

RISK ASSESSMENT REPORT

FOR

PROPOSED INTEGRATED INFRASTRUCTURE FACILITIES FOR HAL NEW HELICOPTER FACTORY AT BIDREHALLA KAVAL, GUBBI, TUMAKURU, KARNATAKA



MEC/Q7BZ/01/S2/002 (Rev- 0)

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HINDUSTAN AERONAUTICS LIMITED

(Government of India Undertaking)
Bangalore, Karnataka.



MECON LIMITED

(A Govt. of India Enterprise)
Bangalore, Karnataka.

CERTIFICATE NO: NABET/EIA/1013/031

Project Proponent

Environmental Consultant

Risk Assessment

1. Risk Assessment

The objective of risk assessment is to analyze and ensure a safer & healthier working environment. As it is an integral part of a good occupational health and safety management plan. Risk assessment includes the following.

- i) Hazard Analysis.
- ii) Evaluation of risk associated with that hazard.
- iii) Determination of appropriate ways to eliminate or mitigate the hazard.

Risk analysis deals with the identification and quantification of risks, the plant equipment and personnel are exposed to, due to accidents resulting from the hazards occurring in the plant. On the other hand, hazard analysis involves the identification and quantification of the various hazards (unsafe conditions) that may exist in the plant.

Hazard and risk analysis involves very extensive studies and requires very detailed design and engineering information. The various hazard analysis techniques that may be applied are, hazard and operability studies (HAZOP), fault tree analysis, event tree analysis and failure mode analysis.

Risk analysis involves also the identification and assessment of risks to neighboring public as a result of hazards. This requires a thorough knowledge of failure probability, formulation of credible accident scenario etc. As in practice, the risk analysis is confined to Maximum Credible Accident (MCA) scenarios.

The risk assessment study covers the following:

- Identification of potential areas.
- Identification of failure cases.
- Visualization of the resulting scenarios.
- Assessment of overall damage potential of the identified hazardous events and the impact zones from the accidental scenarios.
- Specific recommendation on the minimization of the worst accident possibilities.
- Preparation of broad Risk/Disaster Management Plan.

1.1. Hazard Identification

The technique employed here for the hazard identification is Maximum Credible Accident (MCA) analysis. MCA is an accident with maximum probability to occur. MCA analysis does not include quantification of probability of occurrence of an accident. In practice, the selection of accident scenarios for MCA analysis is carried out on the basis of engineering judgment and expertise in the field of accident analysis. Process information study and relevant data would help in

the identification of hazard in the plant. Inventory analysis and following Manufacture, Storage and Import of Hazardous Chemicals (MSIHC) Rules-1989 are also the methods in hazard identification. It is reiterated here that the inventory of hazardous inflammable chemicals will be above the threshold limit and does warrant on-site emergency disaster management plan.

Except HSD, no other gaseous flammable chemicals are handled in the process and hence, release of the same due to leakage from pipes, process equipment, damage of cylinders, valves etc., are not anticipated.

1.2. MCA Scenarios

A MCA has been characterized as accident with maximum damage potential, which is still believed to be probable. As an initial step in this study, a selection has been made from the processing plants and storage units which are believed to represent the high level of risk for the surrounding in terms of damage distance.

a. Methodology

The following steps are employed for visualization of MCA scenario:

- Chemical inventory analysis
- Identification of hazardous processes in individual units
- Identification of accident scenarios and chemical release
- Analysis of past accident scenarios and chemical release
- Analysis of past accidents of similar nature to establish credibility to identified scenarios.
- Natural hazard like earthquake, floods.

b. Short listing of MCA Scenarios

Natural hazards like earthquake, floods cyclone are not expected in Tumakuru region due to following factors. In case of earthquake, the maximum damage, it can cause is cracks or partial peeling of plaster in buildings as Tumakuru falls under Zone-II which is not prone to earthquake. However the buildings are designed and constructed as per standard guidelines to meet seismic consideration.

Another natural hazard is flooding which cannot occur in the site by virtue of higher elevation and its surface drainage pattern.

Based on the storage quantities and properties of the chemicals, following hazards have been identified for MCA analysis.

- Pool fire of HSD due to rupture/leakage.
- General fire hazards

2. HAZARD ASSESSMENT AND EVALUATION

Preliminary Hazards Analysis (PHA) is based on the philosophy “Prevention is better than cure”. This technique, if applied early in the project life cycle, will help eliminate hazards and thus avoid costly design modifications later.

A preliminary hazard analysis has been carried out to identify the major hazards associated with storage areas and the processes of the plant. This is followed by a consequence analysis to quantify these hazards. Finally, the vulnerable zones are plotted for which risk reducing measures are deduced and implemented.

The likely potential hazards associated with the HAL plant are listed in **Table 01**.

Table 01
Potential hazard within the facilities and chemical inventory

Sl. No.	Facility	Process	Potential Hazard	Provision
1	HSD (1X 50KL)	Boiler	Pool fire	Provision for fire protection system including foam, safe distance from other process buildings

1. Maximum Credible Accident Analysis

Hazardous substances may get released as a result of failures or catastrophes, which may possibly damage the surrounding area. The results of consequence analysis are useful for understanding the situation and emergency planning.

There is one scenario considered for MCA analysis:

- Pool fire due to leakage of HSD tank

2. Consequence analysis

The process involves consumption of inflammable fuels like HSD in the boiler which are stored in the MS tank with dyke. Elaborate arrangements are provided to tackle any accidents, leakage etc. within the storage area. In view of this conundrum, a detailed risk analysis is carried out, to find the risk on pool fire.

3. Results and discussions

HSD are stored in tanks. As per OISD norms these storage tanks are provided with dykes.

There is one HSD tank with 50 KL storage facility.

In this study the total heat radiation intensity resulting from the accidental pool fires to the nearest buildings is estimated.

Pool fire for total catastrophic failure is considered for worst case scenario i.e., burning of HSD tank of capacity 50KL in scenario 1. The result of heat radiation distance calculated using Heskestad formula method for HSD pool fire is shown in **Table 02**.

Table 02.
Heat radiation distance during pool fire for HSD - Scenario 1

Sl. No.	Intensity of fire in kW/m ²	Distance in m
1	37.5	6
2	25.0	7
3	12.5	10
4	9.5	12
5	4.0	18
6	1.6	29

risk contours for scenario 1 is superimposed on plant's general layout for 37.5, 12.5 and 4 kW/m² are shown in **Fig. 01**. From the figure it can be seen that risk contour for 37.5 kW/m², 12.5 kW/m² and 4 kW/m² are at 6m, 10m & 18m respectively and the heat radiation intensity falls well within the plant area for both the scenario. It is expected that in case of fire, the heat will not be felt by the public due to plantation and compound wall existing in between the plant area and local habitation.

