7. ADDITIONAL STUDIES

7.1 DISASTER MANANGEMENT PLAN

7.1.1 INTRODUCTION

Disaster is an unexpected event due to sudden failure of the system, external threats, internal disturbances, earthquakes, fire and accidents. Disaster Management Plan (DMP) gives a broad idea of Emergency preparedness in case of an accident. Thus an appropriate DMP shall be prepared in consultation with the project proponent, architect, service consultant and maintenance staff. DMP envisages the need for providing appropriate action so as to minimize loss of life/property and for restoration of normalcy within the minimum time. Adequate manpower, training and infrastructure shall achieve this. An appropriate fire protection system is also developed to meet any emergency.

The emergencies are classified as construction hazard, natural hazard and Man-made hazard. Disaster risk reduction begins throughout our local communities. For greatest impact, these steps must be grounded in local knowledge and communicated broadly.

Construction Hazard:

During the construction time good construction practice and safety requirement should be enforced by the contractor at site. The construction manager can be the co-ordinator for the emergency management. Depending on the severity of the injury/ disaster outside medical help can be obtained. Before commencement of the work the hospital facilities should be identified and the address and phone numbers to be available to the contractor as well as the construction manager. Proper measures should be taken to ensure safety at heights. Fencing/railing should be provided at construction openings to prevent physical injuries and fall of construction workers.

Natural Hazard:

During natural hazard the emergency plan to be implemented with the help and guidance from the district collector, who is the co-ordinator for such activity. Disaster Management Team (DMT) will also be responsible for disaster mitigation and disaster recovery. The primary mass disaster potential for the area is fire and water damage. Fire has an immediate response that can be delivered by the occupants or nearby Fire service Department. In terms of water damage this can occur via storm damage to roofs and/or flooding. In these instances access to tarpaulins and sand bags are critical. Coordination of these efforts is through the DMT.

Manmade/ Operational Hazard:

During the phase project proponent and maintenance staff becomes the co-ordinator for the emergency activity and the emergency cell will be acting in accordance with the disaster management plan (DMP).

Insurance: Key to the management of any disaster is having adequate insurance in place to:

- Reduce the loss in terms of assets if a disaster happens; and
- Reduce lost income in the event that the facility becomes unavailable or partly unavailable.

7.1.2 OBJECTIVES OF PLAN

This plan is developed to make best possible use of resources to:

- Rescue the victims and treat them suitably.
- Safeguard others (evacuating them to safer places).
- Contain the incident and control it with minimum damage.
- Identify the persons affected.
- Preserve relevant records and equipment needed as evidence incase on an inquiry.
- Rehabilitate the affected areas.

The following important elements in the disaster management plan (DMP) are suggested to effectively achieve the objectives of emergency planning:

- Reliable and early detection of an emergency and careful planning.
- The command, co-ordination, and response organisation structure along with efficient trained personnel.
- The availability of resources for handling emergencies.
- Appropriate emergency response actions.
- Effective notification and communication facilities.
- Regular review and updating of the DMP
- Proper training of the concerned personnel.

In order to handle disaster/emergency situations, an organisational chart entrusting responsibility to various plant personnel has been prepared along with their specific roles during an emergency. The possible composition of the management team is given in Figure1.

