

1.1 RISK ASSESSMENT

Risk is a potential that a chosen action or activity will lead to a loss of human or property. Risk assessment is a step for Risk Management. Risk assessment is determination of qualitative and quantitative value of risk related situation or hazard.

Hazard is a situation that poses a level of threat to life health or environment.

Risk assessment involves the following:

- Hazard Identification
- Vulnerability Analysis
- Risk Analysis
- Emergency Preparedness Plan

1.1.1 HAZARD IDENTIFICATION

The project is group housing and there may be following types of hazards:

Natural hazard:

1. Earthquake
2. Flooding
3. Lightening

Man-made hazard:

1. Fire & explosion
2. Electrical
3. Mechanical
4. Robbery/Dacoity/Terrorism

1.1.2 VULNERABILITY ANALYSIS

This is a group housing. hence residents, staff & visitors are vulnerable to risks.

The vulnerable analysis is done on all the hazards as below:

	During Operation
<u>HAZARD IDENTIFICATION</u>	
Natural hazard	

Earthquake	For all Floors
Flood	For the whole complex
Man-made hazard	
Fire & explosion	For the whole Complex
Electrical	For the whole Complex
Mechanical	DG set room,

1.1.3 RISK ANALYSIS

The purpose is to evaluate and make a decision about the level of fire risk to determine whether to take appropriate risk management measures or not.

A safety plan mainly constituting the following shall be implemented during future construction & Operation Phases:

During construction Phase	During Operation Phase
• Safety mats have are being provided at appropriate level and various shafts/ openings are covered to prevent falls, slips, trips etc. • Necessary safety belts, helmets and eye-masks as required are enforced at site. • Adequate guardrails are provided to the staircases and common areas. • Adequate guardrails/ fences are provided around the water storage spaces to prevent drowning accidents. • The machinery and the equipment are being regularly tested and maintained with the specific emphasis against accidental failures. • The deployed Safety officers ensures that the personnel/ labour are kept at a safe distance from working machinery to avoid accidents/ injuries due to toxic gases/ chemical/ noise. • Moving parts of various parts of machineries/ equipment are properly guarded. • Required fire extinguishers are maintained at the construction site. The same shall be adopted for expansion part as well.	• The project is located in Seismic Zone IV; structural designing will be done as per best structural engineering practices complying with all the applicable codes / standards. • Proper designing of drainage system for domestic as well as storm water has been provided. • Rain water harvesting pits will have provision of storage for 45 mm peak hourly rainfall. • Fire Protection system has been designed as per requirements of NFPA & National Building Code – 2005. • Proper Fire evacuation system has been provided. • Safety parameters as indicated under Indian Electricity Rules 1956 and ECBC shall be complied. • Periodic replacement of critical components of elevator/ machines shall be adopted.

Description of each type of hazard and preventive measures taken for each type of hazard with respect to the proposed project is mentioned below:

Earthquake:

The project is located in seismic zone IV where earthquake can occur from 4.0-7.0 Richter scale. Earthquake hazard has been considered as one of the potential threat for the region. The structural design has been scrutinized and certified by empanelled structural engineer as per relevant IS codes, NBC. The foundation and structural design has been scrutinized and certified by structural engineer as relevant IS codes.

Flooding:

The project site is located in an area where no water body exist near the site. Hence, no chances of flood is anticipated. However, flooding can occur due to excess rain. Proper RWH system for storm water has been provided to avoid any logging of water & hence leading to flooding. Rain water harvesting pits will have provision of storage for 20 min rainfall.

Lightening:

Lightning arrester will be installed on the top of the building with proper specification and as per the requirement.

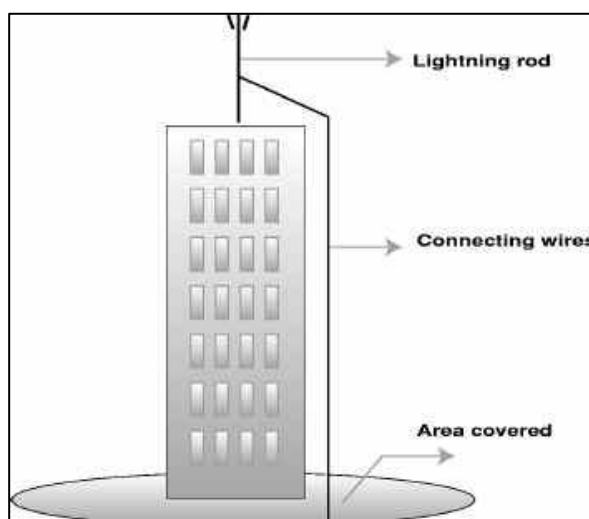
A complete lightning protection system shall be made up of the following components:

- Air Terminals – Also referred to as lightning rods, this inconspicuous copper or aluminium rods are vertically mounted on the roof at regular intervals as defined by industry safety standards. The air terminals serve as strike receptors, designed to intercept the lightning strike.

