the kitchen clean as far as practicable to avoid rats, cockroaches etc.
CHAPTER 2: DISASTER MANAGEMENT PLAN

2.1 Introduction

The process of disaster management revolves around reducing the losses due to natural and manmade disasters. In short – Disaster Management is "it is action taken to prevent Hazard converting into Disaster". It is a methodology to understand and face Disaster and take appropriate measures to minimize the losses of life, property and environment. This can be represented in 3 sections namely – Pre, During and Post situations. In Pre Disaster phase, Capacity Building, Preventive Measures, Mitigation activities take front seat. This is the time before Disaster. With the past lessons learnt, and in anticipation of likely occurrence of Disaster, many activities are carried-out to reduce the impact, spreading of Hazard and during Pre Disaster phase.

2.2 Disaster Management Plan

2.2.1. Preparedness:
Preparedness is a process which embraces measures that enable Managers (Government or Community or Individual) to respond rapidly to Disaster situation in order to cope-up with the situation effectively so that the extent of damage due to disaster or emergency situation can be kept at minimum level. Preparedness includes the formulation of plans at various levels, to be executed in Pre, During and Post Disaster situation. These plans can be prepared by each of the department. Factors, such as Early warning systems, Preparation of Role and responsibilities of various stakeholders, conducting training, mock drills at various are included in Disaster Management plan.
2.2.2 Prevention and Mitigation

The term Prevention is often used to identify the holistic measures taken to protect the interest of life or property or environment. Mitigation is the measure taken to reduce the effects of hazard and vulnerable conditions, in order to reduce the effects / scales of disaster itself. This may include modifying/ updating of building construction laws and following them strictly or taking measures in advance before construction of Dam, Bridges, Highways, Houses, high rise building or any industries, which may cause loss of life or property or damage to environment in disaster situation in later stage.

2.3 High Rise-Building Disaster Management Plan/Emergency Action Plan (EAP)

High rise building Disaster Management Plan mainly focus on the management of building occupants during emergencies and it is known as Emergency Action Plan(EAP) of individual high rise building. While procedures for fire evacuation have been developed and adopted by major fire and emergency services throughout world, there remains considerable variation in practice in the field. With the increased recognition of the need to prepare and respond to non-fire threats such as extreme weather, workplace violence, and utility disruptions in the high-rise environment, the traditional building fire safety plan and organization are a logical starting point in preparing All Hazard Emergency Action Plan(EAP). There must be close coordination between local emergency services and building management in the development and implementation of all-hazard Emergency Action Plans.

2.4 Disaster Management Plan/ Emergency Action Plan(EAP) for high rise building

2.4.1 Introduction

The emergency planning for fire / earthquake/land slide/cloudburst scenarios consists of different aspects such as provision of evacuation pathways, setting up of alarms and warning systems, establishing communication systems, procedures to be followed, roles and responsibilities, leadership, guidance and provision of information.

A proper guideline will be provided for preparing a con plan or disaster management plan during any disasters. It may be noted that this plan would serve as a reference documents consisting of salient information indicating the actions to be taken at the time of disaster, and hence, it has to be made as comprehensive as possible and it needs to be tested and updated periodically. The suggested format of the disaster management plan/EAP is outlines in this Report. A separate detail risk assessment study will be suggested to carry out.

2.4.2 Objective of Plan:

To adopt standards, procedures, and requirements for the orderly evacuation of occupants from any high-rise building, including evacuations necessitated by fire, explosions, or biological, chemical, or hazardous material incidents or releases, either within the facility or in the adjacent area; natural disasters; other emergencies; or the threat.
To assist building management and tenants in developing an Emergency Action Plan (EAP) for the building.

Effectively protecting building occupants in ordinary emergencies for limited evacuations in the event of a fire in a high-rise office building (evacuation of fire floors and floors above and below the fire).

To identify need for additional life safety procedures, other than those for fire, which are required to protect the occupants of buildings in the event of an all Hazard Emergency.