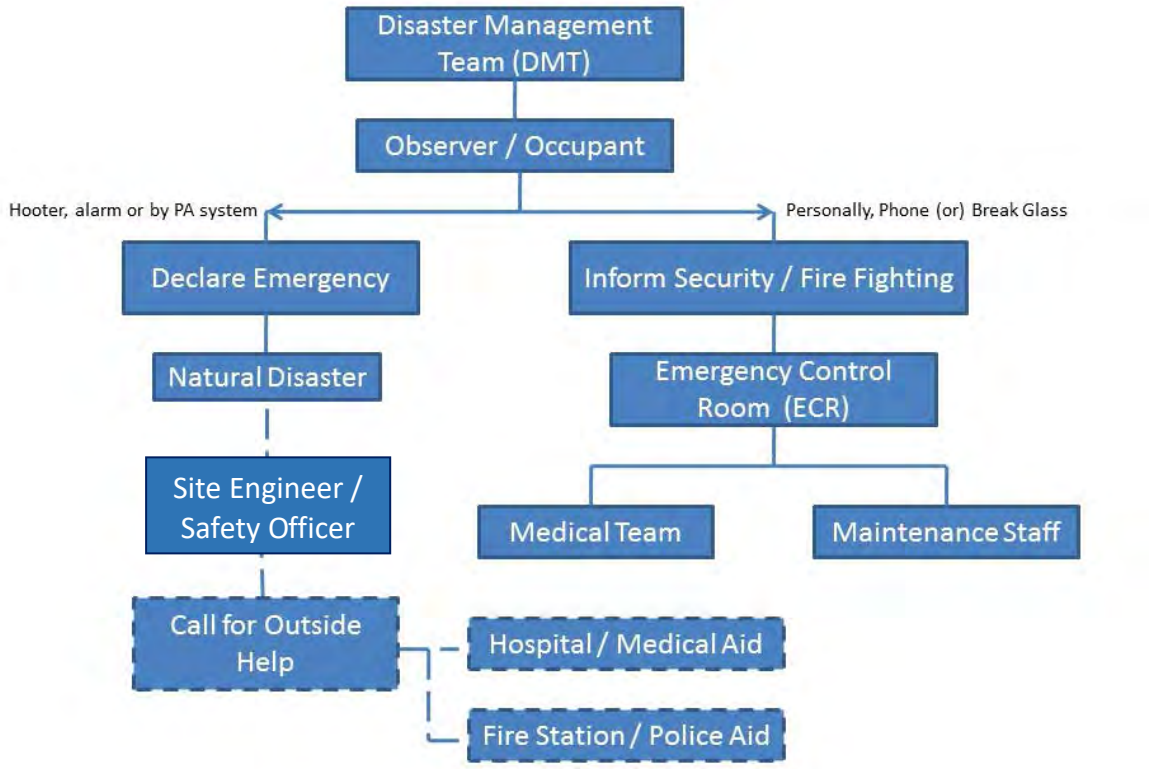

FIGURE 7.1. DISASTER MANAGEMENT TEAM

7.1.3 PREVENTION AND MITIGATION

Prevention and mitigation against and during a crisis is important. In terms of the ability of people (occupants) to be proactive this is limited by the actual event. There are some aspects that fall within people (occupants) control and many that do not. Natural disasters cannot be controlled and there may be short notice in terms of storm events etc. people (occupants) can however mitigate the impact of such events through:

- Storage of potentially airborne items within the buildings (e.g. Dustbins)
- Periodic structural reviews of the facilities to ensure integrity in a major storm event
- Good housekeeping around the site
- Ensuring that trees/bushes are trimmed accordingly

- Removal of cars and other important/expensive assets to higher ground in the event of heavy rains that may lead to flooding
- Storage of flammable liquids in the appropriate location and container
- Storage of gas cylinders in appropriate location and containers
- Maintenance of the facility to a high standard including repair of damaged/deteriorated buildings in an urgent manner
- Maintenance of the roadways and car parks
- Maintenance of building fire detection and fire-fighting equipment in line with the NFPA Standards
- Close observation of weather patterns
- A preparedness to evacuate from the area early enough to save people (occupants) a safe as possible
- Maintaining a means to alert tenants of an impending crisis
- Provision of monitored cameras in the security office which captures recorded footage of the entry to people (occupants/Visitors), the entry to the Building and the area around the office
- Having a well-equipped first aid room and trained staff to complement this
- Having a well-drilled plan and people who are familiar with its application.

