

Risk Assessment Studies

1.0 Introduction

A systematic Risk Analysis will help in identification of the hazards and associated risk. For the project, Risk analysis study has been carried out to assess risks associated with the construction and operation of the proposed development. The risk assessment thus carried out also provides inputs for formulating the onsite Disaster Management Plan (DMP). The Risk Analysis was broadly divided into three categories.

- Hazard Identification
- Failure Frequency
- Consequence or Effect and Damage calculations

1.1 Risk Assessment

Risk assessment is defined in this study as a technique that aims to identify and estimate risks to personnel and property impacted upon by a project. Traditional risk assessment for construction has been synonymous with probabilistic analysis. Such approaches require events to be mutually exclusive, exhaustive, and conditionally independent. However, construction involves many variables, and it is often difficult to determine causality, dependence and correlations. As a result, subjective analytical methods that rely on historical information and the experiences of individuals and companies have been used to assess the impact of construction risk and uncertainty.

1.1.1 Major Hazards

The major hazards anticipated in any major area development projects are illustrated below.

- Hazardous pertaining to fires in buildings
- Fire in diesel storage areas, garbage storage areas and disposal areas
- Natural disasters viz. Earthquakes, flooding, etc.
- LPG gas leak
- Electrical accidents
- Flooding from man-made causes

1.2 Disaster Management Plan (DMP)

Emergency prevention through good design, operation, maintenance and inspection are essential to reduce the probability of occurrence and consequential effect of such eventualities. The overall objective of the DMP/Emergency Response Plan (ERP) is to make use of the combined resources at the site and outside services to achieve the following.

- Localize the emergency on property and people
- Minimize effects on property and people
- Effective rescue and medical treatment
- Evacuation.

1.2.1 Hazard Control Measures

1.2.1.1 Fires

To increase the level of safety in hotels, residential villas, convention center, other built-up areas, installation of smoke alarms or automatic fire detection /alarm systems will be proposed as an early warning of fire to the occupants. Smoke alarms to be positioned in circulation areas between sleeping spaces, in places where fires are most likely to start such as kitchens or living rooms, to pick up smoke in the early stages of a fire, close enough to bedroom doors to be effective when people are asleep.

To prevent fire mishaps and to manage the emergency situation during fire in the proposed project the following activities and precautions are proposed.

- Emergency evacuation plans are important for all hotels, convention center, etc., and the same will be prepared as per Fire & Safety rules.
- It will be advised to keep oxygen cylinders, medical kits and masks for higher floor occupants to prevent smoke inhalation especially for those with respiratory disorders for whom smoke inhalation can be very dangerous.
- Property manager or owners association will be advised to ensure that the firefighting equipments are in good working conditions.
- Every floor will be provided with sufficient firefighting gadgets (water, soil, cylinders)

Simple steps to be followed during emergency are as follows.

Call the fire rescue department: During fire in hotel, convention center or any other area, leave the premises by nearest available exit. Call fire department and do not assume anyone else has called the fire department. Never use lift for leaving the premises during emergency. If your cloth catches fire, do not get panic or run, stop, drop and roll.

Cover your nose and mouth with a wet clean cloth: Stay calm cover your nose and mouth with a wet, clean cloth to prevent smoke inhalation injury and choking. Never jump off or attempt to climb down the side of a tall building as it will mean certain death.

Do not run: During a fire, smoke containing poisonous gases such as CO tends to rise up. When you run in a smoke filled room, you tend to inhale the smoke faster. CO dulls the senses and prevents clear thinking, leading to panic. To prevent being asphyxiated, dip tissues or cloth in water and cover your nose with it.

Head-count of the occupants: During an emergency, make good use of the evacuation procedure and help each other to reach out of building safely. Ensure nobody is left behind by doing a head-count of occupants. Visitors should read and understand the evacuation plan before going into a hotel, convention center and ensure their safety.