### 2.4.3 Purpose of the Plan

The project features in terms of storage of hazardous substances within premises and structures are so small that they cannot contribute to any disaster themselves. Hence there is no specific requirement of disaster management plan as such. However, to meet the exigencies on account of natural disaster arising out of flood and man-made disaster due to fire/explosion induced change to the residents and surrounding area the following Emergency Action Plan (EAP) is proposed for high rise building project.

1. In the event of flood, alarm should be sounded in the building and the machines in operation should be automatically tripped.
2. During monsoon period, regular weather forecasting should be done.
3. The occupants of the building should be trained with first and practices and made aware of action to be initiated following a natural disaster.

### 2.5 Responsibility

#### 2.5.1 Owner.

**General**

1. The owner of a building should cause an Emergency Action Plan (EAP) to be prepared for the building and periodically reviewed and amended, in accordance with the provisions and subdivisions of the EAP. The EAP should include a Pre-Incident/Building Information Card similar to those shown in Annex E.

2. Any changes or updates to an EAP, including essential building personnel and emergency contact telephone numbers, should be submitted to the local Fire Department [or the Authority Having Jurisdiction (AHJ)] within 10 days of the change.

3. The owner of a building should consult with the owners of neighboring buildings in connection with the preparation of the building’s EAP, when a Partial Building Evacuation or Total Building Evacuation drill is to be conducted, or when such a drill would evacuate onto a public street.

4. Appointment of Building Emergency Response Team.

The owner of a building should appoint a Building Emergency Response Team (BERT) consisting of a Fire and Life Safety Director (FLSD), Deputy Fire and Life Safety Directors (DFLSDs), Fire and Life Safety Floor Wardens, Deputy Fire and Life Safety Floor Wardens, and support response team members to respond when an All-
Risk Assessment & Disaster Management Plan

Hazard Emergency occurs. All members should be designated in the EAP, with the authority, duties, and qualifications set forth therein.

The FLSD and the DFLSD should be present on-site during normal business hours.

Building Emergency Response teams should practice allocated tasks and duties pertaining to the evacuation of building occupants.

5. 2.1.3 EAP Plan Filing, Acceptance, Training, and Recordkeeping.

The owner of a building should file an EAP with the AHJ and obtain approval from the AHJ.

The owner of a building should cause educational materials to be distributed and EAP drills to be conducted in accordance with the provisions of the EAP. All building emergency response personnel who could be required to assist with the evacuation of staff or visitors should be given appropriate training and suitable resources to carry out the task.

The owner of a building should cause recordkeeping to be maintained in accordance with the provisions of the EAP.

Under the direction of the building owner, all building occupants and employers of building occupants should comply with the directions of the FLSD and the Building Emergency Response Team upon implementation of the EAP and otherwise fulfill their obligations in accordance with the provision of 5.

2.5.2 Building Occupants

a. Building occupants should comply with the directions of the FLSD and Life Safety Staff upon an announcement that the building EAP has been activated, including a fire evacuation or an all-hazard evacuation such as Remain-in-Place, In-Building Relocation, Partial Building Evacuation, and Total Building Evacuation.

b. Building occupants should familiarize themselves with the requirements of the building EAP pertaining to their responsibilities, cooperate with the Building Emergency Response Team, and participate in EAP drills.

c. Building occupants should familiarize themselves with the building’s fire and life safety equipment and systems in the building.

d. Building occupants should request an exemption from the FLSD if participation in an EAP drill might cause injury or serious hardship.

e. Building occupants should report any incident or suspicious activity that could affect the health, safety, or security of any building occupants or damage to building property.

f. Building occupants with disabilities should have the option to identify themselves via a Personal Emergency Evacuation Plan.
2.5.3 Fire and Life Safety Director (FLSD) and Deputy Fire and Life Safety Director (DFLSD).

