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1 RISK ASSESSMENT

1.1 INTRODUCTION

Mining are associated with several hazards that pose impacts on employees & surrounding area necessitating adequate implementation of Safety and health measures. Hence, Limestone mine safety is one of the most essential aspects for associated people. M/s. Smt Savita Chauhan. has proposed for extraction of limestone located at Mauza Shamah Pamta, Tehsil- Paonta Sahib, District- Sirmaur, State-Himachal Pradesh is highly vulnerable to multihazards viz. earthquake, landslides, flash-floods, Dam Burst, lightening, road accidents, etc.

Risk assessment is essential for prevention of accidents and there is a need to be aware about the risk of an accident and steps can be taken to prevent the same before its happening.

Therefore, risk assessment and disaster management plan is essential for the proposed project for prevention & mitigation of hazards. A systematic model for risk analysis is shown below in **Figure** given below-

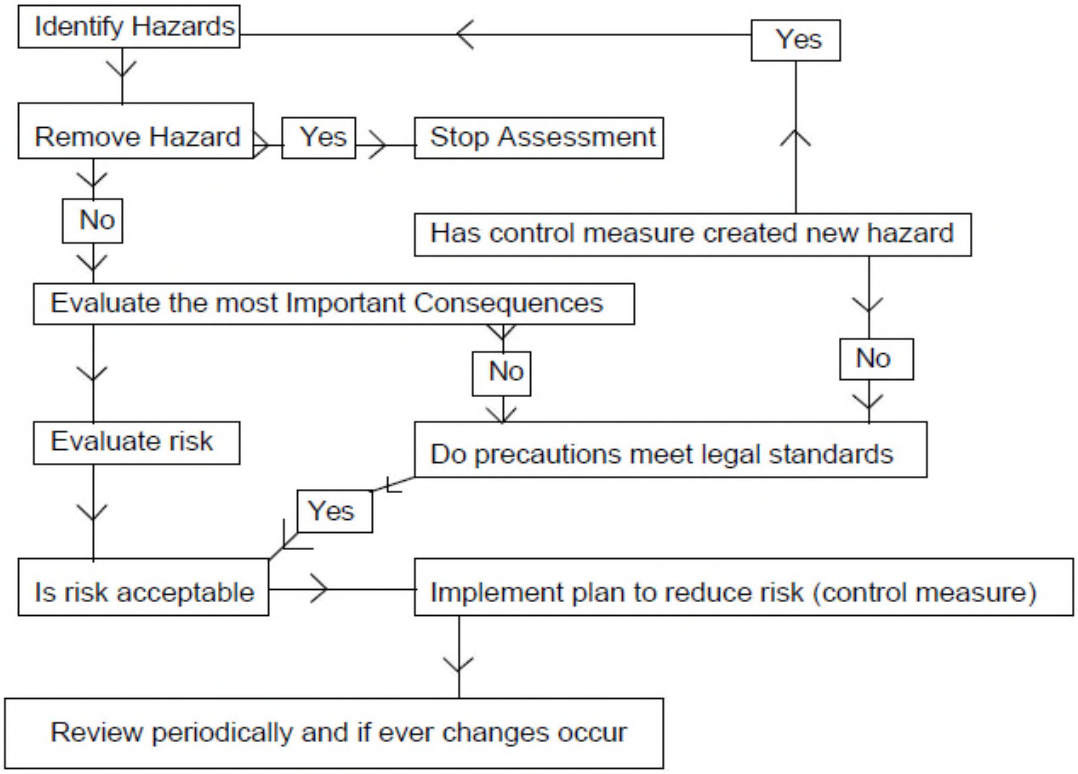

Figure 1: Model for Risk Assessment

Following steps of the risk assessment for Limestone mining are involved-

- Identify the hazard
- Identify activity involves in risk

- Removal of the hazard
- Evaluation of the risk
- Decide on control measures
- Record of the assessment
- Review

1.2 RISK ANALYSIS

Risk Assessment is all about prevention of accidents and to take necessary steps to prevent it from happening. The possible risks in the case of limestone mining project following natural/industrial problems which may be countered during the mining operation are given below:

- Possibility of earthquake as mine lease lies in Seismic Zone-IV (As per 1893:2002).
- Accident due to blasting.
- Accident due to storage of explosive materials.
- Accident due to movement of vehicles.
- Occupational injuries.
- Fires on large surface vehicles through ignition of fuel/hydraulic fluids.

Keeping the above points of high risk accidents like subsidence blasting etc. In consideration, all the statutory precautions will be taken for quick evacuation. Hence, safety of the mine and employees will be taken care of by the mining rules & regulations, which are well defined with laid down procedure for safety.

1.2.1 Risks Involved Due to Explosive Storage and Handling:

The risks involved in storage of explosives and its handling are:

Accidental explosion due to adopting unsafe practices; and Poor blasting parameters leading to excessive ground vibrations, noise, air blast and fly rock during blasting.

- ✓ **Accidental Explosion Due to Adopting Unsafe Practices:**

All activities involving storage, handling and transportation will be in accordance with the

rules made under the Indian Explosive Act and conducted with proper licences and approval from concerned authorities. All blasting operations will be performed by competent persons taking adequate precautions to make the operation totally safe. A detailed code of procedures for storage, handling and use of explosives will be prepared and strictly followed. All the employees will be trained and made conscious of adopting safe practices as per the safety policy and procedures laid down by the company.

