

Risk Assessment & Disaster Management Plan

For

Westend Commercial Building

At

Plot bearing S. No. 169/1, Sector I & II (part), Aundh, Pune-411007



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1. Introduction

The proposed project is development of commercial building, at Plot bearing S.No. 169/1, Sector I & II (part), Aundh, Pune-411007

Details of the proposed project are as follows

- Total Plot Area :29,500 m²
 - FSI Area: 45,634m²
 - Non FSI Area:30,782m²
 - Total Construction area 76,416 m²
 - Max. Height : 33.925 m
 - The total estimated population of users is 6600
- An emergency situation in a commercial complex may be due to manmade hazards like fire, power outage etc. or due to natural disasters viz. earthquake, flooding etc. For the preparedness of on-site emergency, the following objectives are taken into Consideration. The objective of a Disaster Management Plan is to ensure effective mitigation plan and best possible protection of the members of the society during a disaster occurrence.

A hazard is defined as a dangerous condition or events that threaten or have the potential for causing injury to life or damage to property or the environment is called hazard. Hazards can be categorized in various ways, but based on the origin they, worldwide, are basically grouped in two broad headings:-

1. Natural Hazards
2. Unnatural Hazards/ Man Made

2. Risk Assessment and Vulnerability Analysis

The proposed project encompasses the lives of a large number of people. It also involves installation of various structures that meet the comfort and needs of its population but may also pose serious threat to the users & workers in case of an accident. It is thus considered necessary to carry out a risk assessment and disaster management plan for the project.

Disasters can occur at any point of time. It is essential to predict possible scenarios and consider the mitigation plan and also plan for protection for all the involved individuals during occurrence of a disaster. If the inhabitants of a structure are aware of the protocols to be followed during a disaster, loss of life can be averted.

Assessing the risk and vulnerability of disasters is extremely important. The main objectives of a risk assessment plan are mentioned below:

Simplicity: The plan will be concise; roles and responsibilities have been clearly stated.

Flexibility: Emergency procedures have been prepared; we have planned alternative routes to an evacuation assembly area in the event that the main route is cut off by the hazard.

Decision making process: We will adopt and implement a decision making process in the event of an emergency.

Consultation: We will derive a workable plan after consultation with agencies working in emergency services.

Review: This plan we will be reviewed on a regular basis, preferably annually and following any significant emergency, to ensure that it remains workable.

2.1 Steps of Risk Assessment

- a) **Identify Hazards:** We have identified the hazards which will occur due to activity during construction & operational phase, such as risks arising due to excavation, gas cutting & welding, manual handling, lifting, noise, electric work, work in confined space, etc. Also risk occurring from falling material, slip; defective equipment, storage of material etc. have been identified.

Vulnerability Analysis

Vulnerability analysis is identifying areas which are unable to withstand the effects of the hazard.

Table 1: Vulnerability Analysis

Accidents/ Hazards	Mitigation measure
Collapsing of lift	Regular maintenance and checking of the lift. Putting up lift capacity details and sensor inside the lift.
Electric short circuit	Proper insulation of wires. Regular checking of electric boards for any exposed wires and installing automatic trips.

- b. **Identify people at risk:** Inhabitants of the building and support staff like watchmen, sweepers and cleaners, gardeners, etc. are at direct immediate risk during a disaster. Surrounding buildings/ residents/workers could be at risk in the event the disaster cannot be contained.

3. **Evaluate the risk and decide on precaution:** The management of the premises and the people, who will use it, will have an effect on our evaluation of risk. Management alone shall have responsibility along with, building owners or managing agents.

4. **Record, plan, inform, instruct & train:** We will be recording all the significant findings of risk assessment and the actions will be taken. Also we will be recording the discussions with staff or staff representatives. We have prepared the Emergency plan based on all situations. This Emergency plan will be readily available to the employees, their representatives (where appointed), and the enforcing authority.

We will provide adequate fire safety training for the staff & workers. Training will be based on the particular features of our premises.

5. Review: We will be constantly monitoring and implementing the fire risk assessment, to assess how effectively the risk is being controlled. If necessary we will revise the assessment. We will keep records of the testing, maintenance and training etc.