Planning
1. Mapping of hazard vulnerable area shall be done in consultation with staff & residents.
2. There shall be Disaster Management Cell in place.
3. The disaster management cell shall have following members to share the responsibility

I. Fire and Life Safety Director (Administrator)
II. Deputy Fire and Life Safety Director (Asstt. Administrator)
III. Personal Manager
IV. Communication Officer
V. Fire Officer
VI. Security Officer
VII. Engineering In-charge
VIII. Fire pump attendant
IX. First Aid Team

Duties.

a. An FLSD should be on duty during regular business hours or when it is expected that the building will be occupied by more than a total of 500 persons in the entire building. When the FLSD is not on duty, the DFLSD should perform the FLSD duties.

b. When an All-Hazard Emergency occurs, the FLSD should communicate the nature of the emergency to building occupants. Specific instructions should be given for a particular type of emergency evacuation mode. (Describe the type of incident, e.g., “Police action,” “Unknown odor exterior to the building,” “At this time we are shutting down the building’s air intake vent.”)

c. The FLSD should be given sufficient stated authority, powers of sanction, and resources to take responsibility for the day-to-day safety management of the building and to make certain that essential repairs or maintenance are carried out, such as, but not limited to, the following:
(1) Maintaining access and egress routes
(2) Monitoring routine maintenance, testing of emergency fire protection systems in accordance with Standard for the Inspection, Testing, and Maintenance of Water-Based Fire Protection Systems
(3) Monitoring changes to the building (alterations and new construction projects) to confirm that effective temporary life safety measures are in place
(4) Providing supervision of, monitoring of, and instruction to construction contractors and subcontractors on the premises
(5) Monitoring construction, alteration, and demolition projects for welding, cutting, and burning and issuing building Hot Work permits
(6) Ensuring compliance with local building and fire codes
The FLSD/DFLSD should be a liaison with the responding Incident Commander (IC) in the following ways:

(1) Provide a briefing to the IC of the current situation awareness upon the IC’s arrival to the incident
(2) Establish a working location at the Emergency Command Center (ECC)
(3) Attend planning meetings as required
(4) Provide input on the building resources
(5) Cooperate fully with the IC and ECC staff on the building involvement at the incident
(6) Oversee the well-being and safety of the Life Safety staff assigned to the incident
(7) Advise the IC of any building needs or requirements

At a minimum, the building owner should maintain at the building ECC the following items to assist the FLSD, DFLSD and First Responders:

(1) A Pre-Incident/Building Information Card
(2) Building master keys
(3) Current as-built drawings
   (a) Floor layout
   (b) Fire wall separations
   (c) Stair configuration
   (d) Sprinkler and standpipe risers
   (e) Fire extinguishing systems
   (f) HVAC zones
   (g) Electrical
   (h) Plumbing
(4) Fire pumps list and location of building occupants with disabilities

Standard for Pre-Incident Planning, should be maintained at the building’s ECC and at the local AHJ dispatch communications center, with the capability of being transmitted in an electronic format so as to provide First Responders with critical building information on their initial response and to further support an incident action plan.

a. The FLSD/DFLSD is responsible for the training of building emergency response staff.
b. The FLSD should provide an initial situation status report and updated situation awareness information to the IC relevant to the situation at hand.
c. A voice communication through the public address system should be made at appropriate intervals as directed by the IC.

2.5.4 Certification Program for Fire and Life Safety Director/Deputy Fire and Life Safety Director.

A Fire and Life Safety Director/Deputy Fire and Life Safety Director Certification should be issued by the AHJ to a qualified applicant for a designated building, to certify that the holder has completed the necessary and appropriate training relevant to the duties and responsibilities of the FLSD/DFLSD pursuant to this section and has demonstrated knowledge of the designated building, its systems, and its occupants necessary to perform the duties of the FLSD/DFLSD at such building.
Applicants for a Fire and Life Safety Director/Deputy Fire and Life Safety Director Certification should take and pass a required examination as mandated by the AHJ. The examination should be conducted at the building to demonstrate candidates’ skills sets for which the certificate is being issued.

2.5.5 Fire and Life Safety Floor Wardens and Deputy Fire and Life Safety Floor Wardens.

a. The tenant or tenants of each floor should, upon request of the owner or person in charge of the building, make responsible and dependable employees available for designation as support members for the positions of Life Safety Floor Warden and Deputy Life Safety Floor Warden.

b. Each floor of a building should be under the direction of a designated Life Safety Floor Warden for the evacuation of occupants in the event of fire or other emergency. Life Safety Floor Wardens should be assisted in their duties by Deputy Life Safety Floor Wardens.

