RISK ASSESSMENT AND DISASTER MANAGEMENT PLAN

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

1.1.1 Risk Hazard & its control measures

It is attempted to plan and construct the buildings following all safety norms. However, it is not always possible to totally eliminate such eventualities and random failures of equipment or human errors. An essential part of major hazard control has therefore, to be concerned with mitigating the effects of such emergency and restoration of normalcy at the earliest. A detailed table showing activities during construction and operation phase along with mitigation measures are given in Table 1

Table 1: Activities during construction and operation along with mitigation measures

HAZARDS ASSOCIATED WITH ACTIVITIES (During Construction & Operation)	**CONTROL/MITIGATION MEASURES**
Manual Handling - Strains and sprains due to incorrect lifting - too heavy loads -twisting - bending - repetitive movement - body vibration.	- Exercise/warm up - get help when needed - control loads - rest breaks/no exhaustion - no rapid movement /twisting/ bending / repetitive movement - good housekeeping.
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	- Good Housekeeping - tidy workplace - guardrails, handholds, harnesses, hole cover, hoarding, no slippery floors/trip hazards - clear/ safe access to work areas - egress from work areas - dust/water controlled - PPE.

- falling objects.	
Fire - Flammable liquids/Gases like LPG, Diesel Storage area and combustible building materials - poor housekeeping - grinding sparks - open flames, absence of Fire hydrant net work.	- Combustible/flammable materials properly stored/used - good housekeeping - fire extinguishers made available & Fire hydrant Network with reserve Fire water (As per NFPA Code) - Emergency Plan in case of Fire or collapse of structure.
Absence of Personal Protective Equipment -Lack of adequate footwear - head protection -hearing/eye protection - respiratory protection - gloves -goggles.	- Head/face - footwear - hearing/eye - skin - respiratory protection provided - training - maintenance
Defective or wrong Hand Tools - Wrong tool - defective tool - struck by flying debris - caught in or on - missing guards	- Right tool for the job - proper use of tools - good condition/ maintenance guards -isolation/ proper demarcation of work space - eye/face protection - flying debris controlled
Electricity - Electrocution - overhead/underground services - any leads damaged or poorly insulated - temporary repairs -no testing and tagging - circuits overloaded - non use of protective devices.	- Leads good condition and earthed - no temporary repairs - no exposed wires - good insulation - no overloading - use of protective devices - testing and tagging - no overhead/ underground services
Scaffolding -Poor foundation -lack of ladder access insufficient planking -lack of guardrails and toe boards -insufficient ties or other means -all scaffolds incorrectly braced or stabilized to prevent overturning.	- All scaffolds correctly braced and stabilized - 3:1 height to base ratio - firm foundation, plumb and level - ladder access provided and used - proper platform (3 planks/675 mm) - planks secured - guardrails and toe boards

	- 900mm to 1100mm high, within 200mm of working face, mid-rail.
Ladders -Carrying loads -not secured against dislodgement -defective ladders -not sufficient length -wrong positions -incorrectly placed (angles, in access ways, vehicle movements.	- Secured against movement or footed - ladders in good condition - regularly inspected - extend 1m above platform - 4:1 angle - out of access ways, vehicle movements - not carrying loads - 3 points of contact - no higher than 3rd step down - use for access only, not working platforms
Excavations - Trench collapse - material falling in undetected underground services - falls - hazardous atmosphere struck by traffic and mobile plant.	- Soil stability known - no water accumulation - existing services known - material 600mm from edge - clear of suspended loads - hardhats/PPE - ladders - public protection – atmospheric testing - traffic controls - Emergency Plan.
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.	- Welding flash and burns controlled with PPE and shields - fumes controlled with ventilation and PPE (in good condition and properly positioned),Gas cylinders be kept upright & secured position (properly tied) - combustible materials to be kept at secured place to avoid fire & Fire Extinguishers to be kept in fire prone area with training to people for its use.
Noise - Unknown noise levels - known noise levels over 85 decibels	- Levels below 85 decibels - proper protection.
Falling Material - Fall during carrying/Lifting materials-dislodged tools and materials from overhead	- Materials to be secured - kept away from edge

work areas.	- toe boards - Use of hard hats.
Craneage & Lifts - 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.	- Periodic testing by competent authority - correctly slung/secured loads, lifting equipment good condition - use of proper hand signals - falls while unloading controlled.
Visitors Presence at site - Falls - struck by dropped materials - road accidents - insufficient hoarding or fencing - pedestrian access past site - mechanical plant movement on and off site.	- Sufficient hoarding - fencing and barricades - safe pedestrian access past site traffic management for loading and delivery - construction separated from occupied areas of projects.