TABLE 7.1 - THREAT/EMERGENCY RISK MANAGEMENT PLAN

Threat/Emergency	Mitigation	Actions During Emergency	Actions After Emergency
Chemical Incident (Spill)	Good housekeeping and safe handling practice. Allocation of spill kits throughout the area. Staff trained in use of spill kits	Immediate deployment of spill kit especially bunding to ensure that chemical does not get into drains/waterways. Soak-up with spill kit contents. Where actual spill/release has occurred then PPE for those who are involved. Evacuate as required.	Advise the occupants as soon as practicable. Shut the zone as required to allow forensic investigation and for any contamination clean-up. Write incident report for review.
Fire and Smoke	Good housekeeping, responsive and well trained ECO, regularly maintained	As per Fire and Evacuation Plan	Incident Report Contact insurer as required.

	detection and fire-fighting capability. Adequate no of external and internal fire hydrants system provided.		
Theft	Security and monitoring company employed, good housekeeping, secure by design thinking, common sense e.g. expensive items out of sight.	Call Police. Where this occurs during the day provide description to Police.	Burn CCTV footage for provision to Police (if available). Incident Report written. Consideration to be given to tightening security as required.
Cyclone	Good housekeeping, particularly in the lead up to the stormy season. Structural engineering reports on any vulnerable buildings/structures.	Activate the ECR as required. Consideration to be given to area closure if required	Re-open the area as required. Comprehensive walk around the area checking buildings and damage. Initiate Normal life Continuity plan. Engage Insurance company. Take photos as soon as safe to do so. Get feedback from tenants. Undertake structural assessments as required.
Earthquake	Good housekeeping. Earthquake awareness sessions to include what to do when an earthquake strikes (shelter beneath desks or door jams if desks not available).	Initiate the ECR and DMT. Evacuate persons as required. Need to be clear of buildings and glass in particular. Key will be roll calls so rescue crews know	Re-open the area when safe to do so. Structural assessments may be necessary. Initiate Normal life Plan. Involve insurer as

		where to concentrate their efforts in the event of building collapse. In the event of the quake ceasing and no visible damage be aware of aftershocks. Re-occupy when safe to do so. Be aware that items, especially those stored overhead may well have become dislodged. If possible consideration of Tsunamis and safe routes for occupants to be analyzed.	required.
Flood	Good housekeeping, ensuring Creek kept clear of debris especially at the pinch points of the railway bridge and the culvert.	Initiate ECR and DMT as required. Move important assets to higher ground. Ensure all vehicles driven to safe location. Consider closure of the area as required. Where no power the default is to close the area. Consider the role to play in immediate post flood recovery.	
Tsunami	Good housekeeping, access to higher ground.	Treat as per flood. The likelihood of a Tsunami affecting the site are very limited. There may be a storm surge effect and this should be regarded as a flood event more so than a direct threat to human life. Initiate the ECR and DMT and undertake threat	As per flood.

		assessment. Evacuate the persons from lower lying parts of the site as required.	
Total Electrical Failure	Have emergency generator capacity available with adequate supply of diesel.	Establish minimal power to run the EMERGENCY CONTROL ROOM (ECR). Call for electrical emergencies. Increase security guards given that the alarm system back-up batteries are likely to diminish to zero.	Consideration to be given to the battery re-charge and/or replacement in both emergency lighting, and the alarm system.

7.1.3.1 Definitions

1. **Assembly Areas** – The designated place or places where people assemble during the course of an evacuation. Also known as Assembly point.

2. **Disaster Management Team (DMT)** – A group of people mainly drawn from the site who manage the progress of emergency response to emergencies (other than fire) that might have a prolonged activation.

3. **Emergency** – An event that arises internally or from external forces (and sometimes from both), which may adversely affect the occupants or visitors in a facility, and which requires an immediate and programmed response.

4. **Emergency Plan** – The written documentation of the emergency arrangements for a facility generally made during the planning process. It consists of the preparedness, prevention and response activities and includes the agreed emergency roles, responsibilities, strategies, systems and arrangements.

5. **Emergency Planning Committee (EPC)** – Persons responsible for the documentation and maintenance of the emergency plan.