2.5.6 Building Emergency Response Team.

a. The EAP should designate the members of a Building Emergency Response Team (BERT). The BERT should consist of the following persons: building property manager, chief engineer, elevator mechanic, director of security, or, in their absence, their qualified designees, and other building personnel, office employees, or other building occupants designated to assist in the implementation of the EAP, including persons assigned to assist building occupants who require assistance to participate in the plan. The FLSD and the DFLSD should not be designated as BERT members.

b. All BERT members should receive training in the EAP from the FLSD. Such training should consist of not less than an initial 2-hour training session and an annual 1-hour refresher session thereafter.

c. BERT members should perform their designated assignments as set forth in the EAP or as directed by the FLSD.

d. In the event of an All-Hazard Emergency, BERT members should report immediately to the designated locations set forth in the EAP or as directed by the FLSD and be ready to undertake their designated assignments.

2.6 OCCUPANT EVACUATION STRATEGIES

General

Various potential threats to a building may require best practice emergency management so as not to delay moving people to a safe area. This includes provision for an effective means of initiating, monitoring, and managing the evacuation of a high-rise building, where a large number of people could be at risk.
The evacuation of occupants in a building’s exit stairs should be monitored to facilitate effective management of egress capacity, including prioritization of egress for those occupants in greater danger.

Different parts of a building can be evacuated in controlled phase sequences, with the original incident floor and/or zone affected being evacuated first. The FLSD should announce a directive message as to which type of evacuation mode will be used. The types of sequenced evacuation are shown in Table below.

### Table 2.1: Occupant Evacuation Strategies

<table>
<thead>
<tr>
<th>Extent of Evacuation</th>
<th>Managed Sequence</th>
<th>Unmanaged Sequence</th>
</tr>
</thead>
<tbody>
<tr>
<td>No evacuation</td>
<td>No movement — remain in place upon direction</td>
<td>No movement — remain in place per prior instruction</td>
</tr>
<tr>
<td>Partial evacuation</td>
<td>Managed or controlled partial evacuation In-building relocation on same floor Occupants of some floors leave building</td>
<td>Unmanaged or uncontrolled partial evacuation</td>
</tr>
<tr>
<td>Total evacuation</td>
<td>Managed or controlled total evacuation</td>
<td>Unmanaged or uncontrolled total evacuation</td>
</tr>
</tbody>
</table>

Source: NFPA 101, 2012

#### 2.6.1 All-Hazard Evacuations

a. **Remain-in-Place (No Evacuation).**
   The Remain-in-Place provisions of the EAP should be based on an analysis of the circumstances in which such action would best provide for the safety of building occupants and the manner in which that action could best be implemented in the building.

b. The EAP should set forth the actions that would be taken in the event of a Remain-in-Place, including, but not necessarily limited to, those in regard to the following building components or systems:
   1. Access to and egress from the building, including entrances, exits, and stairwells
   2. Elevator operation
   3. Ventilation system operation, including air-handling equipment; heating, ventilation, and air conditioning equipment; and smoke-management systems
   4. Windows that open
   5. Interior doors, including fire doors
   6. Electrical, natural gas, steam, and other utility operations
   7. Fuel oil storage systems and associated pumps and piping

c. **In-Building Relocation.**
   The in-building relocation provisions of the EAP should be based on an analysis of the circumstances in which such action would best provide for the safety of building occupants and the manner in which that action could best be implemented in the building.
The EAP should contain the following steps for an In-Building Relocation Area (INBRA):

1. Set forth the number of building occupants on each floor.
2. Designate the INBRA to which building occupants could be relocated and for each such INBRA identify the following:
   a. The type of area (such as interior office, conference room, file room, or mechanical room)
   b. The floor and the relocation area’s exact location on that floor
   c. The type of protection the area offers
   d. The maximum number of building occupants each relocation area can accommodate
   e. Whether the area affords access to water, lavatories or other facilities, and equipment or supplies, including prepositioned equipment or supplies.