1.2.1.2 Natural Disasters

Disasters occur without notice. Most disasters are natural such as earthquake, floods, hurricanes, sandstorms, landslides, tsunamis and volcanoes. We have no way of stopping them, but we can learn to deal with the difficult situations that arise due to them.

During disasters like floods, fire, earth quake, landslides, rescue beings at home. Even before external help arrives, people affected by the disasters help each other.

The government and many voluntary organizations send teams of workers trained in rescue operations to disaster-affected areas. These teams join hands with the local community helpers such as doctors, nurses, social workers and policemen.

Temporary shelters are built for displaced people. Doctors and nurses provide medical aid. They treat the wounded and work to control epidemics. Social workers collect food and cloth from all over the country for the disaster-affected people. The police maintain law and order. Media – persons help in spreading news about the victims and their conditions. They also post advertisements that urge people to donate for victims.

In extreme conditions, the army and Air force organize rescue operations. They clear roads, send medical teams and help to move people to safer places. The air force drops food, water and clothes in the affected areas. Organization like UN helps in providing aid during massive disasters.

Individually, people from all over the world also come forward to help during a disaster. They donate blood while many donate money. Some even reach the disaster affected places to give an extra hand in the rescue operation. Families adopt children who have lost their parents and thus give them a new home.

What you can do in case disaster strikes are given below

- If there is a tornado, take shelter in a place without windows.
- In an earthquake, remember to crouch under some heavy furniture or stand under the doorframe for cover.
- In case of a fire in the building, leave the building by the stairs. Do not use a lift.
- If the house is flooded, then climb up to the roof.
- Do not use the telephone, except to call for help, so as to leave telephone lines free for the organization of response.
- Listen to the messages broadcast by radio and the various media so as to be informed of development.
- Carry out the official instructions given over the radio or by loudspeaker.

- Keep a family emergency kit ready. In all the different types of emergency, it is better to be prepared than to get ready, to get information so as to get organized, to wait rather than act too hastily
- During floods turn off electricity to reduce the risk of electrocution
- As soon as flood begins, take vulnerable people (old, children, sick, etc) to upper floor
- Beware of water contamination, wait until the water is declared safe before drinking or boil the water before drinking
- Clean and disinfect the room that is flooded
- During storms and hurricanes do not go out in a car or a boat once the storm has been announced
- If caught outside in a storm, take refuge as quickly as possible in shelter (never under a tree), if there is no shelter, lie down flat in a ditch.
- In a thunderstorm keep away from doors, windows, and electrical conductors, unplug electrical appliances and television aerials. Do not use any electrical appliances or the telephone
- During earthquake keep calm, do not get panic, People who are indoors should stay there but move to the central part of the building, people who are outside should stay there, keeping away from buildings to avoid collapsing walls and away from electrical cables. Anyone in a vehicle should park it, keeping away from bridges and buildings.
- During spread of clouds of toxic fumes, close doors and windows, seal any cracks or gaps around windows and doors with adhesive tape. Organize a reserve of water (by filling wash basins, baths, etc. Turn off ventilators and air conditioners.

1.2.1.3 LPG Gas Leak Prevention and Precautions during Leakage

The safety norms to be followed in the Kitchen for use of LPG fuel for cooking are as follows

1. Kitchen should be properly ventilated with a window and an escape door.
2. Kitchen should be separate and not part of living-room / bedroom.
3. Gas stove should be placed away from the window to avoid direct draft.
4. No direct fan on the Kitchen.
5. No direct fan on the gas stove.
6. Gas stove to be placed on a platform above the level of the cylinder.
7. The platform should not be made of flammable material.
8. Cylinder should not be placed in a completely enclosed compartment.
9. Cylinder should not be placed in sump below the ground level.
10. Rubber tube should be visible.
11. Rubber tube should not have outside metal covering.
12. No loose electric wiring in the kitchen.
13. No shelf on top of the gas stove.
14. No parallel electric oven should along with LPG stove / oven.
15. No refrigerator in the kitchen.

The precautions before disconnecting and connecting cylinder are given below.