The general effects of thermal radiation intensity are furnished in **Table 03**.

Table 03
Effects of thermal radiation

Radiation Intensity (kW/m ²)	Observed effect
37.5	Sufficient to cause damage to process equipment. 100% lethality
25	Minimum energy required to ignite wood at indefinitely long exposures (no piloted). 50% lethality
12.5	Minimum energy required for piloted ignition of wood, melting of plastic tubing. 1% lethality
9.5	Pain threshold reached after 8sec; second degree burns after 20 sec.

4	Sufficient to cause pain to personnel if unable to reach cover within 20 sec; however blistering of the skin (second degree burns) 3 rd degree burn
1.6	Will cause no discomfort for long exposure 2 nd degree burn
1	1 st degree burn.

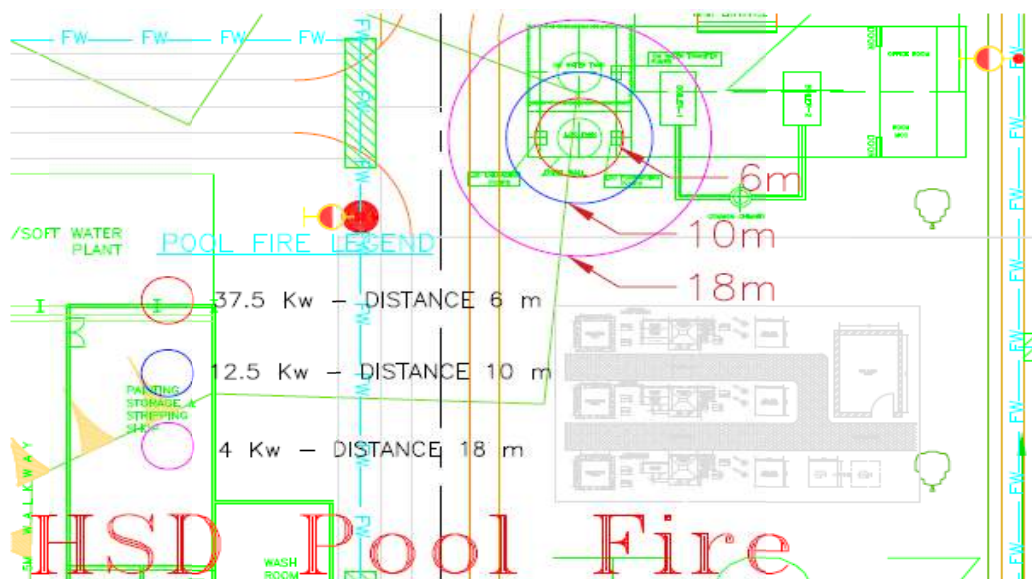


Fig. 01- Risk contours for pool fire

3. Disaster Management Plan

A comprehensive Disaster Management Plan (DMP) including emergency evacuation during natural and man-made disaster is prepared and detailed below:

Disaster is a sudden adverse or unfortunate extreme events which causes great damage to life and asset. Disasters occur rapidly, instantaneously and indiscriminately. These extreme events, either natural or man-induced, exceed the tolerable limit, make adjustments difficult, result in catastrophic losses of life & property and create environmental imbalances. The United Nations defines disasters as 'A serious disruption of the functioning of a community or a society causing widespread human, material, economic and environmental losses which exceed the ability of the affected community/society to cope using its own resources. Disasters can be grouped into two broad categories, viz. natural and manmade.

Natural disasters are catastrophic events which are caused by natural phenomena (hazards with meteorological, geological or even biological origin). Examples of natural disaster are: cyclones, tsunamis, earthquakes and volcanic eruptions which are exclusively of natural origin. Landslides, floods, drought, fires are socio-natural hazards since; their causes are both natural and manmade. For example, flooding may be caused because of heavy rains, landslide or blockage of drainage patterns due to manmade activities.

Manmade disasters are events which are caused by indiscriminate and injudicious human activities. Manmade disaster is associated with industries/residential colonies or energy generation facilities and includes explosions, leakage of toxic waste, pollution, dam failure, war or civil strife, etc. The list of such disasters is very long. Many occur frequently while others take place occasionally.

This Disaster Management Plan includes sum total of all activities, programmes and measures which can be taken up before, during and after a disaster with the purpose of averting/extenuating its occurrence, reducing its impact or recovering from its losses. Disaster management aims to reduce or avoid the potential losses from hazards, ensure prompt and appropriate assistance to victims of disaster, and achieve rapid and effective recovery.

India has been traditionally vulnerable to disasters on account of its unique geo-climatic conditions like floods, droughts, cyclones, earthquakes, and landslides have been recurrent phenomena, and about 30 million people get affected by disasters every year. The loss in terms of private community and public assets has been astronomical. Even though, substantial scientific and infrastructural facilities have developed substantially, the loss of life and property due to disaster has not diminished. In fact, human toll and economic losses have surmounted. In view of this, the Government of India adopted mitigation and prevention as essential components of Disaster Management Plan (DMP). The DMP for any industry has to be prepared to meet statutory and regulatory requirements of the Government of India and the respective state. National Disaster Management Act 2005 provides the basic guidelines on which these plans are prepared and developed to meet any eventualities.

3.1 Need, aim & objective of disaster management plan

1. Need of DMP

The Disaster Management Plan for the proposed HAL new helicopter factory at Bidrehalli kaval is formulated with a view to create an effective and realistic full proof communication, authentic and accurate data base, proof documentation and rehearsal within the plant in the shortest possible time with minimum simple orders and procedures so that people's life and asset will be saved/protected within short period of notice/time.

The purpose of the present document is also meant for ensuring speedy approach for rescue, rehabilitation and to avert further miseries of the affected people. The DMP will act as a guide to the entire administration machinery at the time of disaster preparedness and at the time of relief operation. It will not only provide guidance but also provide courage to face the eventuality in a planned way. This is an attempt towards evolving a systematic, comprehensive and holistic approach to all disasters, natural as well as man-made. It is nevertheless to mention that prevention is more cost-effective than post-disaster relief and rehabilitation. The proposed plant is located in the interior part of Karnataka and hence not experienced with severe cyclones and floods in the recent and past. If any of these natural phenomena do not occur and if at all they occur their severity is expected to be much lesser than those in other parts of the country which are located on the coastal area. Hence, a disaster management plan excludes the counter measures to tide over any incidence related to Cyclone, tidal surges. However, inevitable minor incidences like earthquake, fire, explosion, bomb threats, hazardous material accidents, medical emergencies, electrical accidents, building collapse, drinking water or ground water contamination etc. are anticipated.