3. Designate the route by which building occupants would be directed to the INBRA, if such areas are on a different floor, and identify the stairwells and (if applicable) elevators to be utilized and their capacity.

4. Set forth the actions to be taken with respect to building components or systems in the event of an in-building relocation, including the building locations and systems.

5. Set forth the procedures by which employers of building occupants will account for their employees after an in-building relocation is complete.

d. Partial Evacuation and Total Evacuation.

- The evacuation provisions of the EAP should be based on an analysis of the circumstances in which such action would provide for the safety of building occupants.

- The EAP should identify the safest and most efficient means of evacuating persons from the building or designated floors or areas thereof. Priority should be given to building occupants on floors or other areas of the building most at risk of harm and, in the designation of exit routes, to the avoidance of congestion that would delay the movement of those with priority. The EAP should also ensure that prioritization is actually accomplished [e.g., by implementing provisions for exit stair monitoring, such as video systems, monitored from the Emergency Command Center (ECC)].

- The EAP should encompass the following steps for both a partial and a total building evacuation:
  1. Set forth the number of building occupants on each floor, including an estimate of the number of visitors, if any, on a typical day.
  2. Identify the location of exits, stairwells, and (if to be utilized) elevators and their capacity.
  3. Set forth the actions that would be taken with respect to building components or systems in the event of a partial or total evacuation, including the building locations and systems.

- The EAP should designate the following:
  1. Primary exit routes for the evacuation of each floor or other area of the building and alternative exit routes in the event that the primary routes cannot be used
  2. Whether building occupants will be directed to leave the area by any safe means (other than in circumstances that preclude such action, such as contamination) or directed to one or more assembly areas that have the following capabilities:
2.6.2 Accountability.
Tenants should consider establishing a post-incident communication plan with their staff that takes into account the following actions when building occupants gather in the Accountability Re-Assembly Area:

- The floor warden verifies that the floor has been evacuated by all occupants.
- Identified missing persons are reported to authorities.
- Incident reporting and investigation should include the following:
  - Establishment of an incident debriefing and reporting system to be followed immediately after the all-clear for any emergency is given
  - Investigation to establish root causes and to create a lessons-learned document to help prevent a similar incident from occurring in the future

2.6.3 Accommodations for Persons with Disabilities

The EAP should have procedures in place to address the evacuation of occupants with the following disabilities:

- Mobility impairments
  - Wheelchair users
  - Ambulatory mobility disabilities
- Respiratory impairments
- Visual impairments
- Hearing impairments
- Speech impairments
- Cognitive impairments

- Development and review of the EAP should include participation by representatives of the five major disability groups (mobility impairments, vision impairments, hearing impairments, speech impairments, and cognitive impairments), preferably occupants of the building. If no occupants within one or more categories are available, a member(s) of the local community with the relevant disability should be asked to participate.

- The EAP should provide for the secure storage in the ECC of copies of all the information listed in the chart in Annex C, including but not limited to all Personal Emergency Evacuation Plans completed by individuals with a disability for all spaces in a facility that those individuals commonly use. The chart in Annex C should include a list of the primary floor location for each regular occupant who has voluntarily self-identified as needing assistance and the type of assistance he or she requires to safely evacuate. This information must be kept confidential and provided only to...
authorized building personnel and, in the event of an emergency requiring evacuation, to first responders upon their arrival at the building or as required by local law.

2.6.4 Building Reoccupation.

The plan should include means of reoccupying the building after clearance from the AHJ and the FLSD. The plan might need to include phased reoccupation consistent with building configuration and capacities.

During an emergency evacuation, the FLSD should track what floor(s) have been evacuated at the ECC and provide the situational awareness to the First Responders upon their arrival at the building. *(See Annex D.)*

2.7 EAP DRILLS, EXERCISES, AND OCCUPANT EDUCATION

2.7.1 Purpose

The purpose of drills and exercises is to instill in the minds of all occupants, including the Building Emergency Response Team (BERT), the correct procedures necessary to ensure safety of life and the joint testing of building emergency systems and staff duties.

