

1.0 RISK ASSESSMENT

During the operation of a port, following risks have been identified.

1. Accidents during berthing or unberthing of ships.
2. Accidents involving other marine craft
3. Fire (oil, LPG, natural gas) and explosion.
4. Spillage of oil and other hazardous chemicals (including gases such as ammonia)
5. Exposure to fumes / gases (spilled cargo or generated from fire)
6. Accidents during material handling
7. Natural disasters

National Environmental Engineering Research Institute (NEERI), Nagpur – laboratory under the Council for Scientific and Industrial Research (CSIR) was assigned the task of “Preparation and Updation of Crisis / Disaster Management Plan for Visakhapatnam Port Trust”. NEERI submitted their final report in July, 2014.

1.1 Accidents during Berthing and / or Unberthing of Ships

Berthing involves, moving a ship weighing several thousand tonnes through a narrow channel, maneuvering it precisely and positioning it precisely against a concrete berth slightly longer than the ship’s own length. The designated berth may be located in between two already occupied berths. Unberthing involves pulling the ship out of its berth and towing it through a narrow channel to outside the port’s limits. This movement may take place against strong water currents. If not managed precisely, the ship may hit the berths, other ships / marine craft or channel markers damaging itself, other marine craft or other structures.

To prevent such accidents, it is mandatory for the entire operation be carried out under the control of the port’s pilots with assistance of at least two tugs, with sufficient power between themselves to handle the ship being handled. Rubber fenders are placed along dock walls to protect civil constructions. Only rated and properly tested towing cables are used for towing ships. Towing cables are regularly checked for signs of wear and tear.

1.2 Accidents Involving other Marine Craft

Besides ships and tugs, numerous other marine craft are in operation in the port’s waters. These include dredgers, floating cranes, survey vessels and small launches & utility boats. The port has standard operating procedures (SOPs) for movement of such craft. The SOPs have been designed to avoid accidents. Operators of these craft are thoroughly indoctrinated / trained to follow these SOPs. The Marine Department monitors the movement of all ships and marine craft within the port’s waters to ensure that that SOPs are followed. All marine craft are periodically inspected and surveyed to ensure their sea-worthiness and prescribed safety equipment are on board and they are fully serviceable.

1.3 Fire (Oil and LPG)

Visakhapatnam is a major port which handles a number of hazardous chemicals including Crude Oil, Petroleum Products and LPG. The hazardous chemicals handled at the port and the related pollution scenario is listed in **Table 1.1**.



Table 1.1: Hazardous Chemicals handled at Visakhapatnam Port Along with Pollution Scenario

Sl. No.	Cargo	Nature of Hazard			Nature of Pollution			Amenity Impairment	Other Hazards	State
		Explosive	Flammable	Toxic	Air	Water	Sea Bottom			
1	LPG	Severe	Severe	Low	Yes	No	No	No	None	Compressed gas
2	Liquid Ammonia	No	Low	High	Yes	No	No	Low	None	Compressed gas
3	Crude Oil	No	High	Low	No	Yes	No	No	None	Liquid
4	Naptha	No	High	Low	No	Yes	No	Moderate	None	Liquid
5	Motor Spirit / Aviation Turbine Fuel	No	High	Low	No	Yes	No	Moderate	None	Liquid
6	Superior Kerosene oil	No	High	Low	No	Yes	No	Low	None	Liquid
7	Diesel (HSD / LDO)	No	Moderate	No	No	Yes	No	Low	None	Liquid
8	F.O. / LSHS	No	Moderate	No	No	Yes	No	Low	None	Liquid
9	Ethanol	No	High	No	No	Yes	No	No	None	Liquid
10	Toluene	No	High	No	No	Yes	No	No	None	Liquid
11	Methanol	No	High	No	No	Yes	No	No	None	Liquid
12	Acetone	No	High	No	No	Yes	No	No	None	Liquid
13	IPA	No	High	No	No	Yes	No	No	None	Liquid
14	Styrene Monomer	Moderate	High	Moderate	Yes	Yes	No	Moderate	Reactive	Liquid
15	Molten Sulphur	Low	Low	Moderate	No	No	No	Low	None	Liquid
16	Alumina Powder	Moderate	Low	High	Yes	Yes	Yes	No	Reactive	Solid
17	Caustic Lye	No	No	High	No	Yes	Yes	No	Reactive	Liquid
18	Phosphoric Acid	No	No	Moderate	No	Yes	Yes	No	None	Liquid
19	Sulphuric acid	Yes	No	Moderate	No	Yes	Yes	No	None	Liquid
20	Ammonium nitrate (fertilizer)	No	No	Moderate	Yes	Yes	Yes	No	None	Solid
21	Gas Condensate	No	High	Low	No	Yes	No	No	None	Liquid



