9.0 Risk Management and Disaster Management Plan

A disaster is a natural or man-made hazard resulting in an event of substantial extent causing significant physical damage or destruction, loss of life, or drastic change to the environment. A disaster can be defined as any tragic event stemming from events such as earthquakes, floods, catastrophic accidents, fires, or explosions. It is a phenomenon that disasters can cause damage to life, property and destroy the economic, social and cultural life of people. Disasters in general, can broadly be grouped under three categories viz. (i) Water and Climate related (ii) Geology / Geomorphology related and (iii) Accident related. On project site, accident related disasters from fire, oil spills, and chemical induced and vehicular / operational accidents are quite possible. In the context of the proposed project it thus becomes imperative to identify the type, pattern and the potential severity of the hazards, which can cause loss of life, damage to property and environment and to assess the vulnerability and risks there from with a view to outlining an appropriate response mechanism.

The proposed project site is located in Carlisle Bay district in Bridgetown in the Parish of St. Michael. Bridgetown itself is listed as a UNESSCO heritage site and has potential for cultural and historical tourism. Since the proposed project site is located nearby the seashore, site is quite vulnerable to flood and hurricanes. Therefore, the Disaster Management Plan is required to encompass all the administrative and operational programmes and responses to reduce the risk of emergencies of hazardous events likely to occur at any point of time during construction and operational phases of the project.

9.1 Risk Assessment during the Construction Phase

A construction site if not manage properly be a source of major disasters. There at least nine major type of construction hazards i.e. scaffold, power access equipment, ladder, roof work, manual handling, plant & machinery, excavation, fire and emergency and hazardous substances.

9.2 Risk Assessment during the Operation Phase

9.2.1 History of Disaster in Bridgetown

In the 1600s, four hurricanes devastated Barbados, in the 1700s five systems directly affected Barbados, two causing devastation, and in the 1800s there were 17 hurricanes. The majority of these systems went right over Barbados. In recent years however, Bridgetown Barbados has not suffer the effects of devastation of hurricanes but has been damaged by flood waters on several occasions. The most memorable one was the 1970 flood in Bridgetown that caused conservable damage. Despite lull in recent times Barbados is in the hurricane belt and very susceptible to this natural disaster.

Although Barbados has not had a history of earthquakes they have occurred off the island in our coastal waters from time to time. In fact only November 2018 a 6.3 earthquake occurred off the coast of St. Philip. According to the US Geological Survey the quake was located at Latitude: 15.56N, Longitude: 49.86W and at a depth of 7.3 km. It is therefore imperative that in the planning of such large-scale buildings the likelihood of earthquakes must be taken into consideration.

9.3 Disaster Management Plan for the Construction Phase

Disaster management plan prepared to avoid any risk assessed during the construction phase has been discussed below:

- Scaffolding at site is considered as one of the major hazards at a construction site and can be mitigated by following measures;

a) Inspection and certification (tagging) of the erection.

b) Intermediate guard rails,

c) Barrier and warning notices,

d) Regular inspection of the scaffold.

e) Provision of toe guards to prevent items from rolling over the edge

f) Secure fixing

g) Ladder condition,

h) Position and foundation,

i) Suitability

j) Slippery sideways.

k) Availability of extinguishers,

l) Reducing the possibility of ignition sources,

m) Provision of exit alarms,

n) Personnel awareness of the risks

o) Emergency procedures

p) Regular training of responsible “fire marshals”

- Hazardous Substance is considered as a low risk hazard but should be taken care by preserving the material at right place and in approved conditions.
- Power access equipment causes hazards and should be managed by using good quality tools as well as regular maintenance.
- Hazard of ladder can be mitigated by proper erection and regular check up and vigilance during use of ladders.
- Plant and machinery hazards are very major and can be mitigated by using proper preapproved and certified equipment with regular periodic maintenance.

