7. RISK ASSESSMENT & DISASTER MANAGEMENT PLAN

7.1 INTRODUCTION

The constructional project involves lot of activities like installation of various types of structures and machineries. These activities include lifting and transportation of building materials at different levels, digging pits, operation of concrete mixer, working near electrical circuits, which is required during construction of such project. Hence such work puts workers at risk of burial, engulfment or falling from a height, risk of electrocution where the risk is particularly aggravated by the nature of the work or processes used or by the environment at the place of work or site.

As per preparation of the EIA/EMP Report, studies were to be conducted to provide a clear picture of the project area. The suggested studies/ activities were:

- Risk at construction phase
- Road Safety Measures

7.2 RISK AT CONSTRUCTION PHASE

7.2.1 WORKING AT HEIGHT

The construction of elevated roads frequently requires tradesmen to work at height. Fatalities and injuries involving height relating factors account for many accidents each year.

The risks associated with working at a height are often increased by added access and mobility restrictions. Training, including safety awareness training is essential for employees required to work at height.

7.2.2 MOVING OBJECTS

A construction site is an ever changing environment; hazards are inherent to this industry and only increase as a construction project progress, as things rise and expand.

Construction sites can get quite hectic what with the sheer volume of constantly moving vehicles and trades people- overhead lifting equipment shifting heavy loads, supply vehicles, dumper trucks everywhere, maneuvering around a usually uneven terrain.

7.2.3 SLIPS, TRIPS & FALLS

When you consider the diverse range of activities going on at a construction site at any one time it seems hardly surprising slips, trips, and falls happen on an almost daily basis.

Construction sites are a mish mash of holes in the ground, buildings at various stages of completion, scaffolding, stored materials and equipment: you really do need eyes in the back of your head at times.

7.2.4 NOISE

Noise is a major hazard within the any construction project. Repetitive, excessive noise causes long term hearing problems and can be a dangerous distraction, the cause of accidents.

Beware, using simple ear plugs does not necessarily offer total protection against hearing damage employers are required to carry out and document a comprehensive noise risk assessment – and issue appropriate PPE.

7.2.5 HAND ARM VIBRATION SYNDROME

Hand arm vibration syndrome, or 'blue Finger' as it is commonly referred to, is a painful and debilitating industrial disease of the blood vessels, nerves and joints, triggered by prolonged use of vibratory power tools and ground working equipment.

This industrial disease is frequently cited in compensation claim cases opened by ex-construction workers who worked for years with little or no protection, using inappropriate and poorly maintained equipment.

7.2.6 MATERIAL & MANUAL HANDLING

Materials and equipment is being constantly lifted and moved around on a construction site, whether manually or by the use of lifting equipment. Different trades will involve greater demands, but all may involve some degree of risk.

Where employee's duties involve manual handling, then adequate training must be carried out. Where lifting equipment is used, then adequate training must also be carried out, but may involve some form of test, to confirm competency. Records of training must be maintained for verification.

7.2.7 COLLAPSE

Not exactly a hazard, more a risk – an accident in waiting.

Every year excavations and trenches collapse bury and seriously injure people working in them- precautions need to be planned before the work starts.

The risk of an unintended collapse is generally more associated with demolition works or when a partially completed building or scaffolding collapses, but still accounts for a percentage of fatalities each year.

7.2.8 ELECTRICITY

On average, three construction industry workers are electrocuted each year during refurbishment work on commercial and domestic buildings. People working near power lines and cables are also at risk. There are also a growing number of electrocutions involving workers who are not qualified electricians but who are carrying electrical work, such as plumbers and joiners and decorators.

7.3 ROAD SAFETY FEATURES

Road safety features are essential for high speed facilities such as Elevated Roads. Various types of road safety features are proposed along the Expressway as described below:

7.3.1 ROAD SIGNS

Mandatory Signs/ Regulatory Signs and Compulsory signs

The Mandatory Signs are meant to convey to road users a definite instruction they must follow, e.g. circular signs for speed or other restrictions etc., compulsory signs such as "Compulsory Keep Left" compel the drivers to follow a definite route.

Warning Signs/ Cautionary Signs

The Warning Signs are meant to convey to road users a warning about dangers/ hazards ahead. These are triangular signs warning about hazards lying ahead. Proper warming signs shall be designed for the elevated road.

Informatory Signs

The Informatory Signs are provided to convey to road users information on places of interest, services and facilities and guide road users along routes, etc. This also includes other signs which are useful to the drivers like Direction Signs, Toll plaza ahead sign, etc. For Elevated road these signs gain more importance since at interchanges weaving maneuvers are needed and for that advance warning and informatory signs are necessary. These signs shall generally be mounted on gantries fixed across the carriageway.

Road Markings

It will be essential to provide suitable carriageway markings for conveying to the drivers of hazards or directional lane changes. These are provided also to ensure safety and orderly use of the carriageway in accordance with traffic regulations, to define lanes and guide/ regulate vehicles at junction and to complement the traffic signs.

Carriageway Edge Lines

Carriageway Edge Lines are specifically required to define edges of the carriageway wherever there are paved shoulders or emergency lane. Carriageway Edge Lines recommended are 150 mm wide, yellow in color and continuous along both sides of the carriageway except at merge and diverge locations where a broken edge line is used to provide continuity.

Other Markings

Other Markings such as Directional Arrows, Deceleration Lane Arrows, Chevron and Diagonal Markings, Lane Markings, and other related markings required for smooth operation of traffic are proposed to be provided in accordance with relevant AASHTO/IRC standard code of practices.