Table 2: Steps of Risk Assessment

1	Identify fire hazards	Sources of ignition Sources of fuel Sources of oxygen
2	Identify people at risk	People in and around the premises People especially at risk
3	Evaluate, remove, reduce and protect from risk	Evaluate the risk of a fire occurring Evaluate the risk to people from fire Remove or reduce fire hazards Remove or reduce the risks to people • Detection and warning • Fire-fighting • Escape routes • Lighting • Signs and notices • Maintenance
4	Record, plan, inform, instruct and train	Record significant finding and action taken Prepare an emergency plan Inform and instruct relevant people; co-operate and co-ordinate with others Provide training
5	Review	Keep assessment under review Revise where necessary

2.2 Risk Hazard & its control measures

We will be following all the safety norms during construction & operation phase. However, it is not always possible to totally eliminate such eventualities and random failures of equipment or human errors. A detailed table showing activities during construction and operation phase along with mitigation measures are given below in Table 3.

Table 3: Activities during construction and operation along with mitigation measures

Sr.	Hazards associated with activities (during construction & operation)	Control/Mitigation measures
1	Manual Handling Strains and sprains due to incorrect lifting too heavy loads - Twisting - Bending - Repetitive movement - Body vibration	1. Exercise/warm up 2. Get help when needed control loads rest breaks/no exhaustion no rapid movement /twisting/ bending / repetitive movement 3. Good housekeeping
2	Falls - Slips - Trips Falls on same level, falls to surfaces below, poor housekeeping slippery surfaces, uneven surfaces, poor access to work areas climbing on and off plant unloading materials into excavations wind. Falling objects	1. Good Housekeeping 2. Guardrails, handholds, harnesses, hole cover, hoarding, no slippery floors/trip hazards clear/ safe access to work areas egress from work areas dust/water controlled 3. Personal Protective Equipment
3	Fire Flammable liquids/Gases like LPG, Diesel storage area and combustible building materials poor housekeeping grinding sparks open flames, absence of Fire hydrant network.	1. Combustible/flammable materials properly stored. 2. Good housekeeping 3. Fire extinguishers made available & Fire hydrant Emergency Plan in case of Fire or collapse of structure.
4	Absence of Personal Protective Equipment Lack of adequate footwear head protection hearing/eye protection respiratory protection gloves Goggles	1. Head/face footwear hearing/eye skin respiratory protection 2. Provided training 3. Maintenance of equipment
5	Defective or wrong Hand Tools Wrong tool defective tool struck by flying debris caught in or on missing guards	1. Right tool for the job. 2. Proper use of tools, good condition/ maintenance guards isolation/ 3. Proper demarcation of work.
6	Electricity Electrocution overhead/underground services any leads damaged or poorly insulated temporary repairs -no testing and tagging circuits overloaded nonuse of protective devices.	1. Leads good condition and earthed no temporary repairs 2. No exposed wires 3. Good insulation no overloading 4. Use of protective devices testing and tagging no overhead/underground services
7	Scaffolding Poor foundation. Lack of ladder access insufficient planking lack of guardrails and toe boards insufficient ties. All scaffolds incorrectly braced or	1. All scaffolds correctly braced and stabilized 3:1 height to base ratio firm foundation, plumb and level ladder access provided and used proper platform planks 2. Secured guardrails and toe boards 900 mm to 1,100 mm high, within 200 mm of