6. **Emergency Preparedness –** The arrangements made to ensure that should an emergency occur, all those resources and services that are needed to cope with the effects can be efficiently mobilised and deployed.

7. **Emergency Response Team (ERT) –** Specialist or specially trained personnel to attend to specific incidents to contain, control or eliminate the emergency using

emergency response equipment. The ERT may be in place which is primarily focused around evacuation.

8. **Evacuation –** The orderly movement of people from a place of danger.

9. **Evacuation Diagram –** emergency and evacuation information about the facility, comprising a pictorial representation of a floor or area and other relevant emergency response information.

10. **Facility –** A building or structure that is, or may be, occupied by people (occupants).

11. **Fire and Evacuation Plan –** The plan required to be written for high occupancy buildings to be compliant with the Fire Safety Register.

7.1.4 THE KEY ELEMENTS OF EMERGENCY PREPAREDNESS:

Once the likelihood of a disaster is suspected, action has to be initiated to prevent a failure. The project in-charge, responsible for preventive action will identify sources of repair equipments, materials, labour and expertise for use during emergency. The multiple floors of a high rise building create the cumulative effect of requiring great numbers of persons to travel great vertical distances on stairs in order to evacuate the building.

The Building in-charge will notify the occupants for the following information:

- Early Warnings (Through an alarm or Voice communication system)
- Exit routes (Adequate means of egress).
- Safety areas (Assembly points)
- Nearest infrastructure facilities (Medical aid / Fire aid)
- Occupant Familiarity with the plan through and Practice (Sign ages / Evacuation plan)

7.1.5 EMERGENCY COMMUNICATION SYSTEM

An efficient communication system is absolutely essential for the success of any disaster management plan. Different types of alarms to differentiate types of emergencies should be provided. In case of failure of alarm, placards/boards of various colors should be used to indicate the situations. If everything fails, a messenger should be used for sending the information and the various placards mentioned would also be used. This has to be worked

out in consultation with local authorities involving police and fire department, hospital department considering the following points.

- ✓ Identify the relevant officials to be involved for the first, second and third level of information
- ✓ Preparation of the telephone directory of these officials and making available to all concerned
- ✓ Allotment of toll free number to a central communication center
- ✓ Provide wireless communication tools to safety and security and communication officers
- ✓ Empowering central communication center with latest communication equipment and tools

7.1.6 EMERGENCY PLANNING COMMITTEE

To ensure coordinated action, an Emergency Planning Committee will be constituted. An Emergency evacuation plan based on local needs and facilities available will be prepared. The broad content of plan will include following:

- ✓ Demarcation of the areas to be evacuated with priorities.
- ✓ Safe area and shelters.
- ✓ Security of property left behind in the evacuated areas.
- ✓ Functions and responsibilities of various members.
- ✓ Setting up of joint control action.

An elaborate firefighting arrangement is designed for the proposed project as per the requirement of National Building Code Part-IV, which is detailed below.

7.1.7 ASSEMBLY POINTS

Assembly points are to be set up farthest from the location of likely hazardous events, where pre-designated persons would assemble in case of emergency. The location near to the entrance gate is one of the safest places. This can be the common assembly point. The Assembly points identified for various Building Blocks of our site are given below. The Location of Assembly points given below Table 7.1

TABLE 7.2 LOCATION OF ASSEMBLY POINTS

S.No	Residential Building Blocks	Assembly points identified
	EXISTING	
1.	**Residential Blocks** PHASE A – Ananda (G+13) ★ Tower 1 - 9	❖ Phase A – Landscape area/Greenbelt area ❖ Playground opposite to Temple ❖ Community Hall
2.	**Residential Blocks** PHASE B – Brahma (G+13) ★ Tower 14 - 17	❖ Phase B – Landscape area/Greenbelt area ❖ Open Area
3.	**Residential Blocks** PHASE G – Gulmohar Villas (G+2 Part) ★ V1, V2, V3	❖ OSR Area
	Residential Blocks PHASE E – Ekanta (G+13) ★ EWS 1, EWS 2	❖ Open Area
	PROPOSED	
4.	**Residential Blocks** PHASE B – Brahma (G+13) ★ Tower 10 – 12, 18 - 22	❖ Phase B – Landscape area/Greenbelt area ❖ Open Area
5.	**Residential Blocks** PHASE C – Chaitanya (G+17) ★ Tower 23 – 33	❖ Phase C – Landscape area/Greenbelt area ❖ Open Area
6.	**Residential Blocks** PHASE E – Ekanta (G+13) ★ EWS 3 - 5	❖ Open Area