1. Put off all naked flames & fires.
2. Open doors & windows.
3. Check for leak before connecting.

If you smell the gas the precautions to be taken are given below

1. Close all burner knobs.
2. Put off all fires and Open flames (Kerosene stove, candle etc.).
3. Do not light a match.
4. Switch off knobs of cylinder adopters & pressure regulators.
5. Open all doors and windows.
6. If gas smell persists call your Gas Distributor.
7. Do not operate any electrical switches.
8. Detach the adopters & regulators from cylinder valves.
9. Inform the Distributor/Emergency Service Cell.

General tips for safe use of cooking gas are given below.

1. A cylinder upright is a cylinder right.
2. Always keep the gas stove/burner on a platform above the cylinder level.
3. Do not keep cylinder below floor level.
4. Do not place cylinder inside a closed compartment.
5. Do not accept a cylinder without its safety cap fixed on the valve.
6. Retain safety cap with nylon thread attached to the cylinder.
7. Fix safety cap on the valve when cylinder is not connected.
8. Do not keep cylinder in the hot sun.
9. Check rubber tube/pigtails regularly for cracks.
10. Wipe rubber tubes/pigtails with a wet cloth at the end of the day work.
11. Replace defective rubber tube with ISI approved tube only.
12. Rubber tube should not be longer than 1.5 Meters.
13. Use approved rubber hose only.
14. Always keep rubber tube/pigtails uncovered and visible.
15. Do not insert rubber tube by applying oil or soap.
16. If rubber tube is cracked at ends, snip off ends and re-fix.
17. Do not pass rubber tube/pigtails through hole or pipe on cooking platform.
18. Do not keep the rubber tube/pigtail twisted or looped.
19. No external pressure to be applied on the rubber tube/pigtail.
20. While changing rubber tube, push it over full length of the nozzle.
21. Leakage from rubber tube/pigtail? Do not cover the leakage with plastic bags or cloth; replace the rubber tube/pigtail.
22. Do not place refrigerator in the kitchen.
23. Do not have curtains on the windows in the kitchen.
24. Avoid naked flames and inflammable material near the gas installation.

25. Do not place shelves above the gas stove/burner.
26. Never place a fan above your gas stove/burner.
27. Cooking platform should not be made of inflammable material.
28. No direct draft of air over the gas stove/burner.
29. No source of heat or flame should be brought close to the gas installation.
30. When full cylinder is received, check for its seal, otherwise you may have received a cylinder with defective valve.
31. Do not smoke while receiving refills.
32. Put off all naked flames before changing a cylinder.
33. Do not operate electric switches while changing a cylinder.
34. While receiving a refill, check for its proper functioning.
35. Strike match first, then open burner knob.
36. It is safer to use a matchstick to light the burner.
37. Use cotton apron while cooking.
38. Never leave vessels unattended on a burning gas stove.
39. Clothes are for wearing, not for pan handling. Use a potholder.
40. Close burner and regulator/adopter knobs at nights.
41. Do not allow children to play inside the kitchen.
42. Fire in the building? Close burner & regulator knobs. Disconnect rubber tube. Remove cylinder to safe place.
43. Do not put LPG cylinders into water tanks or wells
44. Do not keep kerosene, spirit, matches etc., within reach of children.
45. No nylon clothes while cooking always use cotton apron.
46. Place vessels such that the handles face sideways, being easy to remove
47. If you smell gas close regulator/adopter and burner knobs immediately.
48. If you smell gas put off all flames.
49. If you smell gas do not operate electric switches.
50. If you smell gas open all doors and windows.
51. Use safety cap to stop valve leak, if any.
52. If you detect gas leakage, contact your distributor immediately
53. Gas leak after office hours? Contact Emergency Service Cell.
54. Never trace leakage with an open flame.
55. Self-repair is unsafe. Call distributor's mechanic.
56. Clean burner holes with soft wire only.
57. While cleaning burner knobs, take care that the markings are not erased.
58. Never dip main frame/body of gas stove in water.
59. Clean mixing tube using stiff bottlebrush.
60. Do not change the color of the cylinder.
61. Get replacement/spares from your distributor only.
62. Entertain gas delivery boys & mechanics with identity badges only. Do not encourage unauthorized persons.
63. Never allow mechanics to take away defective regulator or cylinder without replacement.