Sr.	Hazards associated with activities (during construction & operation)	Control/Mitigation measures
	stabilized to prevent overturning.	working face, mid-rail
8	Ladders Carrying loads not secured against dislodgement, defective ladders not sufficient, length wrong positions .incorrectly placed (angles, in access ways, vehicle movements)	1. Secured against movement or footed ladders in good condition. 2. Regularly inspected extend 1 m above platform 4:1 angle out of access ways. 3. Not working platforms
9	Excavations Trench collapse material falling in undetected underground services Hazardous atmosphere struck by traffic and mobile plant.	1. Soil stability known no water accumulation existing services known material 600 mm from edge clear of suspended loads hardhats. 2. Personal Protective Equipment, traffic controls 3. Emergency Plan
10	Gas Cutting and Welding Fire welding flash, burns, fumes, electrocution in wet conditions flashback in oxygen set, leaking cylinders, acetylene cylinders lying down Poorly maintained leads.	1. Welding flash and burns controlled with and shields; fumes controlled with ventilation. 2. Personal Protective Equipment (in good condition and properly positioned) 3. Gas cylinders will be on secured position (properly tied) 4. Combustible materials kept at secured place to avoid fire & Fire Extinguishers kept in fire prone area. 5. Training to people for its use.
11	Noise Equipment, Machines, Room, Vehicle	1. Use of Personal Protective Equipment 2. Tree plantation act as noise barrier
12	Falling Material Fall during carrying/Lifting materials dislodged tools and materials from overhead work areas.	1. Materials placed in secured area kept away from edge toe boards 2. Use of Personal Protective Equipment
13	Crane lifting Display of carrying capacity i.e. load (No. of person), incorrectly slung, defective lifting equipment, unsecured loads, craning in close proximity to building people and plant falls - Falling materials.	1. Periodic testing of crane by competent authority. 2. Correctly slung/secured loads, lifting equipment good condition 3. Use of proper hand signals 4. Falls while unloading controlled.
14	Visitors Presence at site Falls Struck by dropped materials road accidents Insufficient hoarding or fencing pedestrian access past site	1. Sufficient hoarding 2. Fencing and barricades 3. Safe pedestrian access past site traffic management for loading and delivery 4. Construction separated from occupied areas of projects

Sr.	Hazards associated with activities (during construction & operation)	Control/Mitigation measures
15	Kitchen Fall Burn injury Fire	1. Open cooking, such tried at Blue FROG frying, not be left unattended. 2. Isolation switches for gas and electricity supplies, 3. Isolation switches for any extractor fans will be located near to an exit. 4. Good housekeeping
16	Storage of material Fire	1. Store combustible 2. materials and stock such as baggage, linen and 3. Furniture in a dedicated storage area. 4. Storeroom or cupboard that is fire resisting. 5. Fire extinguishers available near the storage area.
17	Smoking Fire	1. Prohibited smoking in crowded area. 2. Display suitable signs throughout the premises. 3. Design separate area for smoking. 4. Regular inspection in smoking permitted area.

2.3 Instructions for users

- Get out of buildings as quickly and as safely as possible.
- Follow the fire evacuation plan posted in the passageway.
- Go to the nearest refuge floor/evacuation assembly point
- Use the stairs to escape. When evacuating, stay low to the ground.
- If possible, cover mouth with a cloth a avoid inhaling smoke and gases.
- Close doors in each room after escaping to delay the spread of the fire.
- If smoke is pouring in around the bottom of the door or if it feels hot, keep the door closed.
- Open a window to escape or for fresh air while awaiting rescue.
- If there is no smoke at the bottom or top and the door is not hot, then open the door slowly.
- If there is too much smoke or fire in the hall, slam the door shut.
- Stay out of damaged buildings.
- Check that all wiring and utilities are safe.
- Firefighting system is proposed for the project to prevent and control fire outbreaks. The firefighting system will consist of portable fire extinguishers, hose reel, wet riser, yard hydrant, automatic sprinkler system, and manual fire alarm system. The buildings will also be provided with automatic fire detection and alarm system.

3 .Disaster Management Plan

Disaster

A disaster is the product of a hazard such as earthquake, flood or storm coinciding with a vulnerable situation, which might include communities, cities or villages. There are two main components in this definition: hazard and vulnerability. A disaster occurs when hazards and vulnerability meet.

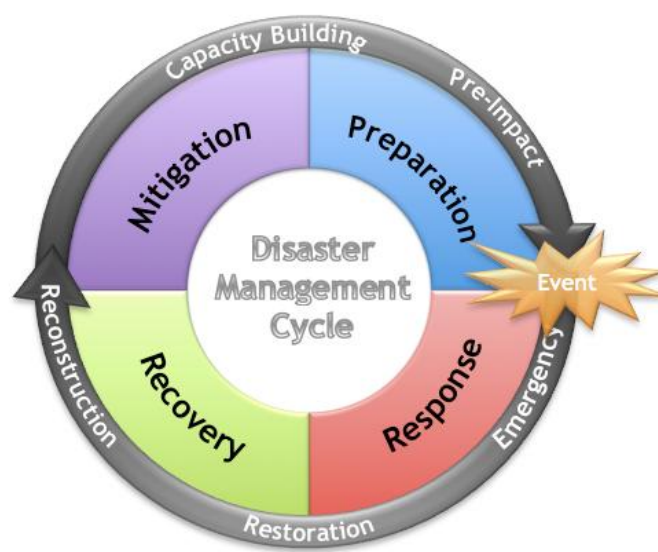
Disaster Management Plan (DMP) deals with the preparations to reduce the impacts of Natural and Man-made disasters. Recent rise in the occurrence of disasters has alerted us regarding the need of pre-planned DMP which will aim at providing effective and timely relief during disaster through organized manner.