7.1.8 EVACUATION PATH

The road straight to the entrance gate is quite wide and no hazardous installation besides the road. This road can be taken as the evacuation path.

The occupants of the fire floor and floors above and below should immediately use the exit stairs to descend to a floor level that is least a few floors below the Fire Floor. It is never appropriate to use the elevator during building emergency. Buildings has written evacuation procedure for all emergencies.

7.1.8.1 INFRASTRUCTURE

Following infrastructure & systems should be provided to meet emergencies.

a) First aid boxes

b) Gas masks

c) Telephone line with STD facility

d) Emergency lighting system

f) Stretchers

g) Transport facility

h) Fire-fighting machinery

7.1.8.2 EMERGENCY SERVICES

This includes fire-fighting system, first aid center, hospital etc. Alternate sources of power supply for operating fire-pumps, communication with local bodies, fire-brigade etc. should also be clearly identified. Adequate number of external and internal telephone connections should be installed.

7.1.9 FIRE SAFETY PROVISIONS

Fire protection is one of the most essential services to be provided. The principal objective of the rescue and firefighting services is to save lives. For this reason, the provision for means of quick dealing with an accident or incident occurring at, or in the immediate vicinity of, any building, assumes primary importance because it is within this area that there is the greatest opportunity of saving lives. This must assume at all times the possibility of, and need for, extinguishing a fire which may occur either immediately following an accident or incident, or at any time during rescue operations. In the design component of the project, adequate measure is being taken as per the provisions of the National Building Code, 2007. The firefighting system will comprise the following,

- **Fire hydrant system**

1. Number of Exit, location and there width should conforms to the requirements of NBC 2005 (II Revision)
2. Adequate fire water storage tank capacity to be provided.
3. Hose reel assembly should be provided covering each floor
4. Manual fire call points should be provided
5. Alternative and independent power system should be provide to fire pumps. Emergency Lighting system

The complex will be provided with all the above and adequate nos. of external and internal fire hydrants with fire hose cabinet refer layout - Fire Hydrant. Existing fire safety facilities given below in Figure 7.1

FIRE ALARM

FIRE EXTINGUISHERS

FIRE WATER STROAGE TANK

FIRE ALARM CONROL PANELS

WATER SPRINKLER

FIGURE 7.2 EXISTING FIRE SAFETY FACILITIES

7.1.10 FIRE & EVACUATION PLAN

Fire Extinguishers

1. Select appropriate extinguisher for type of fire.
2. Pull pin from squeeze handle.
3. Test extinguisher by squeezing handles briefly.
4. Approach fire aiming nozzle at base of fire.
5. Squeeze handles and operate extinguisher in a sweeping motion.

❖ **Public Address System**

As per appendix D.5 of part IV of NBC, every high rise building should have a public address system with 2 way communication to conduct evacuation in a systematic manner & to communicate any messages to occupants on every floor from the control room.

❖ **Escape Route**

As per section 8.2.5 of part IV of NBC, the escape route should be marked with a sign board on the corridor & passage to guide evacuation. Normally, the escape route sign board must be written in luminous paint for easy identification. This is to guide every occupant of the building who is bound to panic in the event of accident.

❖ **Portable fire extinguishers**

Section: As per section 7.10.4 part IV of N.B.C.

First Aid Firefighting appliances are provided & installed in accordance with latest 2190 in the existing blocks. In the proposed blocks shall also be provided as per code.