1.2.1.4 Electrical Accidents

Electrical hazards can cause burns, shocks, and electrocution which can lead to serious injury and even death. When dealing with potentially serious electrical hazards stop and think! Instead of taking a chance and risking your personal safety, call trained professionals to handle problems.

Many times in residential homes, people prefer to take electrical matters into their own hands. Other small aspects of electrical repair in a business setting may be taken care of without needing professional service technicians. If you do decide to take matters into your own hands, safety precautions can avoid injuries and other losses.

7.2.1.5 Prevention of Electrical Accidents

Flexible cords connected to appliance should be wired to conform to the international colour code. Colour of the insulation on the wire is:

- Brown represents live wire,
- Blue represents neutral wire and
- Green/yellow stripes represent earth wire.

What you should look for when selecting an electrical appliance is given below:

- a. The appliance should be suitable for operation on local electrical supply of 240 volts AC and frequency of 50 Hz.
- b. The appliance should preferably be tested and certified by a national or reputed standards testing authority.
- c. Look for certified plugs on the flexible cords connected to the appliances. If the appliance is double insulated and has a 2-pin plug, then it should be fitted with a suitable certified plug.
- d. An essential formality when buying any appliances is a duly completed guarantee card with the dealers/retailer's official stamp and details of the appliance (serial number, etc.).

Safety precautions to be taken when using electrical appliances

- a. Avoid using handheld appliances when your hand and/or body are wet.
- b. Do not use or leave appliances where liquid can splash onto them.
- c. Flexible cords connecting the appliance and the plug should be in good condition, if the cord is frayed, chaffed, cut or melted, have the entire cord replaced by a competent person.
- d. Check accessories such as plugs attached to appliances for cracks and burnt marks and have them replaced. If undue overheating occurs or burnt marks appear in any electrical appliance, have it checked

Some common causes of electrical accidents in the house

- a. **Faulty house wiring:** This usually occurs when un-authorized extension or rewiring is done by unqualified persons. Some of the usual faults are the omission of earth wires and

the reversing of the live and neutral wires. Without an earth wire, the exposed metal parts of appliances may deliver a lethal shock to the user when a fault develops.

- b. **Improper flexible cords:** This can be caused by connecting the flexible cord wrongly to the plug. In the case of appliances which have exposed metallic parts, a 2-core instead of a 3-core flexible cord is used. When the appliance is faulty, the exposed metal parts may become live and a fatal accident could result.
- c. **Faulty appliance:** Attempts to repair faults in electrical appliances by people not trained to do so can result in accidental shock.

To prevent Electrical accidents, the following points should be kept in mind:

- All electrical wiring, rewiring or extension work must be carried out by licensed electrical contractors. On completion, the contractors should test before electricity supply is connected.
- Repair of appliances and replacement of flexible cords should be carried out only by competent persons.
- To ensure electrical safety in the house, a current-operated Earth Leakage Circuit Breaker (ELCB) or Residual Current Circuit Breaker (RCCB) set to operate at a very small leakage current is recommended. (This is usually marked 100mA or 0.1A on the label).
- In case of dangerous electrical leakage to earth, it should automatically cut off the supply of electricity.
- DO NOT repair your own electrical appliances. Engage the services of a competent technician.
- PREVENT children from meddling with socket outlets. It may cause a tragic accident.
- DO NOT use multi-way adaptors. Over loading can cause fire. One socket outlet is for one appliance only.
- DO NOT carry out wiring extension by your-self. Engage a licensed wiring contractor for the work.
- DO NOT use a two-way lighting adaptor for any extension.
- DO NOT connect any electrical appliance to lighting outlets. A lighting outlet does not have an earth wire to prevent danger.
- ENSURE the switch is in "OFF" position before changing bulbs.
- DO NOT make joints to lengthen the lead of the electrical appliances. If the lead wire is worn out or too short, replace it with a new wire.
- DO NOT drive nails carelessly on the wall. There may be concealed wiring inside.
- USE individual socket outlet for every electrical appliance.
- KEEP AWAY from danger areas such as a substation for whatsoever reasons.
- CHECK before carrying out excavation work to prevent damaging any underground cable. The operator may receive severe electric shock or even be electrocuted.
- TAKE PRECAUTION when working in the vicinity of overhead lines to avoid any unforeseen incident.