Therefore, the disaster management plan for HAL is required to deal with all the resultant situations in the wake of any above mentioned disasters. The plant requires a DMP with proactive, comprehensive and sustained approach to reduce the detrimental effects of disasters. Hence, DMP is to be undertaken with a holistic approach that is inclusive of all the above mentioned activities before, during and after disaster with respect to the proposed desalination plant.

2. Aim of DMP

The aim of the disaster management plan is to:

- i. Establish necessary systems, structures, programs, resources, capabilities and guiding principles for reducing disaster risks.
- ii. Prepare and respond to disasters and threats of disasters in HAL in order to save lives of personnel in the plant & property and
- iii. To ensure the continuity and sustainability of the plant.

3. Objective of DMP

The Disaster Management Plan has been formulated with a view to meet the following objectives:

- (i) Prevention of danger or threat of any disaster
- (ii) Create awareness among all stake holders and ensure their involvement

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- (iii) Assessment of the severity or magnitude of effects of any disaster
 - (iv) Mitigation of risk of any disaster or its severity or consequences
 - (v) Development of disaster-resilience
 - (vi) Evacuation, rescue and relief operation
 - (vii) Reconstruction and resumption of normal operation as fast as possible
 - (viii) Contingency plan

The major elements that are needed in the Disaster Management Plan are:

- i. The DMP team is responsible for assessing the situation, deciding the effective counter measures and getting them implemented,
- ii. Resources and facilities including an Emergency Control Centre/Disaster Management Centre, from where the operations will be directed, and which will keep stock of all emergency kits in a state of readiness
- iii. Training of all personnel holding various responsible portfolios with respect to action plans during emergency situation, and other plant personnel, to ensure smooth co-operation in the event of any eventuality.
- iv. Tests/mock drills/exercises to test the readiness of the organization to cope with the emergencies and to check the effectiveness and adequacy of the plans.
- v. Records of testing of instruments/equipment to be used in emergencies of proceedings of exercises conducted, indicating the chronology of events in the occurrence of an accident etc.,
- vi. Emergency preparedness manual, a document describing the responsibilities of the members of disaster management team and other important personnel.

3.2 Organization for disaster management plan

Disasters can be managed effectively only through close co-ordination among various agencies that play key roles in disaster management. In order to create a composite organizational structure for tackling disasters during all three phases viz., pre-disaster phase, impact phase (during disaster) and post-disaster phase, a disaster management team is likely to be formulated once the plant comes into operation. The constituents of the team are enumerated in subsequent clauses. The team is responsible for undertaking all the expedient steps during emergencies, co-ordination with state and district administration, arrangement for rescue operations, and training of personnel.

Head of safety, functions as chief controller of disaster management team. He will be assisted by other members of the team. The chief controller is responsible for laying down the policies in accordance with guidelines and instructions from the central and state Govt. from time to time and to monitor its execution. He will have close interaction with the Deputy Commissioner/ADM (Head of disaster management team, Tumakuru). In absence of the chief controller of disaster management team, the senior most officer of the team or the joint controller will be functioning as the chief controller of DM team.

Besides, having safety In-charge as its chief controller, the disaster management team comprises of personnel from various service group as members. The various service group personnel will assist the chief controller in executing inter related actions during disaster management.

The team shall assemble once in a year during usual time to review the disaster management plans or as and when the controller feels necessary. It will regularly review, update and modify the plans depending upon the situation. It will chalk-out plans for mutual aid, re-enforcement schemes and ensure that the plans are carried out without any confusion. It will also be responsible for conducting regular training programs and mock drills on disaster management plans.

Table 04 below enumerates the various members of the team.

Table 04
Disaster management team

Sl. No.	Post
1.	Chief Controller
2.	Joint Controller
3.	Asst. Controller
4.	In-charge Training
5.	In-charge Fire Fighting
6.	In-charge Casualty Service
7.	In-charge Communication
8.	In-charge Rescue & Services
9.	In-charge Repair Service
10.	In-charge Welfare Services
11.	In-charge Information Services
12.	In-charge Transport Services
13.	In-charge Supply Services
14.	In-charge Liaison Service
15.	Members

3.3 Co-ordination with state and district administration

The Karnataka state has constituted, District Disaster Management Authority (DDMA) for Tumakuru District as stipulated in the National Disaster Management Authority (NDMA) Act of 2005 with the Chief Minister as chairman and the Revenue Minister as vice-chairman, which are nodal agencies at state and district level respectively for handling of any disasters by way of planning, co-ordination, implementation of all measures for response and recovery.