Importance of a Disaster Management Plan

Hazard identification and Risk assessment is done to handle natural disasters such as floods, cyclones, landslides etc., as well as Man Made Disasters. This Disaster Management Plan is designed as per the present need and the major strategies to respond to any unexpected situation have also been considered. In the multi-hazard mitigation plan, all the disasters will be handled properly following the given procedure. The main features of the Disaster Management Plan are:

- It gives importance to all the disasters equally and helps to mitigate the situation beforehand.
- All the line authorities are assigned with their proper role and responsibilities, which are clearly indicated in this plan.

Figure 1: Disaster Management Steps



Following types of natural disaster can occur with a prior indication or without any prior indication.

3.1 NATURAL DISASTERS: Natural Disasters occur naturally with or without any prior indication. Natural disasters which often are sudden and intense results in considerable destruction, injuries, deaths, disrupting normal life as well as the process of development. Increasing population and various other socio-economic factors have forced people to live in vulnerable areas. Natural disasters are perceived on increase in their magnitude, frequency and economic impact.

3.1.1 Earthquake

Earthquakes are usually caused when rock underground suddenly breaks along a fault. This sudden release of energy causes the seismic waves that make the ground shake. Building develops cracks, collapses when the intensity of earthquake is more and prolonged. Probability of Occurrence: As per the earthquake zonation of India, the site falls under seismic zone III which is referred as moderate risk zone. Thus the possibility and severity of the experiencing the earthquake apparently decreases. Although there are no past records of this disaster in this region, earthquake of intensity between 5.0 and 6.9 on the Richter scale can occur in Zone III. Accordingly the measures proposed are enumerated in the section of mitigation and preparedness.

✓ Mitigation Measures:

- What to do during an Earthquake?
 - Keep calm and keep others calm
 - Do not panic

If you are at inside a building or auditorium, Practice Drop, Cover and Hold. Protect yourself by standing in the corner of the room. Do not rush to the doors or the exits and keep well away from windows, mirrors and furniture. Let younger children, elderly and disabled people leave first.

If you are on the road in a built up area, walk towards an open place, in a calm and composed manner. Do not run and do not wander in the street or on the roads for sight-seeing. You must keep the roads free for movement of rescue and relief teams. Also, keep away from buildings, especially old, tall buildings or detached buildings, electricity wires and poles, slopes and walls. They are liable to collapse.

If you are driving, move to side of the road and stop. Stop the vehicle away from flyovers, building walls, slopes, electricity wires/ cables/poles, advertisement boards and stay inside the vehicle.

3.1.2 Cloud Burst and flood due to heavy rainfall

A cloudburst is an extreme amount of precipitation, sometimes with hail and thunder, which normally lasts no longer than a few minutes but is capable of creating flood

conditions. Sudden cloudburst can cause a flood to occur. This is one of the natural disasters. Flooding may occur due to the following reasons:

- ★ If the rainwater does get the access to the natural stream or municipal drains
- ★ Delay in water flow from all runoff towards the natural stream like river, nalla (or sea).
- ★ Slow discharge of water
- ★ Flow diversion
- ★ Chocked up drains, nallah, and river bed.

✓ **Mitigation Measures:**

- Storm water system will be checked and cleaned periodically.
 - Mapping the areas within or leading in or out of the building that will be water logged, flooded or isolated due to the flood. The areas will be marked after completion of the project.
 - Basement area will be mapped.
 - Dewatering pumps will be installed at vulnerable locations.
- Even if heavy rain fall are received, a well-designed storm water drain is proposed at the project site as also there is a municipal storm water drain of adequate capacity.

3.1.3 Cyclones

Cyclones are caused by atmospheric disturbances around a low pressure area distinguished by swift and often destructive air circulation. They are usually accompanied by violent storms and bad weather.