❖ **Water fire extinguishers**

Two extinguishers per compartment/floor of building will be provided.

As per requirement laid down in National Building Code of India, adequate capacity of the underground tank and Terrance floor tanks will be provided.

❖ **Sprinkler System**

Section: As per section 7.10.7 of part IV of NCB.

1. Sprinkler system is a must for basement parking & other risk areas where large quantities of combustible materials are stored.
2. Each sprinkler should cover 6.96m2 area
3. The capacity of water tank shall be calculated on the basis of sprinklers.
4. Sprinklers may connect to main water tank & pump, but capacity of the tank & pump shall be increased in that proportionate.
5. Detectors shall be installed as per IS 2189/ 1988

Water Tank

The capacity of terrace level water storage tank varies from 10,000 ltrs. to 20,000 ltrs. Depending on the type & occupancy of the building.

❖ **CO_2 Type**

For area where electrical fire is expected

❖ **Hose Reels**

1. Hose reels are used on fires involving wood, paper and textiles only, they are not to be used on live electrical appliances or flammable liquids.
2. To release the hose reel, turn the valve on this will charge the hose and release the nozzle (if fitted with a nozzle release lock).
3. The hose can then be pulled out to the fire, the nozzle operates like a garden hose in most cases by twisting the nozzle, and the nozzle can be adjusted to give a spray pattern or a straight jet.

❖ **Alternate Power Supply**

As per appendix D-1.5 of part IV of N.B.C. a stand by generator should be installed to supply power for staircase lighting, corridor lighting, fire pump, pressurization fan & blowers, in the event of disconnection of failure of main supply.

7.1.11 FIRE RISK & EMERGENCY PREPAREDNESS PLAN

Emergencies can occur at any time usually without warning. When an emergency occurs, the safety and prompt recovery of the project site depends on the preparedness and careful response of our workers, peoples and visitors.

The information listed below provides basic emergency information to help individuals respond thoughtfully in an emergency event. Each building contact and emergency preparedness coordinator will have regular meetings with people in their building to be certain everyone knows what to do and what to expect, as much as possible. These meetings will be held often enough to keep everyone properly informed. Training sessions will be coordinated through the Environmental Management Cell.

7.1.12 EMERGENCY RESPONSE FOR FIRE

A. Basic actions

- Immediate action is the most important factor in the emergency control because the first few seconds count.
- Take immediate steps to stop Gas leakage / fire and raise alarm simultaneously.
- Stop all operations
- Electrical system except the lighting and firefighting system should be isolated. If the feed to the fire cannot be cut off, the fire must be controlled and not extinguished.

- Start water spray systems in the areas involved in or exposed to fire risks.
- In case of leakage of gas without fire and inability to stop the flow, take all precautions to avoid source of ignition.
- Block all roads in the adjacent area and enlist police support for the purpose, if warranted.

B. Actions in the event of fire

- Basic actions as detailed above.
- Extinguishing fires: A small fire at a point of leakage should be extinguished by enveloping with a water spray or a suitable smothering agent such as CO_2 or DCP. Fog nozzles should be used.
- Firefighting personnel working in or close to un-ignited vapour clouds or close to fire, must be protected continuously by water sprays. Fire fighters should advance towards the fire downwind if possible.

7.1.13 EARTHQUAKE RESISTANT CONSTRUCTION

Promotion of Earthquake resistant construction mainly includes construction safety, quality control and proper inspection. Previously there were no specific guidelines on earthquake resistant constructions and seismic strengthening. Due to the very fact, most of the buildings till 1990s were built without any safety measures. But in the present scenario, there are building byelaws and guidelines to construct earthquake resistant structures.