The building owner should conduct EAP drills on a regular basis, during regular business hours, and in accordance with the requirements of this section, to familiarize all building occupants with the various procedures for total evacuation, partial evacuation, in-building relocation, and remaining-in-place and the reasons for implementing each type of action.

2.7.2 Types.

1. **Instructional.** Instructional exercises should serve to familiarize building occupants with the requirements and procedures of the EAP by means of informational sessions approved by the Fire and Life Safety Director (FLSD) and may include the use of video presentations or other educational materials. Such sessions should address implementation of the EAP both during regular business hours and at times when Life Safety Floor Wardens and other EAP staff may be absent from the building. Such sessions can be conducted by any qualified person and at any appropriate location, including, but not limited to, stairwell entrances and in-building relocation areas.

2. **Stairwell Familiarization.** Stairwell exercises serve to familiarize building occupants with the process of in-building relocation and building evacuation via the building's stairwells. A stairwell familiarization exercise should have building occupants enter a building stairwell and then be escorted down several levels, during which time stairwell safety features and safe evacuation procedures should be reviewed.

3. **Evaluation.** Tests should be conducted to evaluate the preparedness and capabilities of occupants and life safety staff (e.g., through “fire drills”). Stair monitoring system video recordings, especially of occupant use of exit stairs, if available, should be used to assess performance and attain realistic expectations of what can be accomplished in an actual emergency.

4. **Frequency.**
EAP drills should be conducted on a regular basis, as follows:

(1) At least two EAP drills should be conducted annually for the first 2 years after the date of the EAP acceptance, the first of which should be within 6 months of the date of acceptance. A rotation of the EAP drills within the first 2-year period can include a drill for Full-Building Evacuation, Partial-Building Evacuation, In-Building Relocation, and Remain-In-Place to familiarize the occupants with the various types of all-hazard emergency movement modes.

(2) Beginning in the third year from the date of the EAP acceptance, an EAP drill should be conducted on each floor of the building at least once a year.

(3) The number and type of EAP drills required to be conducted for a building will vary based upon jurisdiction requirements and the type of building. It is important that the BERT and all building occupants are aware of and understand what they are required to do in case of an emergency.

(4) The building owner and the AHJ should jointly determine the efficacy of full-building or partial building evacuation drills.

5. Participation.
   All building occupants present on the affected floors at the time the EAP drill is conducted, including visitors, should be required to participate in the drill.

   EAP drills may be conducted in conjunction with fire drills or as required by the local AHJ, provided the drills highlight the differences between responses required for each drill.

7. Notifications.
   An owner undertaking a full-building evacuation drill should consider doing the following:
   (1) Notify the local AHJ not less than 72 hours in advance of any full building evacuation drill.
   (2) Notify the owners of neighboring buildings not less than 72 hours in advance of any full-building evacuation drill. The owner of a neighboring building, upon receipt of such a notification, should notify the occupants of such neighboring building of the drill, to prevent the evacuation from causing alarm. (See definition of Neighboring Buildings in Section 1.)
   (3) Provide not less than 72 hours’ advance notification to the other AHJ departments of any full building evacuation drill and make any necessary arrangements with those agencies for such a drill.

   The obligations of owners of buildings and employers of building occupants pursuant to this section should not be construed to apply to building occupants who are visitors in the building, except that visitors should be required to participate in any EAP drill being conducted at the time of their visit.

2.8 EAP TABLETOP EXERCISE

2.8.1 General.
   A tabletop exercise/training drill that simulates an EAP all-hazard emergency incident should be conducted annually by the building owner. A tabletop exercise held in an informal, stress-free environment will elicit constructive discussion as participants
examine and resolve problems based on existing types of All-Hazard Emergencies and identify where the EAP needs to be refined.