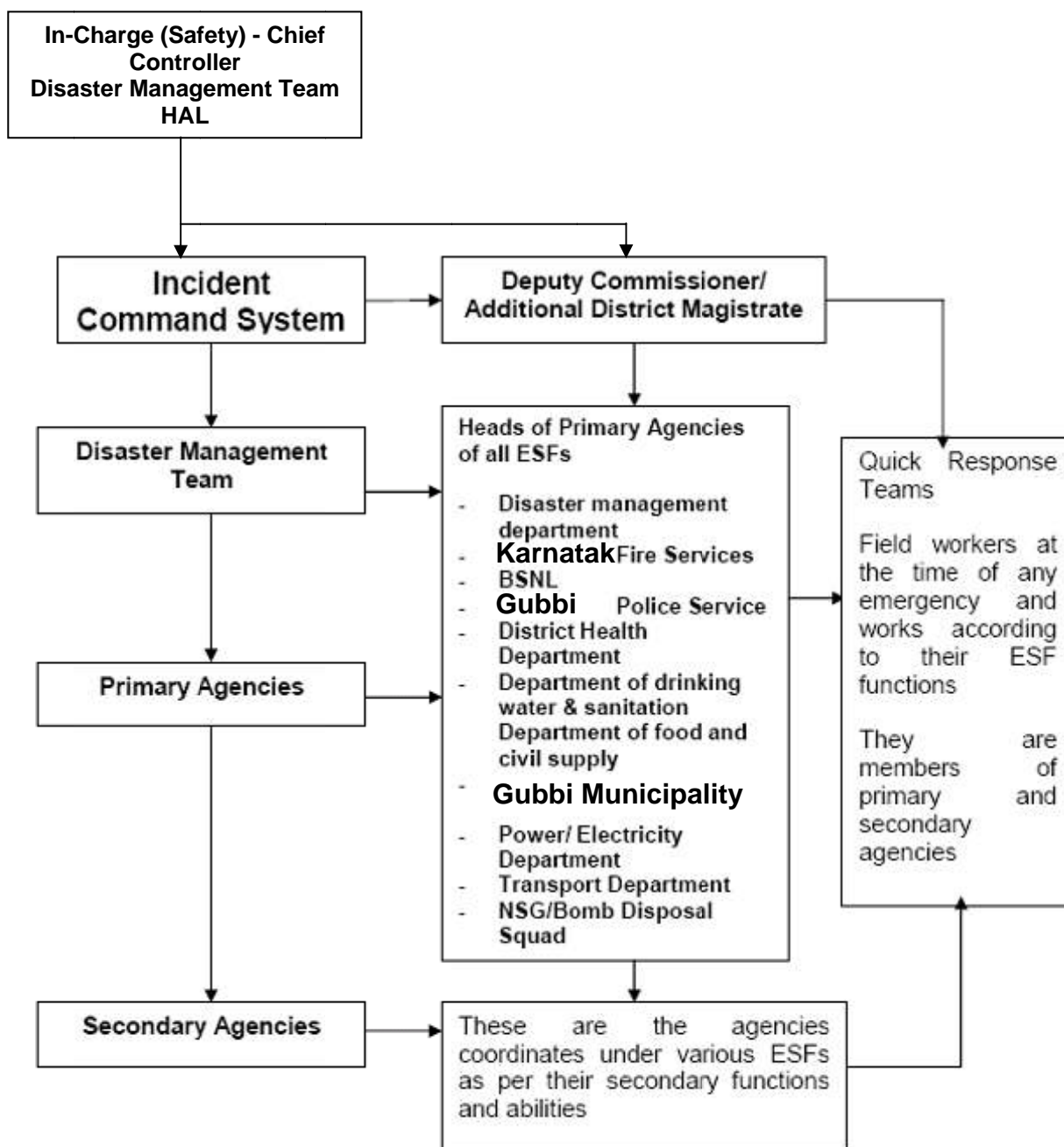
The DDMA of Tumakuru has a preparedness plan which establishes an organized setup to conduct Emergency Support Functions (ESF) for the natural and man-made disasters. It outlines an implementing framework for sharing of resources, as per requirement, among national and state level institutions during an emergency situation.

The preparedness plan has structured the responsibilities of all line departments' i.e. primary and supporting departments to function together marshalling their capabilities, skills, resources, and authorities across the State and respective districts. The plan unifies the efforts of state departments and supporting agencies to be involved in emergency management for a comprehensive effort to reduce the effects of any emergency or disaster within the state.

The ESF activates under the guidance of an Incident Commander (Deputy Commissioner/Additional District Magistrate) who is also head of Incident Commander System (ICS). Under the ICS, a team of ESFs' nodal officer's work together also called as Disaster Management Team (DMT).

All ESFs have to assist the Incident Commander, i.e. Chief of operations at state level and Deputy Commissioner(s) at district level as per their assigned duties described in the DDMA guidelines. HAL will have close interaction with incident commanders at district & state level. In case of disaster, disaster management team of HAL & DDMA team will be activated simultaneously and they will work in tandem

CO-ORDINATION OF CHIEF CONTROLLER, DISASTER MANAGEMENT TEAM, HAL WITH DISTRICT OFFICIALS



3.4 Disaster analysis

Risk is a measure of expected losses (death, injuries, assets, economic activities etc.) due to a potential hazard (of a particular magnitude) occurring in a given area over a specific period of time. Risk analysis involves determining the

The seasonality of hazard as mentioned by District Disaster Management authority is shown in **Fig. 07 - 01** below which is very useful to identify the period of occurrence of disaster.

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Hemisphere. This center moves inwards 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 wind strength. Cyclones can be hazardous as they are normally associated with strong winds.

The HAL plant area is located interior part of Karnataka and hence, not prone to storms and cyclones and has not experienced in the recent and past. However, if at all it occurs in future, the pre caution to be taken are enumerated below:

Pre-disaster phase

- (a) A central control room shall be established.
- (b) Measures for rapid dissemination of warnings issued by the IMD/DDMA, Bangalore/Tumakuru shall be conceived by the disaster management team and communicated properly among the plant employees.
- (c) On receipt of disaster outbreak, then medical team, nearest police station, local NGOs shall be immediately informed.
- (d) Evacuation of persons inside the plant shall be properly planned in micro and macro levels in case of emergencies.
- (e) Cyclone shelters shall be identified for persons trapped inside (if any) the plant during emergency.
- (f) Plans shall be circulated to the in-charge of critical operating units of the plant for safe shut down of respective units.

Disaster phase

- (a) The occurrence of storm/cyclone shall be immediately communicated to the mass and also to the disaster management team for carrying out rescue operations, through the entire available medium for communication.
- (b) Mobilization of inventory boats boatmen and other vehicle tagged to cyclone shelter centres for their use at the time of need.
- (c) Information shall be passed on to DDMA and hospital regarding the causality.

Post disaster phase

- (a) Control room shall be establishment
- (b) Military assistance shall be sought for various activities like Corpse disposal, Medical aids, Epidemics control etc.

- (c) Arrangement shall be made for receiving outside relief like safety measures, dispatch etc.
- (d) Deployment of plant resources.

Further, the following measures are envisaged to meet the worst conditions.

Pre disaster phase

- (a) A central control room shall be established.
- (b) Measures for rapid dissemination of warnings issued by the IMD/DDMA, shall be conceived by the disaster management team and communicated immediately among the plant employees on duty.
- (c) On receipt of disaster outbreak, then medical team, nearest police station, local NGOs shall be immediately informed.
- (d) Evacuation of persons inside the plant shall be properly planned in micro and macro levels in case of emergencies.
- (e) Severe storm/cyclone shelter shall be identified.
- (f) Plans shall be immediately communicated to the in-charge of critical operating units of the plant for safe shut down of respective units.

Disaster phase

- (a) The occurrence of severe storm/cyclone shall be immediately communicated to the mass and also to the disaster management team for carrying out rescue operations, through the entire available medium for communication.
- (b) Mobilization of inventory boats boatmen and other vehicle tagged to rescue centres for their use at the time of need.
- (c) Information shall be passed on to DDMA and hospital regarding the causality.

Post disaster phase

- (a) Control room shall be establishment.
- (b) Assistance shall be sought for various activities like Corpse disposal, Medical aids, Epidemics control etc.
- (c) Arrangement shall be made for receiving outside relief like safety measures, dispatch etc.