As per the National Disaster Management Authority of India, the Geographical areas which fall under seismic zones II, III, IV and V, which are vulnerable to potential impact of earthquakes, landslides, rock falls or mudflows. Proposed project site come in the Seismic Zone III Moderate, the risk involves due to earth quake cannot be ruled out. The seismic zone map of Tamil Nadu is given **Figure 7.3**

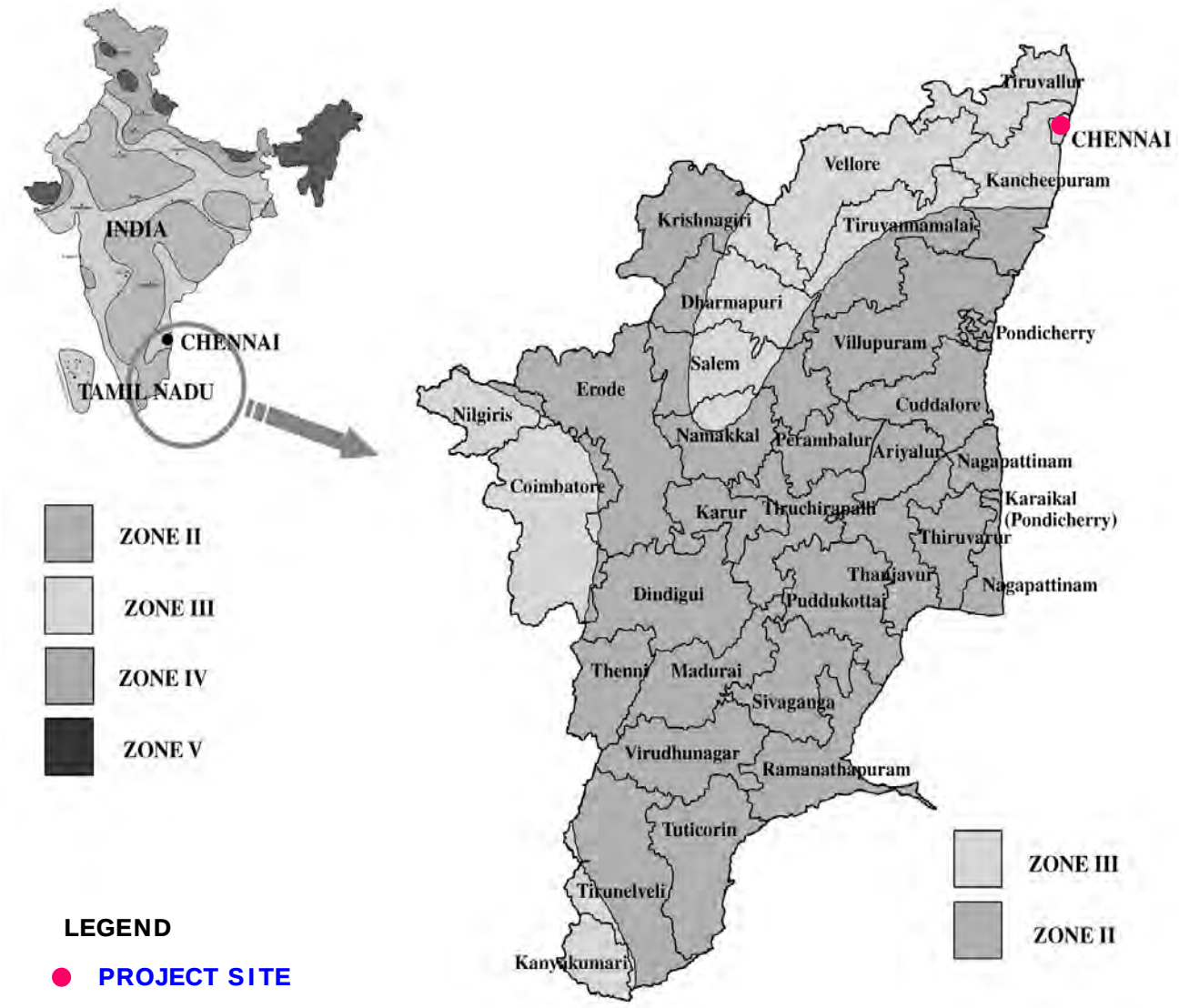

FIGURE 7.3 - MAP SHOWING SEISMIC ZONES IN TAMIL NADU

Preparedness Methodology

In a disaster management cycle, preparedness shall be the first step, instead of waiting for a disaster to occur and then to manage it. This plan contains a series of measures for preparedness in schools, colleges, hospitals and communities. People of every part of the Urban Local Bodies (ULBs) to be guided to prepare themselves or to prepare their own coping mechanism.