Leakage / spillage of flammable liquids / gases and consequent fire and / or explosion is a potential risk at all ports handling such liquids / gases. To minimize the risk to infrastructure and personnel and equipment, such materials are handled at dedicated berths which have necessary infrastructure and resources in place to handle such incidents. Visakhapatnam Port has SOPs in place designed to prevent accidental leakage / spillage of flammable liquids / gases during handling of such materials. The SOPs also include procedures to handle any leakages / spillages and consequent fire and / or explosion. The Fire Officer is responsible for ensuring that all necessary safety precautions / procedures are strictly followed. He is also responsible for periodical inspection of safety features including alarm systems, safety instruments, control valves and fire-fighting assets.

1.4 Spillage of Hazardous Chemicals

Spillage of these chemicals poses risk to the environment as well as the infrastructure of the area and personnel and equipment deployed in the area. To prevent accidents, specific SOPs have been developed for each of the above chemicals. The concerned personnel have to strictly follow the SOPs. The same is periodically verified by the Port's Safety Officer and the Fire Officer. Nevertheless a Disaster Management Plan has been prepared to handle any emergency arising out of spillage / leakage of any of the above chemicals.

None of the above chemicals are likely to be handled in bulk at the proposed multipurpose terminal.

1.5 Spillage of oil during refueling of ships (bunkering)

Oil (fuel, lubricants) may be spilled during bunkering of ships. To prevent the same, pipes which are used for pumping operations are tested for damages / holes prior to being used. Usually a single flexible rubber pipe, long enough to reach refueling point on the ship, is used. This eliminates joining two or more pipes for oil pumping. Absence of joints on pipelines eliminates potential points of spillage. Nevertheless, if joints are present on pipelines, they shall be tested for leaks prior to pumping operations. During pumping of oil, workers are deployed along the pipeline to look out for leaks. Whenever any leak is detected, pumping operations are shut down and necessary remedial measures are undertaken. A Safety Officer is also deployed during pumping out of oil to enforce safety precautions, as specified in the "Instructions Issued by the Deputy Conservator to Masters of Vessels Regarding Anti Pollution Measures in the Harbour" to prevent oil catching fire.

1.6 Exposure to Fumes / Gases

Workers engaged in cleaning cargo tanks of oil / gas / chemical tankers may be exposed to flammable and / or toxic gases. To prevent the same, it has been specified in the "Restrictions on Tankers Issued by Visakhapatnam Port Trust", that in all tankers the inert gas system should be in working condition and the vapour testing equipment should be in working condition so that flammable / toxic gasses can be purged till safe working atmosphere is attained.



1.7 Accidents during material handling

At the project, heavy pieces of cargo (loaded containers, project cargo, and granite blocks), some of them weighing more than 30 tonnes, will be handled. Grab cranes will be also used to handle dry bulk cargo. Accidents may occur on account of failure of cranes, snapping of cranes' ropes and failure to follow safety precautions.

Cranes and other mechanical material handling equipment undergo periodic inspections and servicing as per manufacturers' guidelines. Hooks, chains and ropes used for material handling are also periodically inspected and tested to ensure their integrity.

1.8 Natural Disasters

The project is located in Seismic Zone II. The area is however prone to cyclones. The last major cyclone to hit Visakhapatnam was the severe cyclonic storm "Hudhud". Shortly before landfall near Visakhapatnam, on October 12, 2014 Hudhud reached its peak strength with three-minute wind speeds of 175 km/h (109 mph) and a minimum central pressure of 960 mbar (28.35 in Hg). The other major cyclones which have hit Andhra Pradesh in the last 25 years are as follows:

Year	Name	Lowest Pressure (mbar)
1990	BOB 01	920
1998	BOB 05	982
2003	03B	992
2007	Yemyin	986
2008	Khai-Muk	996
2010	Laila	986
2012	Nilam	982
2013	Helen	990
2013	Lehar	980

VPT has delineated emergency response procedure in case of cyclones which is as follows:

- In case of cyclone warnings, a Cyclone Station will come into operation at Emergency Control Centre.
- The Harbour Master will initiate action so that vessels double up moorings and securely move port crafts to protected areas. Vessels at vulnerable berths will be shifted to safe berths / roads.
- All other departments will open their respective cyclone co-ordination rooms to function round the clock. These rooms will be closed only after obtaining orders from the Chairman, VPT.
- Safety of personnel and the men engaged in relief activities will be looked after by the relief units set up by respective departments.
- Dy. Commandant, CISF will keep extra vigil on General Stores Complex and other important buildings. A special task force will be constituted by CISF for relief & rescue operations and liase with the local police.