2.8.2 Format.
The exercise should begin with the reading of a short narrative that sets the stage for the imaginary disaster. The facilitator then stimulates discussion by either or both of two approaches:

1. Problem statement to various participants, either individually or by agencies
2. Simulated messages, which are more specific than problem statements

2.8.3 Participants then discuss the action they might take in response to the problem statement or simulated message. In either instance, introduction of the problem should generate a discussion that focuses on roles, plans and coordination, the effect of the incident on other agencies, and the like.

2.8.4 Roles.

A. Facilitator.
A facilitator should lead the tabletop discussion, decide who gets a message, call on others to respond, ask questions, and guide the participants toward sound decisions.

B. Participants.
Depending on the objective, the tabletop exercise could involve many people or agencies, anyone who could learn from or contribute to the discussion as planned, or all agencies with a policy, planning, or response role. Participants should respond to simulated messages or problem statements as they would in a real emergency.

C. Facilities, Time, and Frequency.

Facilities. The exercise should be conducted in an area such as a large conference room where all participants can sit around a table. The use of maps, charts, and packets of materials will enhance the exercise.

Time. The exercise usually takes 1 to 2 hours but can go longer.

Frequency. The exercise should be conducted at least annually or at the direction of the AHJ.

2.9 REVIEWING AND UPDATING THE EAP

2.9.1 Review
The EAP should be reviewed and updated every 5 years or when required by the AHJ.

2.9.2 Updates.
In addition to the required reviews (see 8.1), the EAP should be reviewed and updated at times when any of the following conditions or events occurs:
1. Building alterations or renovations
2. Modifications to floor plans or associated building drawings
3. Significant changes to building occupancy classification or tenancy
Annexure: 1
Project Layout
Fire Protection Plan (Basement & Ground Floor)

FIRE PROTECTION ARRANGEMENT FOR HOTEL BUILDING (A 5) AS PER NATIONAL BUILDING CODE OF INDIA PART IV 2005 (ABOVE 15 MTR BUT NOT EXCEEDING 30 MTRS IN HEIGHT)

BASEMENT FLOOR PLAN

GROUND FLOOR PLAN
Fire Protection Plan (First, Second, Third & Fourth Plan)
Fire Protection Plan (Fifth Floor & Machine Room)

FIRE PROTECTION ARRANGEMENT FOR HOTEL BUILDING (A-5) AS PER NATIONAL BUILDING CODE OF INDIA PART 17 2005 (ABOVE 15 MTR BUT NOT EXCEEDING 30 MTRS IN HEIGHT)

FIFTH FLOOR PLAN

MACHINE ROOM / STAIRCASE FLOOR PLAN
ANNEX A
Sample of Open Letter to Tenants

TO: Occupants of [insert name or address of building]

RE: ALL-HAZARD EMERGENCIES for [insert name or address of building]

We are providing you with a Building Emergency Package to assist with emergency procedures for [name and address of building]. The effectiveness of the building Emergency Action Plan (EAP) depends on your being familiar with the emergency procedures for fire incidents; all-hazard emergencies for human-caused incidents, such as utility disruptions, bomb threats, workplace violence, and medical emergencies; and natural incidents, such as hurricanes, tornadoes, earthquakes, and flash flooding.

For those reasons, periodic EAP drills will be conducted. It is not necessary in all drills to actually evacuate, but one evacuation drill should be conducted annually to give experience to the building occupants.

In the following material, you will find a description of the emergency equipment, systems, warning devices, and evacuation procedures as well as specific evacuations for the various All-Hazard Emergencies.

On each floor level near the elevators, there is a floor layout denoting locations and routes for accessing exits off the floor. Posted at each stairwell are the names of the Life Safety Floor Wardens, who will assist you during an emergency evacuation. As with any building fire and/or all-hazard emergency, you will be directed by the Fire and Life Safety Director.

Please provide the following information:

Name of Company: ____________________________

Floor(s) Occupied: __________________________

Name of Primary Contact Person: _______________________

Telephone: __________________ Email: ____________________________

The number of employees on the floor during the following times:

8:00 AM to 5:00 PM __________________________

5:00 PM to Midnight __________________________

Midnight to 8:00 AM __________________________

Weekends __________________________

NOTE: We encourage every employee with a disability that could affect emergency response to contact the Fire and Life Safety Director at [insert phone number or contact information] to let us know how we can best assist him/her during an evacuation.