(d) Deployment of plant resources

2. Floods

The proposed helicopter plant is located at an altitude 812 to 846m above MSL which is not a low lying area. The area is mostly impermeable. Soil investigation report reveals that about a depth of 5 to 10m, sandy loam layer are observed which are partially pervious.

The area is neither located on the banks of river nor on the foothills and the from past 15 yrs rainfall record it is clear that the rainfall is in the range of 780 to 900 mm. Even during heavy rainfall the area has not witnessed any flood situation. The proposed plant will be constructed at an average safe ground level of 820m above MSL. Hence, floods situation is not anticipated. Therefore, hazard due to flood is not expected here.

3. Earthquake

An earthquake is a series of tremors on the earth's crust caused by generation of elastic (seismic) waves due to sudden rupture within the crust or movement of earth crust plates. The resultant of tremors generates immense energy released from the accumulated stress on the tectonic plates.

An earthquake becomes a disaster only when it strikes the populated areas. Sometimes a moderate earth quakes on Richter scale inflicts great damages by stimulating and augmenting other natural physical processes such as landslides, tsunami, floods and fire. According to the latest seismic zone map of India, about 59 percent of Indian land is vulnerable to moderate or severe seismic hazard and above.

The site lies in seismic zone II as per the seismic zone mapping of India (IS: 1893-2005) and has the lowest seismic potential. There is no capable fault identified within the study area. The seismic zone map of India is shown in the **Fig. 03.**



Fig. 03 Seismic zone map of India

Since, the plant is located in the lowest seismic potential zone (zone II), HAL has planned to adopt all the structural designs confirming to Zone II criteria, in order to withstand any eventualities. Further, to meet the above, the following measures are envisaged.

Pre disaster phase

- (a) Earthquake resistant construction of new structures.
- (b) Selective seismic strengthening & retrofitting of existing & lifeline structures shall be done on priority basis.
- (c) Laws and regulations shall be stringently enforced.
- (d) Awareness & preparedness program shall be carried out at regular intervals to develop personal skills and enact during emergency situations.

Disaster phase

- (a) The occurrence of earthquake shall be immediately communicated to the mass and also to the disaster management team for carrying out rescue operations, through the entire available medium for communication.

- (b) Fire department shall be immediately informed in order to avail their services.
- (c) Information shall be passed on to the DDMA and hospital regarding the causality.

Post disaster phase

The following actions are to be taken:

- Control room shall be established.
- Military assistance shall be sought for various activities like Corpse disposal, Medical aids, Epidemics control etc.
- Arrangements shall be made for receiving outside relief like safety measures, dispatch etc.

4. Fire

Adequate fire fighting systems such as portable fire extinguishers, water based fire hydrant system and fire detection & alarm system shall be provided in the proposed plant and looped with the already existing system available in the district. Details of the proposed system are enumerated below:

Fire protection facilities

To meet the eventuality of occurrence of fire, the following facilities will be provided:

- (i) Fire detection cum alarm system
- (ii) First aid portable fire extinguishers
- (iii) Fire hydrant system
- (iv) Water sprinkler system

(i) First aid portable fire extinguishers

Fire extinguishers of various types viz. Dry Chemical Powder (DCP), CO₂, water & foam having different capacities will be provided as per IS:2190 for the proposed plant.

Area	Type of fire extinguishers
Plant	4.5 kg CO ₂
	2 kg CO ₂
	9 lit. mech. foam

The detailed engineering of the project is under progress. The quantity and locations will be furnished on completion of project.

(ii) Fire hydrant system

System consists of fixed piping network, pumps, overhead water tanks, underground tanks, hydrant valves along with hoses in hose box.

Hydrant valve along with hoses will be provided in HAL premises. In addition to that, hydrant valves shall also be provided. The project will have adequate security persons to operate the system and mock drill will be conducted every 6 months.

(iii) Fire detection cum alarm system

Fire detection cum alarm system will also be provided in sensitive areas like administrative building and plant area.

(iv) Water sprinkler system

Water sprinkler system will be provided in high risk area.

Pre-disaster phase (Practice of fire drill)

(i) Step 1

The disaster management team of HAL will be looped in for the proposed fire protecting team. The team consists of various service providers including in-charge for fire fighting. The in-charge of fire fighting will be responsible for ensuring evacuation of all the occupants from the entire plant area or the accident area and they must meet team members at a predetermined location outside the premises.

(ii) Step 2

The in-charge of fire fighting will provide evacuation information to the occupants before the drill begins. Occupants will be made aware/trained about the evacuation path, from their work area and alternative paths in the event if 'EXIT' is blocked. Evacuation signs are to be displayed inside the plant area at various locations to ensure quick evacuation. The in-charge of fire fighting shall train the occupants, on how to operate and use a fire extinguisher, as well as whom to contact in case of an emergency.

(iii) Step 3

The fire fighting in-charge develops several fire drill scenarios, to make employees/occupants aware about available evacuation routes with

preparedness. During fire drill, security personnel should stand in front of different EXITS holding signs that state “Exit blocked/an alternative route”. This makes the occupants aware of the different exit routes from the building and makes them to think about realistic emergency situation.

(iv) Step 4

Fire drills shall be conducted at regular intervals. The drill interval is generally every six months.

Disaster phase (During fire)

In case of minor fire like electric short circuit, the person who discovers the fire shall extinguish the fire with available fire-fighting system or call the security using the nearest available telephone/mobile to take assistance of security personnel in extinguishing the fire. In case of major fire, it is necessary to follow fire-drill to avoid loss of life and material. The procedure will be as follows:

(i) Expected action by Individual

- With the available fire fighting system in the vicinity personnel shall try to extinguish the fire.
- Alarm shall be raised them in the vicinity, by shouting “Fire, Fire” at louder voice until the alarm is activated by other person.
- The security and fire in-charge shall be intimated immediately
- Electrical Maintenance shall be informed to disconnect the electrical supply.

(ii) Expected action by Security Personnel on Duty

- On receiving the message of fire, the security personnel will ascertain the location of fire and raise the fire alarm.
- On raising the fire alarm, the following actions shall be undertaken:
 - i. Front and rear gates shall be opened and those on duty shall be helped to leave the premises.
 - ii. Except the two guards at the main gate and one guard at the rear gate, all the guards shall rush to the fire location after hearing the fire alarm without waiting for any further instruction /order immediately, and shall shout “Fire, Fire” through voice communication system. The shift In-charge/senior most security personnel available at the location shall take control of the fire operation.