Road Furniture

Metal Beam Crash Barriers

Metal Beam Crash Barriers shall be provided on both edges of the road where road height exceeds 3 m, and on the outer edge of the road on sharp curves.

These shall consist of W-Beam fixed on posts (ISMC150) placed 15 m apart C/C with spacers (also ISMC 150). Suitable reflectors shall be fixed on the beam @ 3 m c/c for proper delineation of the barrier line. The metal beam crash barrier shall start with a parabolic flare away from the carriageway in the incoming section, the equation of the parabola being

$$y = \frac{wx^2}{l^2}$$

Where,

w = tangent offset at minimum flare = 1200 mm

l = total length of flare = 11400 mm

y = tangent offset at any point in guardinal flare

x = distance from point of tangent to any point of offset

Road Studs

Direct reflecting road studs shall be fixed on the carriageway edge lines to provide visual guidance at night about the carriageway edges. These shall be fixed as per standard IRC guidelines for road studs.

Delineators

Delineators provide visual assistance to drivers about the alignment of road ahead and warn them about hazards, particularly at night. The different types of Delineators proposed for the Project Road are:

- Cluster of Red Reflectors on triangular notes as object markers provided at the heads of medians and directional islands.
- Circular Red Reflectors on face/tips of islands and median.
- Circular White Reflectors fixed on Guard Posts at prescribed spacing to delineate the alignment in sharp curves.

Fencing

The expressway being a full access-controlled facility, suitable fencing shall be provided at the PROW limits to desist pedestrians, stray animals, etc. on to carriageway. The fencing shall be standard chain link type or similar suitable arrangement.

Others

- Human safety is an important issue along the road as pedestrians, cyclists, animals, herdsmen as well as bullock carts, scooters, cars, buses, vehicles carrying hazardous industrial goods and trucks use roads. The number of serious accidents is correlated with the total number of accidents involving heavy vehicles. It has been observed that accidents involving trucks and buses constitute 15% of the total accidents.
- Road safety is an issue that needs to be resolved through realignments, geometric improvements leading to improved visibility and greater (road) turning radius. The measures for the road safety include-raised carriageway, strengthening of pavement, improving upon curves and geometry, median, by pass, truck lay byes Intersection improvement, grade separator, service road and footpath, guard rails, pedestrian crossing with blinker lights, pick-up bus stops, hard shoulders, signage & striping and antiglare screens.
- Design improvements at curves, segregating slow moving traffic in the market places by service lane, provision of wider median in rural stretches and plantation of shrubs and under trees to avoid the glare of vehicles moving in opposite directions during night are some of the design solutions provided. Provision of proper signage, proper lighting arrangements will be made.

- Traffic management plans will be developed, especially in congested locations. Traffic control measures including speed limits will be enforced strictly. Further growth of encroachment and squatting within the ROW will be discouraged.

7.4 DISASTER MANAGEMENT PLAN

The overall objective of DMP is to make use of the combined resources at the site and outside services to achieve the following:

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

The DMP is, therefore, related to identification of sources from which hazards can arise (based on Hazard Identification) and to minimize credible loss scenario that can take place in the concerned area. The DMP takes into account the maximum credible loss scenario and actions that can successfully mitigate the effects of losses.

Hence emergency plan need to be well planned, so that with less effort and resources, emergencies may be controlled and terminated, in minimum time, to reduce damages to life and properties. The Disaster Management Plan is designed to-

- Anticipate the types of disasters that are most likely to occur.
- Identify the possible effects of any disaster that may occur.
- Identify the preventative and mitigating strategies to deal with any possible disaster.
- Involve all role players in a coordinated manner to respond to the challenges posed in disaster situations.
- Procure essential goods and services for disaster management.
- Identify the weaknesses in respect of capacity and skills to deal effectively with disastrous situations.
- Provide essential training and skills to handle such disaster and to promote awareness and preparedness in respect of the occurrence of disasters.
- Plan in advance the relief and rescue operations that may be required or to be exercised in disaster situations.

The hazard identified for the project include hazards pertaining to fires in diesel storage areas, LPG leakage and earthquake. DMP pertaining to these as described in the following section.

7.5 RESPONSE IN CASE OF EARTHQUAKE

The project area is in Seismic Zone–IV and care has been taken in design so that it can withstand the earthquake of with maximum magnitude and intensity likely to occur in zone IV.

7.6 RESPONSE IN CASE OF FIRE

- On sighting a fire, it shall be immediately informed to the environment manager giving the exact location and type of fire in detail.
- Initiate the Emergency Response Team for fires
- If the fire is small, engage in extinguishing the fire using the nearest fire extinguisher.
- Guide the Emergency Response Team staff to the emergency assembly point.
- The Emergency Response Team shall immediately inform the nearest dispensary and security force. If required a fire tender shall be summoned.
- The response team shall 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 inform the district authorities and call for external help.
- The Emergency Response Team will provide immediate relief to the injured residents at the scene of incident. Any injured persons shall be evacuated on priority to the dispensary or one of the nearest hospitals based on their condition.

7.7 FIRE FIGHTING SYSTEM

A state of the art 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, and manual fire alarm system. Important component are mentioned below.

- Provision of hose reels, external hydrants and wet risers
- Provision of firefighting tank for the emergency,
- There is a provision of firefighting pumps in emergency.
- Adequate Fire Extinguishers shall be available in emergency situations
- HT and LT panels will be protected with manually operated CO_2 protection system.
- Portable fire extinguishers shall be provided at strategic locations