9.4 Disaster Management Plan for the Operational Phase

9.4.1 On Site Emergency Management Plan

9.4.1.1 Earthquake

Spatial and temporal impacts of earthquake are large. Resource requirements are both intensive and extensive for management of earthquake. The project impact area comes under seismic zone 5; therefore the probability of occurrence of earthquake in future is high. The IS code assigns a zone factor of 0.36 for zone5 for resistant design structures in this zone. This is a very high-risk damage zone. In the case earthquake occur the following management plan will be adopted:

- Since earthquake is the most uncertain natural occurrence giving birth to massive calamities on both life and property, adequate care has been taken into account while designing the infrastructure facilities for the proposed site as per seismic zone.

- Extensive rescue operations are required to shift the injured persons to the nearest medical units and evacuate the trapped individuals to safer places. Appropriate medical services are necessary to control epidemics in the post earthquake period.
- Suitable steps on war footing basis need to be adopted to restore all the essential services like, electricity, water and food supply, telecommunication, transportation, etc. Proper steps should also ensure the protection and safeguard of properties.
- Damage to road access due to landslides/land subsidence would need immediate clearing for which operations in close coordination with the concerned departments/agencies in the district will have to be made.
- Areas indicating signs of liquefaction should be declared out of bounds and district vigil should be kept to prohibit trespassing.
- Foundations of the structures prone to liquefaction will require technical assessment.
- Alteration in the river and canal water flow that may inundate the site areas would require immediate evacuation of people and properties in coordination with the district authorities.

9.4.1.2 Fire

Though fire in general is a localized problem it may assume unmanageable proportions if immediate care is not taken. Following management plan shall be adopted:

- Storage of fuel will be as per the rules and guidelines as laid down in the relevant statutes.
- Adequate fire safety equipment e.g. extinguishers, dry chemicals, carbon dioxide, foam spray; water spray should be kept in the complex.
- Codes for cables to be applied for preventing short circuits in wiring.

- Adequate Immediate actions call for the extinguishing of fire by using proper devices necessary, depending on the nature of the fire keeping in consideration that the fires are not spread further to cause greater loss of life and properties.
- Immediate rescue operations will be initiated for which assistance of the local fire service authorities to be sought.
- Emergency medical attention will be extended to the affected / injured persons immediately. Serious burn cases should be transported to the Queen Elizabeth Hospital in town or any other healthcare facility in the area.

Flood and Hurricanes

Since the proposed site is located very close to coastal plain of seashore, the area is highly susceptible to coastal flooding.

Inundation by the sea on coastal areas is potentially caused by unusually high tide, storm surge, hurricanes and wave activity including tsunamis. Long-term processes like subsidence and rising sea level as a result of global warming can lead to encroachment of the sea on land.

Floods

Floods are among the most common and destructive natural hazards causing extensive damage to infrastructure, public and private services, the environment, the economy and devastation to human settlements. Floods usually are local, short-lived events can happen suddenly and sometimes with little or no warning. They usually are caused by intense storms that produce more runoff than an area can store or a stream can carry within its normal channel. There are two ways to mitigate floods: 1) Structural and 2) Non-structural. Structural measures are the ones like Embankments; Water shed management, Reservoirs, Natural water retention basin and buildings on elevated area. Whereas non-structural measures include flood plain zoning and flood forecasting and warning.

Flood preparedness planning is about putting in place a set of appropriate arrangements in advance for an effective response to floods. Some of the commonly identified flood preparedness activities are:

- Public awareness raising on flood preparedness, response and mitigation measures;

- Stockpiling of emergency relief materials i.e., food, emergency medicines, materials for temporary shelter etc.;
- Installation of community-based early warning system for issuance of timely and effective flood warnings;
- Management of safe areas for temporary removal of people and property from a threatened location;
- Transportation to safe areas/ evacuation centre;
- Ensuring access to health and sanitation facilities;

Hurricanes:

- Keep a hurricane Lantern filled with kerosene, flashlight and enough dry cells. Keep some wooden boards ready so that glass windows can be boarded.
- Keep your radio on and listen to latest weather warnings and advisories from the local Radio stations. Pass the information to others.
- Get away from low lying beaches or other locations that may be swept by high tides or storm waves. Leave sufficiently early before your way to high ground gets flooded. Do not delay and run the risk of being marooned.
- Get extra food, especially things which can be eaten without cooking or with very little preparation. Store extra drinking water in suitable covered vessel.
- Check on everything that might blow away or be torn loose. Kerosene tins, cans, agricultural implements, garden tools, road signs and other objects become weapon of destruction in strong winds. Remove them and store them in a covered room.