Please return the information requested within 10 working days of receiving this letter. If you have any questions, please contact me at [insert phone number or other contact information].

Sincerely,

[Name of Fire and Life Safety Director]
cc: Property Management
## ANNEX B
Building Record of Persons with Disabilities

<table>
<thead>
<tr>
<th>Floor</th>
<th>Number of Occupants with Disabilities</th>
<th>Contact Information</th>
<th>Assistance Required (Temporary or Permanent)</th>
<th>Monitor Names</th>
</tr>
</thead>
<tbody>
<tr>
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</tbody>
</table>
## ANNEX C
### Occupant Tracking Table

<table>
<thead>
<tr>
<th>Occupancy Floor and Load</th>
<th>Floor Evacuation Status</th>
</tr>
</thead>
<tbody>
<tr>
<td>Basement</td>
<td>✓</td>
</tr>
<tr>
<td>Ground Floor</td>
<td>✓</td>
</tr>
<tr>
<td>1&lt;sup&gt;st&lt;/sup&gt; Floor</td>
<td>✓</td>
</tr>
<tr>
<td>2&lt;sup&gt;nd&lt;/sup&gt; Floor</td>
<td>✓</td>
</tr>
<tr>
<td>3&lt;sup&gt;rd&lt;/sup&gt; Floor</td>
<td>✓</td>
</tr>
<tr>
<td>4&lt;sup&gt;th&lt;/sup&gt; Floor</td>
<td>✓</td>
</tr>
</tbody>
</table>
Annexure E

IMPORTANT TELEPHONE NUMBERS:

Supervisors at Taluk Level

<table>
<thead>
<tr>
<th>Tahsildars and Additional Tahsildars</th>
<th>Phone Numbers</th>
</tr>
</thead>
<tbody>
<tr>
<td>Tahsildar, Cherthala</td>
<td>91-478-2813103</td>
</tr>
<tr>
<td></td>
<td>94474 95004</td>
</tr>
<tr>
<td>Tahsildar, Ambalappuzha</td>
<td>91-477-2243771</td>
</tr>
<tr>
<td></td>
<td>94474 95005</td>
</tr>
<tr>
<td>Tahsildar, Kuttanadu</td>
<td>91-477 -2270221</td>
</tr>
<tr>
<td></td>
<td>94474 95006</td>
</tr>
<tr>
<td>Tahsildar, Karthikappally</td>
<td>91-479-2412797</td>
</tr>
<tr>
<td></td>
<td>94474 95007</td>
</tr>
<tr>
<td>Tahsildar, Mavelikkarra</td>
<td>91-479 -2302216</td>
</tr>
<tr>
<td></td>
<td>94474 95008</td>
</tr>
<tr>
<td>Tahsildar, Chengannur</td>
<td>91-479 -2243771</td>
</tr>
<tr>
<td></td>
<td>94474 95009</td>
</tr>
</tbody>
</table>

Control Room, Collectorate, Alappuzha: 91-477-2251675 91-477-2251549
Control Room Email: alptsunami[at]keraladotnic[dot]in
Control Room, Govt. Rest House, Kayamkulam: 91-479-2440971 9-479-2440924 (fax)
District Collector: 91-477-2251720 94471 29011
Deputy Collector (General): 91-477-2251549 94474 95001
Revenue Divisional Officer, Alappuzha: 91-477-243441 94474 95002
Sub Collector, Chengannur: 94474 95003
Tahsildar, Cherthala: 91-478-2813103 94474 95004
Tahsildar, Ambalappuzha: 91-477-2243771 94474 95005
Tahsildar, Kuttanadu: 91-477-2270221 94474 95006
Tahsildar, Karthikappally: 91-479-2412797 94474 95007
Tahsildar, Mavelikkar: 91-479-2302216 94474 95008
Tahsildar, Chengannur: 91-479 -2243771 94474 95009

Source: [http://alappuzha.nic.in](http://alappuzha.nic.in).