- iii. Shift In-charge shall carry the master-key with him.
- Out of two guards available at main-gate, one guard shall inform the following offices immediately:
 - i. In-charge fire fighting
 - ii. Local Fire Officer (Gubbi/Tumakuru)
 - iii. Security In-charge.
 - iv. Electrical Maintenance.
- The Chief Controller of Disaster Management Team shall be in regular contact with the local fire officer (Gubbi/Tumakuru) to avail fire tender.
- Till the fire tender arrives, the senior most security personnel available at the fire scene shall ensure that fire is fought in correct and efficient manner. Personnel inside the plant shall be evacuated safely either through ladders or rise ladders available in the fire tender.
- The entire message shall be entered correctly in the occurrence book.

Expected action by occupants

- After hearing the fire alarm, all the personnel inside the plant should immediately leave the premises in an organized way, under fire servicemen guidance.
- After the fire is extinguished, the area shall be carefully cordoned for further investigation.

Post disaster phase (After fire)

- Insurance Department shall be informed for claims, if required.
- Letter shall be given to Fire Department regarding outbreak of fire.
- Senior officials shall be informed regarding the incident.
- In case of possible sabotage, police shall be called to assist investigation.
- On no account, debris shall be removed from the place of fire, until the investigation is completed by the Competent Authority.

Training of security personnel

Security personnel shall be trained as per instructions laid in the emergency procedures described in the fire safety plan, before they are given any responsibility for fire safety.

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- (i) Instruction on the use of the voice communication system.
 - (ii) Procedures for evacuating persons who are in need of assistance.
 - (iii) Action to be taken to initiate any smoke control or any other fire emergency systems installed in the plant in the event of fire, until the fire department services are rendered.
 - (iv) Implementation of established procedure, to facilitate fire department, to access the fire location within the premises.

Plant chief controller of disaster management team along with the in-charge of fire fighting and security personnel shall attend the concluding session after every comprehensive fire drill. The reason for the session is to review the procedures and reactions of all participants. During the briefing, challenging areas shall be identified and solutions shall be implemented.

5. Explosion

Pre-disaster phase

Explosion can occur due to fire or low intensity crude bomb placed by miscreants. It is difficult to pinpoint the location of the bomb or the place of explosion. Therefore, following measures shall be adopted to prevent such incidents.

- a. Proper identifications of all individuals shall be done before allowing them to enter into the plant area.
- b. Persons entering into the premises must be enquired and entry passes shall be accordingly issued, so that their identification are kept with the reception.
- c. Any suspicious activities, inside the premises shall be informed to the Security personnel immediately.

Disaster phase

- a. Police authority shall be informed immediately.
- b. The incident Commander (Deputy Commissioner) DDMA team and Plant Chief Controller for Disaster Management informed immediately.
- c. Nearest hospital shall be informed for seeking urgent help.
- d. Casualty shall be send immediately to hospitals.
- e. The incident site shall be cordoned with the help of Security personnel

Post disaster phase

- a. Assistance and first aid to the victims who have sustained minor injury shall be immediately provided.
- b. The emergency procedures to be followed in case of fire, including actuating the fire alarm, information to fire department, clearance for firefighting equipment to access the fire location, instruction to the occupants on procedures to be followed when the fire alarm is energized, evacuating the endangered occupants and confining, controlling and extinguishing the fire.
- c. The bomb squad team (Tumakuru) shall be informed and all assistance for searching any crude bomb left over shall be provided.
- d. Evacuation of all employee/occupants from the premises shall be carried out in a systematic way.
- e. Security shall assist police and bomb squad team to perform their duties.
- f. Information shall be imparted to the insurance department for claims, if any.

6. Bomb threats

The objective of bombing and bomb threats may be any of these: damage, harassment, creating fear among occupants/employees, death or injury. The effect of the bomb threat will depend upon the type of organization/department.

HAL employees, especially in the dispatch section must review the postal material i.e. package/package/envelope/bundle. Use of gloves and respirators or a glove-box protects the persons while opening the suspicious post/dak.

The following information is to be shared with employees to assist them in identifying and responding to suspicious envelopes and packages.

Some characteristics of suspicious packages/letters include the following:

- Excessive, inadequate or missing postage fee
- Handwritten or poorly typed addresses
- Incorrect titles or no name
- Misspelling of common words
- Oily stains, discoloration or odour
- No return address
- Excessive weight
- Lopsided or uneven envelope
- Protruding wires or aluminum foil

- Excessive security material such as masking tape, string, etc.
- Visual distractions
- Clock ticking sound
- Restrictive markings such as “Personal”, “Confidential”, or “To Be opened by” without proper employee name.
- Postmark city/province/state does not match the return address
- Foreign mail from politically unstable or hostile countries
- Unprofessional wrapping
- Threat markings on exterior of package
- Inappropriate air mail or special delivery stickers

Pre-disaster phase

- (a) Do not shake or bump it.
- (b) Do not open, smell, examine, touch or taste.
- (c) Treat it as suspect.
- (d) If it is suspected that the package/device is a bomb:
 - Do not cover it.
 - Open doors and windows to minimize blast effects.
- (e) If it is suspected that the package/device is contaminated with a chemical or biological agent:
 - Gently place in clear plastic bag, if available or cover with other materials.
 - Close the door.
 - Minimize physical contact with other people.
 - Wash hands with soap and water.
 - Remove contaminated clothing and place in a sealed container (e.g., plastic bag) to be forwarded to emergency responders.
 - Shower (with soap and warm water) at the earliest.
 - List all people who may have been in contact or close proximity to the suspicious package/device and provide this list to appropriate authorities.
 - If necessary, seek medical assistance as soon as possible.
- (f) Clear the nearby area from where the package was discovered.
- (g) Inform police and bomb squad team and provide the following information:
 - Object location
 - Object description
 - Any other useful information

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- (h) Report the incident to the police control room (Dial 100) and nearest police station.
 - (i) Inform Disaster Management Team of HAL and DDMA
 - (j) Attempt to establish ownership of the object.
 - (k) If necessary, initiate evacuation procedures.
 - (l) Proper checking of visitors or strange people entering inside the premises shall be made.
 - (m) Strange persons not accompanied by an occupants/employee entering the organization or department should be approached to determine the reason for their presence.
 - (n) Employees should check their immediate work area on the assumption of duty to ensure that there is nothing unusual or out of place
 - (o) All staff members should be instructed to report any suspicious objects to management, and to refrain from touching the same
 - (p) Visitor entrance is controlled and supervised in a discreet and courteous fashion. The security personnel or receptionist shall check the visitor's identification, the reason for the visit and the person or department he/she wishes to visit.

Additionally, it is essential that any hand luggage, samples or other objects carried into the plant area by a visitor, shall be checked properly by security on duty. This will assist in easy recognition of any parcel left behind.