1.1.2 Emergency Response Plan (ERP)

The overall objective of an Emergency Response Plan (ERP) is to make use of the combined resources at the site and outside services to achieve the following:

1. To localize the emergency and if possible eliminate it;
2. To minimize the effects of the accident on people and property;
3. Effect the rescue and medical treatment of casualties;
4. Safeguard other people;
5. Evacuate people to safe areas;
6. Informing and collaborating with statutory authorities;
7. Initially contain and ultimately bring the incident under control;
8. Preserve relevant records and equipment for the subsequent enquiry into the cause and circumstances of the emergency;
9. Investigating and taking steps to prevent reoccurrence

The ERP is therefore related to identification of sources from which hazards can arise and the maximum credible loss scenario that can take place in the concerned area. The plan takes into account the maximum credible loss scenario - actions that can successfully

mitigate the effects of losses/ emergency need to be well planned so that they would require less effort and resources to control and terminate emergencies, should the same occur.

Main hazards identified for the project include hazards pertaining to fires in buildings and fire in diesel storage areas, earthquake and LPG leakage and an ERP pertaining to these is described in the following section.

1.2 RESPONSE IN CASE OF EARTHQUAKE

1.2.1 Response Procedures for Occupants

If indoors:

1. Take cover under a piece of heavy furniture or against an inside wall and hold on.

2. Stay inside: The most dangerous thing to do during the shaking of an earthquake is to try to leave the building because objects can fall on you.

If outdoors:

Move into the open, away from buildings, streetlights, and utility wires. Once in the open, stay there until the shaking stops.

If in a moving vehicle:

Stop quickly and stay in the vehicle. Move to a clear area away from buildings, trees, overpasses, or utility wires. Once the shaking has stopped, proceed with caution. Avoid bridges or ramps that might have been damaged by the quake.

After the quake

1. After the quake be prepared for aftershocks.

2. Although smaller than the main shock, aftershocks cause additional damage and may bring weakened structures down. Aftershocks can occur in the first hours, days, weeks, or even months after the quake.

Help injured or trapped persons.

1. Give first aid where appropriate. Do not move seriously injured persons unless they are in immediate danger of further injury. Call for help.

2. Remember to help those who may require special assistance--infants, the elderly, and people with disabilities.

3. Stay out of damaged buildings.

4. Use the telephone only for emergency calls.

1.2.2 Response Procedure for Emergency Team

1. Formulate an Emergency Response Team for earthquake response.

Using the public address system, inform residents of response procedures discussed above.

2. Inform the necessary authorities for aid.

3. Ensure no person is stuck beneath any debris, in case of a structural failure.

4. Ensure that all occupants standing outside near the buildings are taken to open areas.

5. Ensure that the first aid ambulance and fire tender vehicles are summoned if necessary.

6. Inform the nearby hospitals if there are any injuries.

7. Check the utilities and storage tanks for any damage.

1.3 RESPONSE FOR LPG LEAKAGE

1. The affected area should be evacuated and cordoned off immediately

2. Initiate an Emergency Response Team for LPG leakage.

3. Shut down the main valves in the gas bank.

4. Ensure that only concerned personnel are present in the affected area and all other personnel and visitors are moved to the nearest assembly points.

5. Rescue trapped personnel, also check if any personnel are unconscious in the area and immediately move them outside and provide first aid. Ambulance should be summoned to take injured personnel to the nearest hospital.

6. Personnel in the nearby buildings to close all doors and windows to prevent entry of the leaked gas.

7. Source of leakage to be traced and isolated from all the other areas. And if required use pedestal fans to bring down the gas concentration.

8. In case of a fire follow the instructions in case of fire.

1.4 RESPONSE IN CASE OF FIRE

1. Required response during in the event of a fire should be described in signs located in the lobby.

2. On sighting a fire, it should be immediately informed to the environment manager giving the exact location and type of fire in detail.

3. Initiate the Emergency Response Team for fires.

4. If the fire is small, engage in extinguishing the fire using the nearest fire extinguisher.

5. Guide the Emergency Response Team staff to the emergency assembly point.

6. The Emergency Response Team should immediately inform the nearest dispensary and security force. If required a fire tender should be summoned.

7. The response team should immediately move to the point of fire and take all necessary steps to stop the fire. If the fire is not controllable and spreads then the manager in charge should inform the district authorities and call for external help.

8. The Emergency Response Team will provide immediate relief to the injured residents at the scene of incident. Any injured persons should be evacuated on priority to the dispensary or one of the nearest hospitals based on their condition.

Instructions for occupants

1. Get out of buildings as quickly and as safely as possible.

2. Use the stairs to escape. When evacuating, stay low to the ground.

3. If possible, cover mouth with a cloth to avoid inhaling smoke and gases.

4. Close doors in each room after escaping to delay the spread of the fire.

5. If in a room with a closed door.

6. If smoke is pouring in around the bottom of the door or if it feels hot, keep the doorclosed.

7. Open a window to escape or for fresh air while awaiting rescue.

8. If there is no smoke at the bottom or top and the door is not hot, then open the door slowly.

9. If there is too much smoke or fire in the hall, slam the door shut.

10. Stay out of damaged buildings.

11. Check that all wiring and utilities are safe.

A state of the art fire fighting system is proposed for the project to prevent and control fire outbreaks. The fire fighting system will consist of portable fire extinguishers, hose reel, wet riser, yard hydrant, automatic sprinkler system, and manual fire alarm system. The Commercial buildings will also be provided with automatic fire detection and alarm system.