- Civil Engineering Department will arrange for sand bags for field working teams and arrange for shifting of important plans / documents to safe places.
- Chief Incident Controller (DC) will assess the situation and report to the Chief Emergency Controller (Chairman, VPT).
- The engineering Services (E/M) will remain alert on duty for any electrical isolation of areas / substations.
- Chief Emergency Controller (Chairman, VPT) will remain in contact with District Authorities and declare offsite emergency if required.

The Cyclone Emergency Prepared Plan is shown in **Fig. 1**.

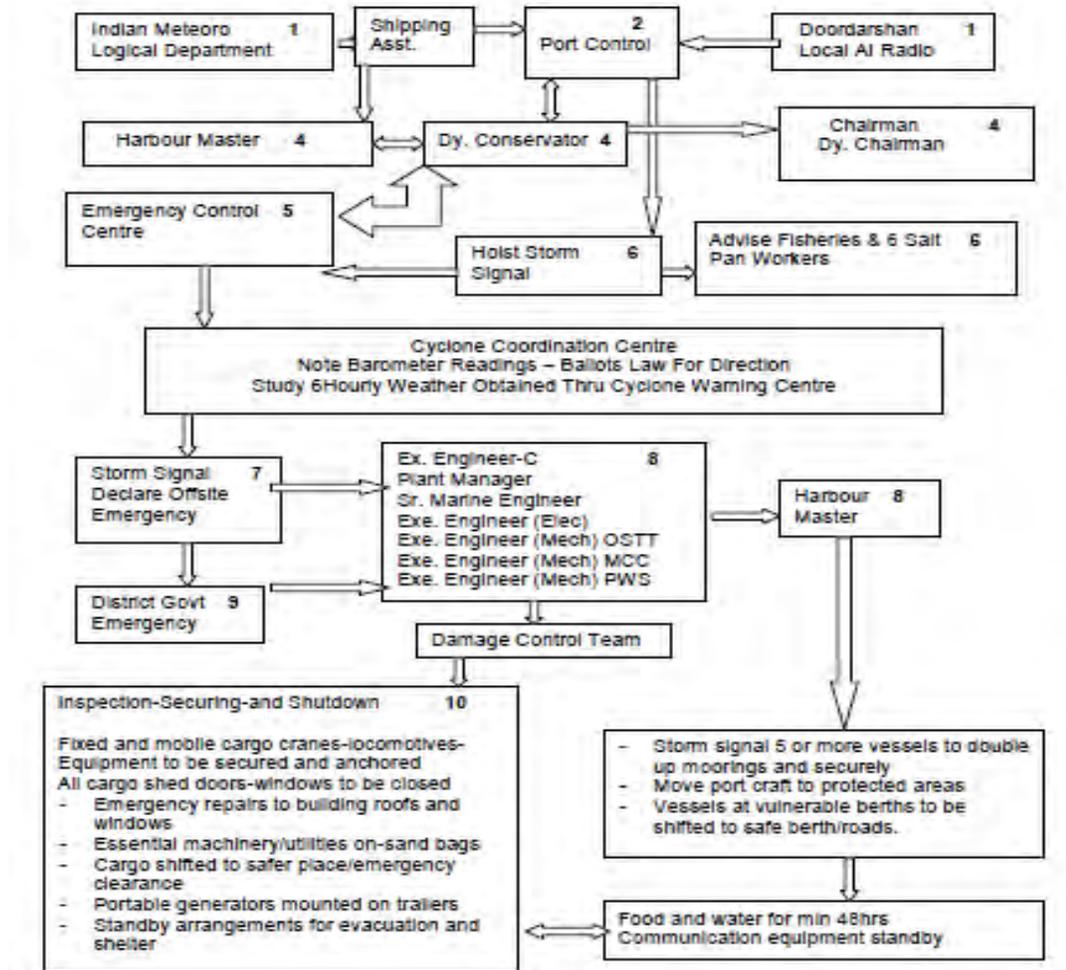


Fig. 1: Cyclone Emergency Preparedness Plan

The following measures will be undertaken to reduce damage due to earthquakes:

- Crisis Management Group will activate the Emergency Control Centre.
- Crisis Management Group will initiate onsite management as per Crisis management and Disaster Preparedness Plan Manual

- Incident Controller (Harbour Master) will initiate Emergency Operations at site and report to Chief Incident Controller (Dy. Conservator who heads the Marine Department).
- Evacuate the affected zones with the help of Warden Team.
- The Chief Incident Controller will assess the situation and report to the Chief Emergency Controller (Chairman, VPT).
- Chief Emergency Controller (Chairman, VPT) will seek assistance of District Authorities if required.