- If the centre of' ‘eye' of the storm passes directly over your place, there will be a lull in the wind and rain, lasting for half an hour or more. During this period stay in safe place. Make emergency repairs during the lull period if necessary, but remember that strong wind will return suddenly from the opposite direction, frequently with even greater violence.
- Remain in shelters until informed by those in charge that they may return home and report the losses to the appropriate authorities.

Details of district profile with potential disasters and areas prone to it are mentioned along with district level DMP measures. Check if project area comes in any of the areas prone to natural disasters.

Despite all efforts and the measures provided for, it is within the realm of possibility that emergencies and accidents can take place. The primary objective of Emergency Management Plan is to defend the men, material and property against such hazards and restore normalcy as soon as possible. An Emergency Management Group (EMG) is thus constituted with such objective and to provide help to those in need in the times of disaster. The EMG constitutes of personnel having various duties and responsibilities that work in tandem with each other and proper hierarchy to mitigate the adverse impacts of disasters and return to normalcy with immediate effect. All the personnel of EMG operate through Emergency Control Centre (ECC) that is a nodal point for all communications and record of observations and data logging.

9.5 KEY PERSONNEL AND RESPONSIBILITIES

For effective handling of the emergency, there will be a designated Site Main Controller (SMC), Work Incident Controller (WIC) and various other key persons. The key responsibilities of all the personnel that form the part of EMG are as follows:

Site Main Controller

- He will report to the Emergency Control Centre and will assume overall responsibility of the site and its personnel. The main duties of SMC comprises of:
- Assessing the magnitude of the situation and decide whether a major emergency exists or is likely to develop, requiring external assistance.
- Inform District emergency chief (i.e. District Emergency) accordingly.
- Ensure that the key personnel are called in promptly.
- Maintain a continuous review of possible developments and assess these to determine most probable course of events.
- Assume the head of ECC and oversee all the functions are performed as planned.

Work Incident Controller

- The WIC will report to the SMC and would act in such a manner as to manage the hazardous situation, put in control and mitigate. The main duties of WIC comprises of:
- Exercise direct operational control of the affected area.
- Ensure the accounting for personnel and arrange for non essential workers to be sent to assembly point.
- Arrange for a chronological record of the emergency to be maintained.
- Establish communication link with the ECC (through phone or messenger) and keep the SMC informed about the developments at the incident site

Safety Coordinator

The Safety Coordinator would assist the WIC in removal of unsafe situations and act as overseer to monitor that all the activities for emergency management are performed safely and will not escalate the situation.

Medical Officer

The M.O. will rush to the scene of emergency on receipt of information and ensure that casualties are receiving adequate help. The WIC is to be informed of the steps taken and seek advice for further mobilization of medical resources from within and outside the site.

Maintenance Support Officer

He will provide assistance as per the demand of WIC / Safety Officer and will be responsible for electrical supply cut-off / restoration and other mechanical and workshop help.

Civil Support Officer

His responsibility is to provide fabrication/construction manpower for any demolition/ construction as per the emergent situation and provide temporary barricade to the affected location.

Material Support Officer

He has to ensure that the stores remain open throughout the period of emergency for providing material assistance together with providing assistance to the Maintenance Support officer and Civil Support officer for receiving adequate supplies of machinery spares and material.

Area Staff

They will ensure removal of non-essential workers to the assembly points and will facilitate Roll Caller to verify the causality.

Messengers

Messengers will act as per the direction of respective key personnel.

Employees

All the employees are responsible to inform their section in charge about the mishap. The employees of the emergency area except involved in the emergency handling must assemble at the designated assembly points.