Sensitization Programmes

A series of awareness programmes to be organized to reach out to the local residents Disaster can strikes everywhere everyone irrespective of land, caste, people and gender. The objectives of the programmes shall be –

- To bring awareness about disasters among the inmates of all institutions and residents of all communities in the district.
- To pave way for strict enforcement of building rules in construction department and contractors.
- Preparation of Building evacuation plans and training the general public to save their lives at the time of Cyclone, Flood, earthquake, fire accidents or any other major disaster.

7.1.14 SEVERE WEATHER WARNINGS

Severe weather events are the most common hazard, Thunderstorms, cyclones and severe weather events are the possible scenarios than any other group of disasters. The warnings are provided when severe weather is expected that is not directly related to severe thunderstorms, tropical cyclones or bushfires. Examples include land winds, storms, flash-flooding, dangerous waves or tides.

7.1.15 SEVERE STORM / CYCLONES

It is an intense vortex or a whirl in the atmosphere, characterized by high winds rotating about a calm center of low atmospheric pressure in anticlockwise direction in the Northern Hemisphere and in clockwise direction in the Southern Hemisphere. This center moves onwards and pressure increases outwards. The force of the pressure in the center and the rate at which it increases outwards gives the intensity of the cyclone and the strength of winds. Cyclones can be hazardous as they are normally associated with strong winds.

Pre disaster phase

- (a) Measures for rapid dissemination of warnings issued by the nearest Cyclone Warning Center.
- (b) Evacuation readiness in case of emergencies
- (c) Identification of cyclone shelters

Disaster phase

- (a) Quick communication between communities about the earthquake occurrence by telecommunication, electronic media, e-mail etc., to relocate at cyclone shelters
- (b) Mobilization of fire services
- (c) Inform rescue team of state government and hospital about the causality.

Post disaster phase

- (a) Establishment of control room
- (b) Medical aids
- (c) Deployment of resources
- (d) Outside relief receiving, stocking, safety, dispatch

7.1.17 RECORD KEEPING AND REPORTING

Records will be maintained for regulatory, monitoring and operational issues. Log book of Equipment inspection and calibration records, Vehicle maintenance and inspection records, incident records, Maintenance of Corporate Social Responsibilities towards the society even after the completion of construction of the project work and during the Operation/maintenance phase.

TABLE 7.3 FACILITES NEAR TO THE BUILDING IN CASE OF NATURAL DISASTER

S. NO	Hospital	Distance	Direction	Contact No
1	Srinivas Priya Hospital	1.0 km	WNW	+91 94444 59999
2	Sri Balaji Hospital	0.9 km	SSW	+91 44 2662 2111
3	K. V. T. A. Clinical Labs	4.0 km	NE	+91 44 2595 7264
4	Apollo Hospitals	2.7 km	SE	+91 44 2529 6080
5	K.M. Hospitals	2.1 km	SSW	+91 44 2661 3155
6	Abhijay Hospital	2.5 km	WNW	+91 93615 75757
7	Stanley Government Hospital	3 km	E	+91 44 2528 2350
8	DRJ Hospital	4.6 km	W	+91 95000 18304
9	Police Control Room	1.6 km	WNW	100
10	Ambulance	0.4 km	N	101
11	Fire Service	1.7 km	NNE	101
12	Coastal security helpline	-	-	1093

7.2 TRAFFIC AND TRANSPORTATION STUDY

We have done the traffic study in Stephenson Road and Dr Ambedkar College Road which connects Perambur High Road on West side and Perambur Barracks Road on South side and the detailed study report is enclosed as Annexure XIII.