Disaster phase

- a) This is the prerogative of HAL, and shall be done only when there is a reason to believe imminent danger. This decision shall be taken after careful consideration of the facts e.g. if the employee search has unearthed a suspect package/bomb etc.
- b) The evacuation method shall be same as fire drill. It is to be ensured that there is no panic while moving out from the different areas. After the evacuation process the proper search for the bomb shall be organized.
- c) If a suspected material which is assumed to be bomb is found inside the premises, then the security shall inform the police and bomb squad team to diffuse the bomb.

- d) Till the time bomb squads do not reach the location, it is the duty of the security personnel to cordon the area and not allow any body to approach the location.

Post disaster phase

- (a) Security personnel shall search the entire area along with bomb squad team and the police as a cleaning up activity as well as to locate any left out bomb if planted.
- (b) After proper search and diffusion of the bomb, the occupants/employee shall be allowed to go to their respective locations.

7. Terrorist attack

Criminals or terrorists may use firearms, knives, arson, vehicles and other “low-tech” devices to cause physical threats. Security measures and physical barriers like tyre killers shall be considered as means of preventing or minimizing the impact of these threats and occurrences.

Well-planned and prearranged laid-down procedures may be appropriate for application in the plant premises to protect employees/occupants.

Pre-disaster phase

Security personnel and receptionists shall take the following action to prevent terrorist attack inside the plant premises:

- (a) Only authorized persons shall be allowed to enter into the premises.
- (b) Personnel verification and identification shall be carried out at the reception by seeking the details of the persons to whom he or she wanted to meet.
- (c) Cross verification with the visitor/employees/occupants to which they want to meet, shall be done at the reception before permitting their entry.
- (d) Proper checking of their baggage and personal belongings at the reception by security.
- (e) Visitor's vehicles are to be checked before entering the premises.

Disaster phase

If it is certain that terrorists have entered into the plant premises then the following actions are to be taken:

- (a) Main gate of HAL shall be closed.

- (b) Information shall be given to the nearest Police Station immediately.
- (c) Information shall be given to the Disaster Management Team and DDMA.
- (d) All the gates, inside the premises shall be closed except the place where the terrorists are hiding.
- (e) Security personnel shall cordon the concerned area and prevent anybody from entering inside the location.
- (f) Police shall be assisted to nab terrorists.

Post disaster phase

- a) Search for suspected person who might have helped the terrorist.
- b) Brief the investigation team about the incident, after the terrorists are caught.

8. Medical emergencies

Pre disaster phase

- (a) Emergency contact phone numbers shall be displayed at various locations.
- (b) Emergency vehicle (108)/Hospital ambulance shall be called to attend the victims.

Disaster phase

The person who is in need of medical emergency shall be shifted to the nearest hospital.

Post disaster phase

Regular track of victims having medical problems shall be kept, so that they can be shifted to the specialized hospital, if required.

9. Roof collapse

Plant may experience roof collapse resulting from environmental occurrences such as earthquake, high winds and or due to faulty design/ageing.

Pre disaster phase

- (a) In-charge of Civil and his team shall inspect buildings at regular intervals.

- (b) Based on the damage assessment, repair/remedial measures shall be executed.
- (c) In the event of intolerable conditions or imminent situation, evacuation shall be carried out.

Disaster phase

- (a) Injured persons shall be shifted immediately to the nearest hospital.
- (b) Security personnel shall assist the trapped person come out from the collapsed structure.
- (c) Information shall be given to the Disaster Management Team of HAL and DDMA about the incident.
- (d) Employees shall assist security personnel in order to remove the debris (till professional help arrives)

Post disaster phase

- (a) Debris shall be removed at the earliest.
- (b) Structures shall be checked and strengthened, if required.

10. Electrical accident

There is great danger of electrocution when occupants/employees are in contact with live wires unknowingly/carelessly or in the event of conductor snapped from the poll. In most of the cases, accident occurs due to short circuit, defective wiring, defective electrical appliances and improper use of electrical equipment.

Pre disaster phase

- (a) Faulty electrical appliances and equipment must be properly handled and promptly repaired.
- (b) Proper maintenance of electric wiring and fuses are essential. Fuse wires shall be of appropriate rating.
- (c) Electrical gadgets shall be disconnected when not in use.
- (d) All electrical appliances shall be properly stored in a safe place, guarding them from any unauthorized access.
- (e) Electric wires or cords, if faulty, shall not be used until repaired.
- (f) Electric gadgets shall be repaired only by a qualified person.

- (g) Warning signs and appliance cautions shall be fixed near the appliances.

Disaster phase

- (a) In case of a fire caused by electricity, switch-off in-coming power supply and then only action shall be taken to extinguish the fire.
- (b) The main switch for the electric supply in the affected zone/premises shall be switched-off immediately.
- (c) In case of electrical accident person shall not stand on metal or wet surfaces. The person should stand on a non electrical conductor like rubber-mat or dry wooden platform.
- (d) The evacuation, if needed, shall be properly exercised without chaos and confusion. Everyone shall be directed to gather at a common point to ensure the safety and evacuation of all.
- (e) The electrical rescuer personnel concerned shall be immediately intimated about the accident and all operations must be stopped to restrict further outbreak.
- (f) The victims shall be examined to determine, whether they are in contact with energized conductors.
- (g) All electrical circuits shall be de-energizing, if at all possible.

Post disaster phase

- (a) Aid of trained electrical personnel shall be sought.
- (b) Accident site shall be approached cautiously
- (c) Protective equipment such as high voltage gloves shall be used
- (d) Special insulated tools shall be used
- (e) Unconscious victims shall be immediately admitted at the nearest hospital after providing first aid facilities and detailed information shall be communicated to the attending physician.

11. Civil disturbance/mob attack

Civil disturbances include riots, mob violence, threatening individuals and groups causing loss of human beings and properties.

Pre disaster phase

In case of civil disturbance or strike/demonstration:

- (a) If 'bandh' is declared on any working day and it is apprehended that there might be some disturbances, then the police shall be informed beforehand.

Provoking or obstructing the demonstrators shall be avoided.

- (b) If information about any disturbance is received in advance, then proper arrangement shall be taken to secure the plant area by closing gates etc.
- (c) Wandering of unauthorized persons inside the plant premises shall be immediately reported to the security personnel on duty.
- (d) Normal work routine shall be carried out to the maximum extent.
- (e) Personnel inside the plant shall stay away from doors, windows or any other openings of the premise.

Disaster phase

Security personnel near main gate shall inform the nearest police station immediately. If mob attacks on the premises, then security personnel shall close all entry and exit. Security personnel in HAL premises shall gather near the mob attack and try to prevent miscreants entering into the premises till the time police reaches the spot.