- DO NOT meddle with any broken overhead wire. Report the matter immediately to the nearest electric office.
- DO NOT climb any electric pole. You may receive an electric shock or get electrocuted.
- DO NOT throw anything onto the overhead lines.
- NEVER attempt to retrieve anything stuck to overhead lines by whatever means.
- DO NOT climb transmission line towers. No one is safe from its high voltage shock.
- DO NOT erect any structure close to transmission lines.
- DO NOT fly kites close to overhead lines.
- TAKE PRECAUTION when working in the vicinity of overhead lines to avoid any unforeseen incident.
- NEVER stand on a damp or wet surface when using electrical equipment.
- USE a portable electrical tool, which is properly earthed.
- DO NOT tap electrical power without a proper plug.
- DO NOT use any electrical tool which has a damaged casing, cap, switch, lead or plug.
- BEFORE using portable electrical appliances and tools, always check for:
 - Worn or defective insulation
 - Loose or broken connection
 - Earth wire connection

1.2.1.6 First Aid and Emergency Procedures

Burns are caused by dry heat such as fire, electricity, strong acids and alkalis. Details of the first aid for burns are given in **Table 1.1**.

Table 1.1 First Aid for Burns

Burns Covering Small Area	Burns Covering Extensive Area
i. Allow cold tap water to run gently over the area or immerse in cold water. ii. It may be necessary to cover with gauze or a clean handkerchief, and bandage.	i. Allow person to lie down. ii. Cover burned areas with sterile dressing or clean cloth and lightly bandage. iii. If clothing is adhering, do not disturb; leave the clothing alone. iv. Keep person warm. If person is not nauseated, he may have sips of water. v. Arrange for immediate medical care. (Call 108 for ambulance.)
<p>Note: Do not use ointments, greases, pastes or powder on burned area. Do not prick the blisters caused by burns. Tetanus Immunization Protection against tetanus should be considered whenever the skin is broken by injuries</p>	

Against electrical shock

- i. If possible switch off current.
- ii. If not, remove casualty from contact with electric source using non-conductive articles like a dry broom handle or dry rope.
- iii. Do not touch patient directly, with object that conducts electricity.
(Examples of electric conductors: iron, metal, wet clothing, etc.)
- iv. Give Rescue Breathing (Artificial Respiration if breathing has stopped).
- v. Arrange for emergency medical care. (Call 108 for ambulance.)

Artificial Respiration, Rescue Breathing Technique

To be used for a person who has CEASED BREATHING due to drowning, choking, electric shock or other causes.

- i. Wipe out any fluid vomitus, mucus or other objects from the mouth with fingers. Be certain to reach into the throat with finger in case there is an object blocking the throat. Remove clothing to expose chest.
- ii. Place person on his back, place hand or soft object under neck, and keep the head tilted back as far as possible.
- iii. Grasp the angles of the jaw below the ears and lift the jaw so that it juts forward. This will keep the tongue away from the back of the throat, so that air can get in.
- iv. Pinch nose with your fingers and blow breath into mouth with smooth, steady action until the chest is felt or seen to rise.
- v. Allow lungs to empty.
This action should be repeated at the normal breathing rate, i.e. 12-15 times a minute.
- vi. The purpose is to make the chest move as it would normally.
- vii. Have someone contact physician.