Technical Coordinator

The persons in charge of the respective sections are designated as Technical Coordinators. They will ensure that all operations are put in safe and standby condition.

Utilities Coordinator

The utilities coordinator will hold the responsibility of examining and assessing the requirement of water for the purpose of fire fighting and other requirements like drinking and processing water. If required, he will shut down the main power supply to the site and arrange for safe backup power in the affected area and the emergency control centre.

Liaison and Public Relations Coordinator

The liaison and Public Relations coordinator may be a separate person or the duties may be performed by SMC only. He will liaise with local police/ law enforcing authority, District Emergency Officer, Chief Medical Officer, District Fire Officer, etc. for possible help, if needed.

Transportation Coordinator

The transportation coordinator will have the responsibility of ensuring that all vehicles are in good state of repair and maintain a log of all vehicle movement and remain standby for any immediate situation.

Communication Coordinator

Communications officer will provide information to the emergency services as directed by SMC and shall have all available means and messengers to communicate.

9.6 Emergency Preparedness

In addition to planning and delegating responsibilities to the identified key persons, the proposed land parcel will be adequately equipped in terms of safety equipment and facilities in order to be completely prepared for combating emergencies.

Fire Alarm and Fire Fighting

All the fire risks in the site like the engine room, stores, the vehicle dispatch section, administration blocks, electrical substation, etc. will be adequately armed with fire alarm systems (smoke detectors) and will be equipped with fire extinguishers. The land parcel will be equipped with an adequate fire hydrant system.

Personal Protective Equipment

The PPEs act as last line of defence and provide physical protection to the personnel. Sufficient supplies of PPEs like helmets, gloves, ear muffs/plugs, face mask, fire escape masks, water gel blankets, goggles etc. will be maintained at the proposed site.

Communication System

Communication facilities play a key role in notification, coordination and even for calling external help during emergency situations. In view of this, adequate communication arrangements shall be made as given below:

- External telephones
- Facsimile
- Internal telephones in all sections
- Public Address System
- Walkie-talkies

In addition to the above, a siren with adequate audible range to cover the entire site will be available.

Training

Workers will be trained in fire-fighting and safety aspects through demonstration exercises and mock drills.

Emergency Control Centre

It is necessary that the emergency is controlled from one specific point so that all the inputs are available at the Emergency Control Centre (ECC). At ECC a list of emergency telephone numbers, communication facilities & necessary documents for emergency management will be available.

9.7 EMERGENCY MANAGEMENT PROCEDURE

It has been observed that pre-planned and practiced procedures for management of emergency substantially reduce the damage potential of an accident. Thus, for any facility it is necessary to have clear-cut procedures for different functions of emergency planning and management. All occupants within the land parcel will be authorized to report the emergency. If the incident is of a serious nature, the security in-charge of the shift will contact the site in-charge to report the situation who will then mobilize suitable personnel to accesses the situation and declare the emergency accordingly. The SMC shall perform the following broad duties:

- Emergency Shut-Down

- Accounting of Personnel
- Evacuation
- Rehabilitation
- Inform relatives of the affected people
- Terminate the emergency procedures

These will be followed by:

- Head count of all the individuals at the assembly point
- Constitution of the committee to investigate the cause of disaster, which will submit a detailed report of the findings.
- Based on the findings and lessons learned during emergency, the on-site plan will be suitably modified to make it more effective.
- Mock-drills will be carried out on the on-site plan to check its effectiveness and for identification of areas for improvement.
- Regular training programs through audio-visual Aids will be conducted to enhance the preparedness of all workers, specially the emergency combat personnel.

9.8 Off-Site Emergency Preparedness Plan

Off-site emergency plan follows the on-site emergency plan. When the consequences of an emergency situation go beyond the site boundaries, an off-site emergency comes into play. Off-site emergency is essentially the responsibility of the public administration however; the site management will provide public administration along with technical information relating to the nature, quantum and probable consequences on the neighbouring population.