Post disaster phase

Demonstrations or visible actions, intended to advocate a position on any particular issue, may become problematic. These activities may interfere with the HAL routines by creating agitation. Adequate protection shall be provided to the occupants/employees till rescue team arrives.

12. IT disaster recovery plan

Purpose and scope

HAL will develop this disaster recovery plan (DRP) to be used in the event of a significant disruption of IT enabled services. The goal of this plan is to outline the key recovery steps to be performed during and after a disruption to return to normal operations as soon as possible.

3.5 Disaster Management plan specific to the site

The proposed HAL new helicopter factory is mainly consist of manufacturing & assembling units. The plant will not be using any chemicals in the process as

used in any other chemical industries/plants except a small quantity of acids and alkalis used for plating purposes of helicopter components. Hence, any detailed DMP pertaining to handling of chemicals are not warranted. The general DMP pertaining to fire, drought and terrorist attacks are covered in the general DMP. The same is applicable to site-specific DMP. The fire fighting facilities as proposed for the plant facilities are as follows:

3.6 Fire Fighting Water System

To cater to the needs of water based fire-fighting system dedicated firewater pumping system housed in a closed pump house along with static water reservoir shall be provided. The fire water system shall comprise of fire water piping network, pumps, hydrants/LV with necessary electrics and instrumentation. To ensure availability of firewater at designed pressure, electric motor driven fire fighting pump and diesel engine driven pump (standby) sets will be provided. The fire fighting network will be kept charged through two nos. of jockey pumps.

Category of hazard - ordinary (as per TAC)

Yard hydrants - at 45 m intervals

Internal hydrants - at 30 m intervals

Min pressure at remotest hydrant - 3.5 kg/cm^2

2 nos. of 30 m long hose shall be provided along with fittings for each yard hydrant.

2 nos. of 15 m long hose shall be provided along with fittings for each internal hydrant

- a) Electric Driven Fire water Pumps for pump house 1
Nos. of pumps: 2 no.
Capacity: $273 \text{ m}^3/\text{h}$
Head: 8.8 bar
Type: Centrifugal pumps
- b) Diesel Driven Fire water Pumps for pump house 1
Nos. of pumps: 2 no.
Capacity: $273 \text{ m}^3/\text{h}$
Head: 8.8 bar
Type: Centrifugal pumps
- c) Jockey Fire water Compensation pumps
Nos. of pumps: 2 no.
Capacity: $20 \text{ m}^3/\text{h}$
Head: 8.8 bar
Type: Centrifugal pumps
- d) Storage tank
Capacity- 1092 m^3

-
- Type- RCC
Nos. -1 (Two compartment)
- e) Pipe, valves – Lots
- f) Electric Driven Fire water Pumps for pump house 2
Nos. of pumps: 2 no.
Capacity: 273 m³/h
Head: 8.8 bar
Type: Centrifugal pumps
- g) Diesel Driven Fire water Pumps for pump house 1
Nos. of pumps: 2 no.
Capacity: 273 m³/h
Head: 8.8 bar
Type: Centrifugal pumps
- h) Jockey Fire water Compensation pumps
Nos. of pumps: 2 no.
Capacity: 20 m³/h
Head: 8.8 bar
Type: Centrifugal pumps
- i) Electric Driven Fire water Pumps for pump house 2
Nos. of pumps: 1 no.
Capacity: 171 m³/h
Head: 8.8 bar
Type: Centrifugal pumps
- j) Diesel Driven Fire water Pumps for pump house 1
Nos. of pumps: 1 no.
Capacity: 171 m³/h
Head: 8.8 bar
Type: Centrifugal pumps
- k) Jockey Fire water Compensation pumps
Nos. of pumps: 2 no.
Capacity: 10.8 m³/h
Head: 8.8 bar
Type: Centrifugal pumps
- k) Storage tank
Capacity- 1092m³
Type- RCC
Nos. -1 (Two compartment)
l) Pipe, valves - Lots
-

3.7 Conclusion

Disaster Management Plan provides an institutional mechanism for a quick and co-ordinate response for preventing disasters and also for initiating appropriate response activities, in case of an event of a disaster.

From the foregoing studies it is clear that the plant area is not prone to cyclone, storms and Tsunami. However, considering the disaster history of the area and any eventuality, the plant is designed to withstand the above mentioned calamities without causing much damage to the plant and plant personnel as well as the surroundings.

The mitigation measures described in various chapters of this documents, if taken in proper methodology will ensure minimum loss to life and property.

The members of the disaster management team are expected to initiate action on their own as per the procedure in the event of a disaster or a threat of a disaster. But they are certainly expected to keep the chief controller, Dy. Commissioner and emergency operation centers informed of the actions being taken by them and act promptly as per the directions received from them. In a disastrous situation, a quick rescue and relief mission is essential, so that, the ensuing damage can be minimized to a considerable extent, if adequate preparedness levels are achieved. Indeed, it has been noticed in the past, that as and when attention has been paid to adequate preparedness measures, the loss to life and property has been considerably reduced. Thus, HAL shall organize series of awareness campaigns and skill trainings at all levels and shall ensure a “**Disaster Resilient HAL**”.

The Disaster Management Plan envisaged for the proposed HAL new helicopter factory coming at Bidrehalli kaval Gubbi Tumakuru is adequate to meet any eventualities.

4. CONCLUSION

- Economy of the study area is dominated by agriculture. However, the proposed project is not going to cause any damage to the existing rural agrarian economy of the study area, instead it may help agriculture by way of providing supplementary income which may attract increased investment in agriculture and consequently, agricultural production
- Employment opportunities-The proposed project will bring about 1014 no. of direct employment which will progressively reach 4000. In addition, it is expected that around 500 nos. of job opportunities will get created indirectly due to this project. However, this numbers will be reached over a period of time as per the progress of project. During the construction phase alone, about 1000 laborers will be employed for construction work

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- Infrastructure facilities-Improving the existing infrastructure of neighboring schools/colleges, development of basic infrastructure such as hospitals and roads, involvement of ancillary industries for machining/fabrication jobs etc. are expected due to the project. The project is likely to speed-up the growing realization on importance of education among the people of the study area
 - Peoples' perception regarding the project, in general, is favorable specifically, due to the advantages of employment opportunity, business development and improvement in education etc. However, some people are fearful about pollution and increasing of traffic movement
 - Detailed DMP would be sufficient to meet any untoward incidents and exigencies
 - The heat generation of 4 W/m^2 due to fire on storage of inflammable fuels is confined within 18m