✓ **Mitigation Measures:**

There is no history of any cyclone in this area. However in such an instance, people will be advised to stay in the shelter in tightly secured windows and doors. The glass of windows etc. will be covered with paper/cardboards to avoid glass breaking due to flying objects outside.

3.1.4 Lightning Strike

Lightning can strike branch circuitry wiring in the walls of the building. Lightning can strike an object nearby, such as a tree or the ground itself and cause a surge. Voltage surges can be created by cloud to cloud lightning. A highly charged cloud which passes overhead can also induce a voltage surge.

✓ **Mitigation Measures:**

Buildings are protected from lightning by metallic lightning rods extending to the ground from a point above the highest part of the roof. A lightning arrester is a device used on electrical power systems and telecommunications systems to protect the insulation and conductors of the system from the damaging effects of lightning. The typical lightning arrester has a high-voltage terminal and a ground terminal. The conductor has a pointed

edge on one side and the other side is connected to a long thick copper strip which runs down the building. The lower end of the strip is properly earthed. When lightning strikes it hits the rod and current flows down through the copper strip. These rods form a low-resistance path for the lightning discharge and prevent it from travelling through the structure itself.

3.2 MAN MADE DISASTERS:

These kinds of disasters generally occur due to human error or negligence.

3.2.1 Fire

Fire is a hazard which is caused mainly due to human negligence. Reasons like electrical short circuit, rain water seepage in electrical installations, gas cylinder malfunctioning, can cause fire disaster in a commercial building. A full proof firefighting system is designed for the buildings which meets all fire safety norms and has a mitigation plan to tackle the fire hazard. During construction all safety precautions will be taken to handle the fire hazard. During construction fire can break out due to following reasons:

- ★ Electrical loose connection
- ★ Electrical short circuit
- ★ Storage of Inflammable material like diesel, paint at site
- ★ From cooking gas cylinders at labor hutment

✓ Mitigation Measures:

The proposed project is designed with utmost care for all fire safety norms for its users and the building as a whole with focus on mitigating such calamities during construction and operation phases of the building. Fire proof material will be used as per design for various components of the building. Electrical cables and switches will be IS (Bureau of Indian Standard) certified and will have the minimum fire rating to mitigate any fire hazard. The cabling and jointing will be done by professional agencies to avoid any mistake while installation.

For each building we will be providing the following Firefighting equipment's:

- Wet riser
- Fire pump
- Sprinkler pump and Jockey pump
- booster pump
- Court yard hydrant system
- Fire Hydrant system
- Automatic fire alarm system
- External hydrants
- Potable fire extinguisher
- OHT & UGT firefighting water storage
- Fire escape masks
- Water curtain system provide

The Emergency Preparedness programme comprises the following elements:

- Proper fire escape routes with indicative boards will be placed.
- Fire detection system will be installed in each floor of the building.
- Provision of sufficient capacity of underground tanks for firefighting.
- Fire pumps, booster pumps, sprinkler pumps, wet risers & jockey pumps will be provided in each building.
- Court yard hydrant system & Fire Hydrant system will be provided in each building.
- Automatic fire alarm system we be installed in each building.
- Intelligent automatic fire detection and alarm system in each buildings.
- We will be installing fire extinguisher in each floor of the building
- We will be providing Sprinkler system throughout the floors & all common areas shall be as per CFO requirement and relevant IS codes. Sprinklers must be provided throughout the common areas and internal areas.
- Provision of external and internal hydrants.
- Regular mock drills we will be carried out.
- For fire tender movement 18m wide DP road and 6 m wide internal roads will be provided.

Figure 2: Firefightingequipment

		
Sprinkler system	Fire extinguisher	Fire alarm
		
Booster pump	Fire escape routes	Fire hydrant

3.2.2 Building collapse

To protect against building collapse, hardening of the buildings structural systems may be required. This is a multi disciplinary effort of the architect, structural engineer, mechanical engineer and other design team members in order to achieve a balance building envelope. Designers should balance the hardening of the building envelope so that the columns, walls, windows and glazing have an approximately equal response for damage/ injury.

3.2.3 Vehicle Accidents

Speeding on congested roads and narrow lanes are a few issues that can lead to accidents. Accidents while mainly arise due to human error can sometimes even be caused due to mechanical failure.