Main Conductors – Constructed of aluminum or copper, these braided cables connect the air terminals to the other system components and the grounds.

- Grounds – A minimum of two ground rods, driven at least 10 feet deep in the earth are required for all structures. The ground terminations direct the dangerous current into the ground, to eliminate the chance of injury or damage to the structure. Special grounding requirements are sometimes necessary in shallow, sandy or rocky soil, which are addressed in the industry safety standards for installation.

- Bonds – Bonding joins metallic bodies (roof components) and grounded building systems to the main conductor to ensure conductivity and prevent side flashing (lightning jumping between two objects.)
- Surge Arresters and Suppressors – A surge is an increase in electrical current due to a lightning strike on or near a power line or utility service. Surge suppression is installed at the electrical panel/s to prevent the entrance of overvoltage which can cause a fire. Arresters installed at electrical panels help protect heavy appliances and prevent fires at the service panel entrances. Additional devices may be needed to protect other in-house electronics. Surge protection devices are typically installed in conjunction with a lightning protection system.



Fire & Explosion:

Fire threat can happen anytime and anywhere within this housing complex. It may occur within the individual residential unit or in the housing complex from different sources like electrical, cooking etc.

Fire safety measures shall be taken as per NBC-2016 Code. Following measures shall be adopted in the complex for fires safety:

Table 1: Fire pump details

DESCRIPTION	Residential (Under Construction)	
FIRE FIGHTING PUMPS	MAIN PUMP ROOM	
	CAPACITY (lpm)	QTY.

Main Fire pumps for Hydrant System	2850	01
Main Fire pumps for sprinkler System	2850	01
Diesel operated fire pump	2850	01
Jockey pumps	180	03
Water curtain pump (electric)	2850	01
Water curtain pump (diesel)	2850	01

Electrical:

The electrical current can pass to the floor & metals due to inadequate insulation or accidently.

The main hazards involved with electricity are:

- **Improper Grounding:** Electrical equipment will be properly grounded. Grounding reduces the risk of being shocked or electrocuted. The ground pin safely returns leakage current to ground.
- **Exposed Electrical Parts:** Exposed wires or terminals are hazardous. If any wire or electrical part is found in this condition, supervisor will be informed. A panel that has exposed wires will never be used. All openings must be closed and outer insulation on electrical cords must be intact.
- **Inadequate Wiring:** Properly rated extension cords will be used. It will be ensured that all power tools are used with a properly rated extension cord.
- **Damaged Insulation:** Defective or inadequate insulation is a hazard. Insulation prevents conductors from contacting each other. Tools or extension cords with damaged insulation will never be used.
- **Overloaded circuits:** Overloaded circuits can cause fires. Proper circuit breakers will be used. An outlet will never be loaded.
- **Damaged tools and equipments:** Electric tools that are damaged will never be used. Someone may receive a shock or be electrocuted.

In addition to that, following measures shall be adopted:

- There will be colour coding and labelling of high voltage electrical wires.

- Sand bags/ wire bucket shall be placed near the electrical control/panel
- Work practices and handling of the electrical equipment shall be properly managed.
- Properly maintained equipment and tools will be used.
- Service of electrical equipment shall be done under the supervision of trained personnel.
- Temporary connections made for experimental reasons shall be safe and properly insulated.
- Live electrical terminals shall be shielded.

Mechanical:

Mechanical hazards are created by powered operation of equipment or tools.

Mechanical hazards can occur at three locations:

1. Elevators
2. DG set room, Pump & motor room.
3. Vehicular Movement

Following preventive measures shall be taken.

1. Elevators shall be properly maintained with record book of maintenance.
2. Periodic replacement of critical components of elevator/ machine.
3. Proper training to operators of DG/STP
4. The protective guard will be installed at motors.
5. There will be safe distance demarcation on heavy machines like cranes (during construction)
6. Sign of danger at the hazard places.