The Earthquake Emergency Prepared Plan is shown in **Fig. 2**.

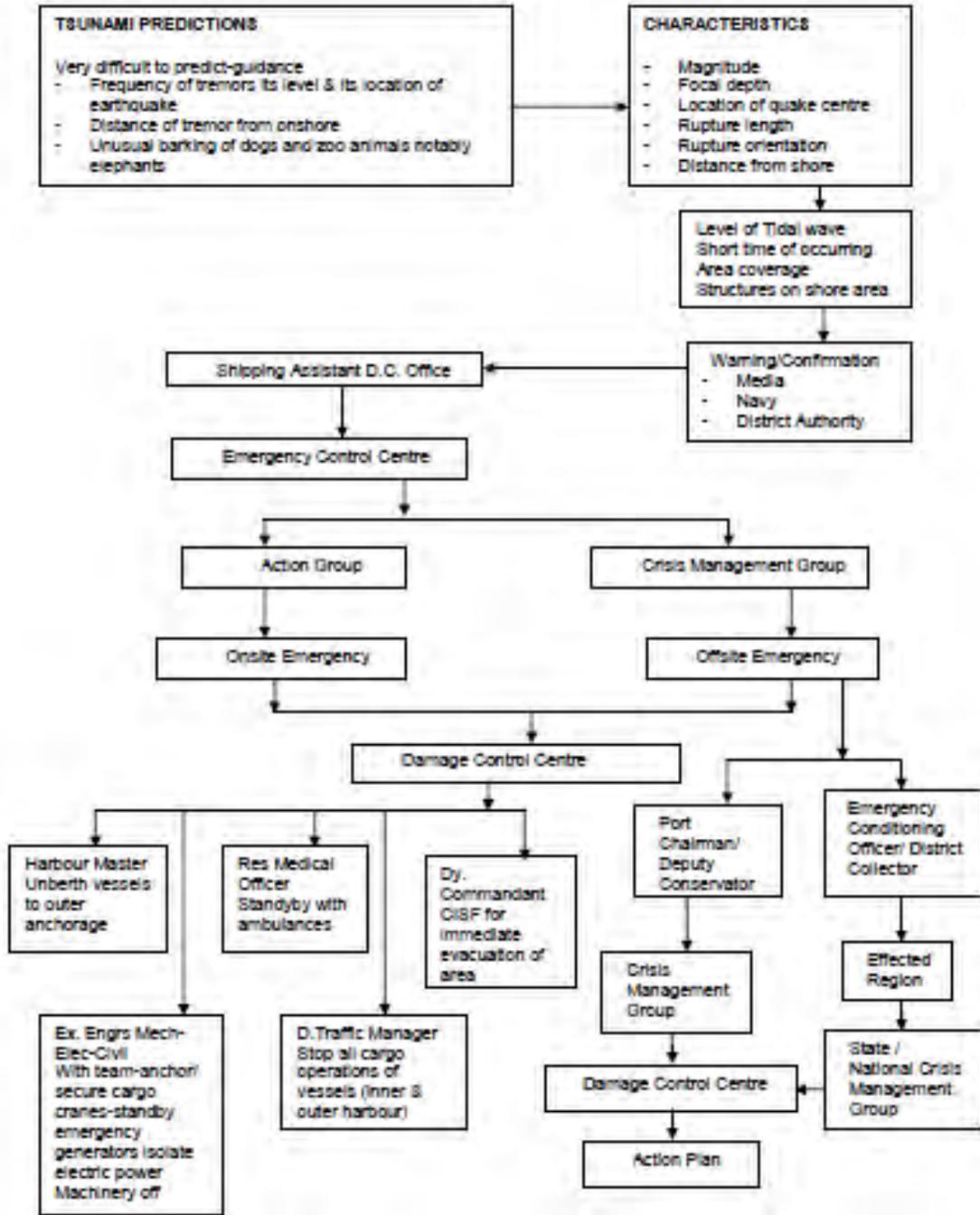


Fig. 2: Earthquake Emergency Preparedness Plan