The off-site plan in detail will be based on those events which are most likely to occur, but other less likely events which have severe consequence will also be considered. Incidents which have very severe consequences yet have a small probability of occurrence should also be considered during the preparation of the plan. However, the key feature of a good off-site emergency plan

is flexibility in its application to emergencies other than those specifically included in the formation of the plan.

The main aspects which should be included in the off-site emergency plan are:

- Organization/ hierarchy
- Communication systems
- Specialized knowledge experts or agencies
- Voluntary organizations
- Meteorological information
- Humanitarian arrangements
- Public information
- Assessment of emergency plan

Emergency Code of Practices

The following are the code of practices (COP) that will be followed during the disasters from natural hazards which can affect the proposed land parcel:

Objective

To provide relief to the affected people in quick and efficient manner

Earthquake Preparedness

The earthquake susceptibility in the proposed land parcel will be studied and the earthquake protection measures will be accordingly incorporated in the building design stage itself.

Line of Action

Earthquakes are situations that do not affect a particular identified location. Thus, after the earthquake the SMC will perform the following duties-

- Patrolling of sensitive locations and the entire facility

- Instruct communication officer to contact all department heads to give status of their respective areas, men and machinery.
- If any help is sought at some place, mobilize the resources accordingly
- Immediate attendance of all the staff and visitors

Fire fighting Code of Practice (COP)

Objective

The main objective of this COP is to detect the source and location of the fire and extinguish followed by the evacuation of victims and goods to a safe area.

Fire fighting Preparedness

The critical areas should be provided with fire alarm, extinguisher and automatic fire hydrant system. Caution and awareness signage shall be strategically installed at regular interval in those areas.

Line of Action

Immediately on the breakout of the fire, the following line of action shall be adopted:

- To reach the location of crisis at the earliest
- To identify the source of fire and take necessary action to diminish the cause
- To make sure all the fire automatic fire hydrants are operational
- To evacuate the area as early as possible
- Instruct communication officer to contact all department heads to give status of their respective areas, men and machinery.
- Immediate attendance of all the staff and visitors
- Providing of medical on site aid to affected people
- Call ambulance on immediate basis for the affected people and send them to nearest hospital

9.9 MANAGEMENT FRAMEWORK AND CONCLUSION

The overarching objective of the project is the economic development of the district / country and improvement in the quality of life of the local population in general. It therefore becomes necessary to develop an appropriate response mechanism, which would act in close coordination with the District Emergency Officer / DDMA of the district. For this purpose, the authority should set up a Disaster Management Cell with a small team of dedicated personnel trained in relief and rescue operations required for the anticipated emergencies. In addition to the above the authority should undertake the following:

- Timely warning to the local residents will be made through an effective communication system.
- Timely alerting the key personnel in Disaster Management Cell of the district for taking emergency action
- A Disaster Management Committee will be set up involving all the stakeholders particularly the local community and NGOs and a list of personnel with allocated responsibilities will be kept at the office and in all the concerned local body offices.
- All power supply lines and connections, public address systems, etc. will be thoroughly checked before onset of the hurricane season and special mock drills should be will be organised to put all concerned on alert.

The administrative machinery of the project along with local NGOs will organize regular awareness campaigns with the help of the local authorities where women and school children from the community should be involved. Involvement of NGOs is necessary in mobilizing community efforts for the control of epidemics by ensuring standards of environmental sanitation, disposal of waste and personal hygiene.

The buildings in the project site will be used as safe shelters during emergencies.

Volunteers' Handbook for Disaster Preparedness of the UNDP will be circulated during awareness campaigns.

9.9.1 Coordination with Concerned Authorities

The policy of the Barbados Government of Barbados through the Department of Emergency Management (DEM) emphasizes on sustainable disaster/risk reduction throughout the island by building capacities at all levels to institutionalize disaster risk management in the country. For strengthening the overall capacities for emergency/disaster response in the country, the government is systematically assessing the existing systems at the national, sand district levels. Mock drills with the community should be carried out regularly which may be helpful while formulating the disaster response mechanism by the authorities.