✓ **Mitigation Measures:**

The project site has internal roads more than 6 meter which can sufficiently cater to the vehicular needs at the project site. Traffic flow to and within the site will be properly maintained so that there are no obstructions to existing traffic flow on access roads. Also, road side parking will be avoided. The entry/ exit to the site will be with adequate curvature at kerbs so that vehicles coming out/ entering the building do not impinge on road traffic directly. Regular maintenance and upkeep of the internal roads within project site will ensure smooth traffic flow.

3.2.4 Security breach

Included in this category are Break-ins, Bomb Threats, riots & vandalism. Bomb threats could be genuine or false and many a time they turn out to be a hoax. Unscrupulous elements with the intention of creating a panic tend to resort to such hoax calls. Confirmed militants however resort to such deeds with the intention of destruction and strike terror. It would therefore be prudent to assess bomb threats. The threats are usually through phone calls, giving very little time to react or through mail, giving a certain date of an explosion that could occur. It is very rare that the caller will identify himself and the message sent through any messenger for fear of easy identification.

✓ **Mitigation Measures:**

The most important component for plan development is the set of controls or measures used to prevent a security incident. Physical security controls/measures are grouped into three broad elements: operations, architecture and technology. High perimeter boundary walls will be constructed and efficient and trained security guards will be employed to tackle any possible breaches.

3.2.5 Malfunctioning of Lifts

Due to Technical snap or power failure lifts could get stuck in between floors, or the wire could snap and the lift may fall down the shaft.

✓ **Mitigation Measures:**

Regular maintenance of lifts and other Building Management Systems has to be conducted. There should be a specific committee appointed for maintaining the systems during the operation phase.

3.2.6 Power failure

Power failure to a building will have a serious impact on its operations, particularly if the failure occurs during normal operating hours when the building is fully occupied. They can be caused due to Manmade/ Technical Fault or as a result of Natural Events.

✓ **Mitigation plan**

Buildings have emergency and standby power systems to provide safety and comfort to building users during interruptions in their normal power supply.

- We will be providing D.G set of capacity 10435KVA, as a backup for electrical supply for elevators, common lighting areas, firefighting equipment, STP etc.
- We will be providing independent electrical circuits for critical equipment like fire pumps, sprinkler pumps.
- UPS will be used as a backup to protect computers, telecommunication instruments, data loggers etc.

4 ONSITE EMERGENCY PLAN

For the incidents which could affect users and the environment inside the building.

- We will display the emergency phone nos. (Includes phone number and address of nearby hospital, fire station, police station, public help service etc.)
- We will be carrying out periodically maintenance and checking of all equipment.
- We will give training to all users for different type of emergencies
- We will carry out training program for the users, security guards, housekeeping staff and other stake holders of the building.
- We will prepare the evacuation plan, floor plan, site plan, elevation marked with refuge area etc.
- We will regularly carry out fire & emergencies drill programmer
- Each building has the following Inventory resources equipment:
 - ✓ Overhead and underground water storage tank
 - ✓ Portable fire extinguisher on each floor
 - ✓ Fire Hydrant system
 - ✓ Automatic fire alarm system detection
 - ✓ Smoke detecting system
 - ✓ Proper fire exits and signage at entry and exit
 - ✓ Proper fire and electric audit at regular intervals will be conducted

5.OFFSITE DISASTER MANAGEMENT PLAN

List of nearest Police station, fire station clinics and hospitals is been maintained for medical emergency as also any other eventuality. The table below is ready and will be distributed to all members within the building and later for off-site plan to neighborhood. This information we will be updated every six months before safety drills. The updated information will be shared with users.

Table 5: List of External Agencies

Sr.	Name	Contact No.	Distance
Police Station			
1.	Aundh Police station Department Ward No. 8, Aundh Gaon, Aundh Pune, Maharashtra 411027	98602 79548	0.71 km
Fire Station			
1.	PCMC fire station –Jana Arunakumar Mukaya Agnishamak Kendra	020 2742 3333	6 km
Hospital			
1.	Kotbagi hospital	020 2588 2770	0.21 km
2.	AIMS hospital	020 2580 1000	0.78 km
3.	Shashwat hospital Aundh	020 6729 6464	0.49 km