Robbery/Dacoity/Terrorism: All the preventive measures shall be taken as given in security plan. Following measures shall be adopted to prevent any type of terrorist attack:

Site Emergency Plan At The Entry Gate

1. **Manual Checks:** At all gates the visitors and guest shall be manually checked and asked for ID's.
2. **Boom Barrier** shall be installed to restrict entry of unauthorized vehicles.

3. **CCTV:** Day & Night vision fixed CCTV cameras
4. **Checks at Entrances:** All cars entering will be checked thoroughly inclusive of Bonnets, Luggage Hold with hand held, metal detectors, mirrors and other checking stuffs.
5. **Central Control Room:** This will control the security system from inside.
6. **Communication Systems:** Proper communication system to security staff shall help them to coordinate better during emergencies.

Emergency Response Procedure

Even after all the preventive measures for any emergency following infrastructure shall be provided.

1. Administrative office shall also make an Emergency Control Room.
2. Assembly area shall be demarked for each building.
3. Communication system shall be installed in the complex which includes intercom and public addressing system.
4. Fire alarm shall be installed at vulnerable place.
5. The evacuation plan of each building shall be displayed at each floor of respective building.
6. The safe zones (at the time of emergency) on map shall be displayed at different locations.
7. First Aid facility shall be made available at Control room.

Emergency Response Procedure During Injury and Illness

If someone has an injury or becomes suddenly seriously ill and requires emergency medical attention, call shall be made to the nearest hospital. In the common areas of the complex there will be a list of ambulance or emergency medical service contact numbers.

1.1.4 EVACUATION PLAN

Evacuation plan includes the evacuation due to

- fire hazard
- Flood
- Earthquake

An evacuation policy, procedures, and escape route assignments must be framed to make the residents and visitors familiar with about the person who is authorized to order an evacuation, under what conditions an evacuation would be necessary, how to evacuate, and what routes to take. Exit diagrams are typically used to identify the escape routes to be followed by residents from each specific floor.

Fire Evacuation Plan:

Building occupants are required to evacuate the building when the fire alarm sounds.

Instructions:

- Immediately the fire department will be notified by pulling the alarm station.
- If trained, able and safe (with a sure and safe exit), a portable fire extinguisher will be used to extinguish the fire. If one extinguisher does not put out the fire, evacuation will be followed.
- The building will be evacuated as soon as the alarm sounds and proceed to the EAA.
- Others will be warned on the way out
- Stairs will be used only. Elevators will not be used.
- All will be assembled to safe assembly area for accountability and follow-on instructions.

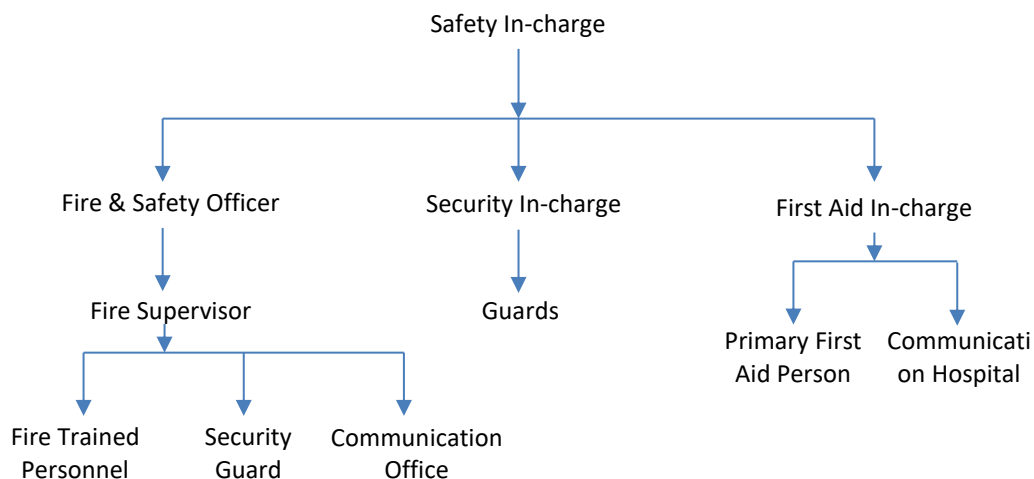


Figure 1: Disaster Management Cell