- ✓ **Poor Blasting Parameters Leading to Excessive Ground Vibrations, Noise, Air Blast and Fly Rock During Blasting**

The frequency of blasting will be optimized by conducting blasting once a week and also adopting multi-row blasting using delay detonators. The blasting pattern, stemming column, charge per hole, etc. will be designed so as to control the fly rock and the ground vibrations. Non-electric shock tube initiation systems will be deployed to enhance safety of operations, better blasting control and reduce noise due to air blast. Depending on the actual experience once the excavation commences, blasting parameters can be changed suitably to adhere to strict safety measures.

1.3 PREVENTIVE/CORRECTIVE MEASURES

Measures for Earthquake

Proper training will be given to the labours for earthquake and the area will be evacuated as soon as there is any news or signal for earthquake.

Preventive and Corrective Measures for Accidents Due To Excavation of Limestone

The mining will be done open cost semi-mechanized method having bench wise mining. The bench height will be 6 m and width 8 m and slope would be 70^0. Hence, the chance of failure is negligible.

Preventive and Corrective Measures for Accidents Due To Blasting

Proper trained person is appointed for the blasting purposes. There is the fix time for blasting so during blasting, it has informed to all working personnel working in the mine. The competent person has been appointed for the blasting purposes.

Preventive and Corrective Measures for Accidents Due To Explosive Storage

The explosive would be stored as per "THE EXPLOSIVES RULES, 2008". The explosive storage & handling would be done by competent person having adequate experience.

Preventive and Corrective Measures for Accidents Due To Trucks & Dumpers

- All transportation within mine lease should be carried out directly under the supervision and control of the management.
- The vehicles will be maintained in good condition and checked thoroughly at least once a month by the competent person authorized for the purpose by the management.
- Road signs will be provided at each and every turning point up to the main road.
- A statutory provision of the fences, constant education, training etc. will go a long way in reducing the incidents of such accidents.

Preventive and Corrective Measures for Occupational Injuries

- Training will be given to the workers on how to use hand equipments.
- First aid will be provided on-site only if any accident occurs.
- In-case of poor condition of any equipment, it will be changed immediately.

Preventive and Corrective Measures for Fires on large surface vehicles through ignition of fuel/hydraulic fluids

- Availability of fire extinguishers on-site throughout the operational phase of mine
- Maintenance of vehicles on monthly basis.

2 DISASTER MANAGEMENT PLAN

2.1 INTRODUCTION

The objective of disaster management plan is to localize a disaster and to the maximum extent possible contain it to minimize the impact on life, the environment and property. The disaster management plan may be broadly divided into following steps as given in **Figure** below-

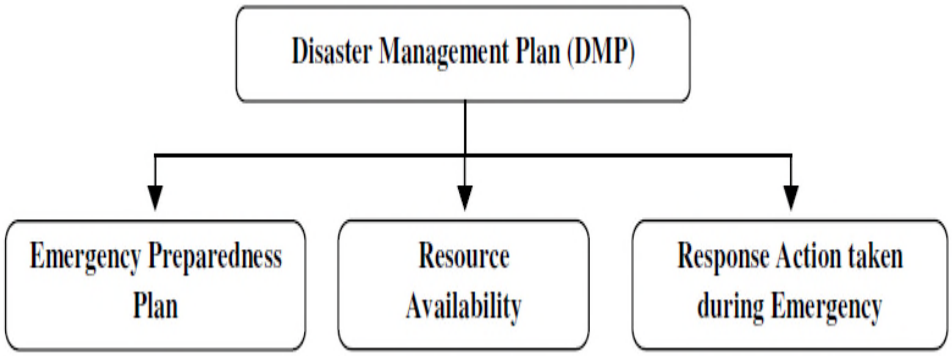

Figure 2: Steps for DMP

2.2 TYPES OF EMERGENCIES

The type of emergency primarily considered here is the major emergency which may be defined as one which has the potential to cause serious danger to persons and/or damage to property and which tends to cause disruption inside and/or outside the site and may require the co-operation of outside agencies.

An emergency in the limestone mine site can arise due to certain undesired incidents as landslides, earthquake etc.

2.2.1 Definition of On-Site Emergency and Off-site Emergency

An On-site emergency is one where the consequences of an undesired incident remain confined within the mine site. Emergencies at the mine site shall be On-Site Emergencies if the consequences remain confined within the premises of mine site.

An emergency, which is likely to develop or has developed such as to pose a threat to members of public outside the mine site, is termed as an off-site emergency.

2.2.2 Classification of Emergencies

Emergencies have been broadly classified into three levels:

Level 1 : The incident at mine site is confined to a small area and does not pose an immediate threat to life or property.

Level 2 : An incident at mine site involving a greater hazard or larger area which poses a potential threat to life or property.

Level 3 : An incident at mine site involving a severe hazard or a large area which poses an extreme threat to life or property.

2.2.3 Priority in Emergency Handling

The general order of priority for involving measures during the course of emergency would be as follows:

- Safeguard life
- Safeguard environment
- Safeguard property

2.3 SPECIFIC OBJECTIVES OF THE DISASTER MANAGEMENT PLAN

A formal planning for managing disasters is therefore necessary to ensure reduction in times of occurrence of any disaster or on its result. This can only be achieved through:

- Pre-planning a proper sequence of response actions.
- Allocation of responsibilities to the participating agencies.
- Effective management of resources.
- To incorporate the disaster resistant features of national building code and earthquake resistant codes of Bureau of Indian Standards.
- To ascertain the status of existing resources and facilities available with the various agencies involved in disaster management.
- To assess their adequacies and short falls if any in providing a meaningful disaster response.
- Monitoring & evaluation of actions taken during disasters and providing relief.
- Minimize damage to property and the environment.
- Initially contain and ultimately bring the incident under control.
- Identify casualties.
- Provide authoritative and factual information for the news media.

The main objectives of the Disaster Management Plan would be:

- Ensure that loss of life and injuries to persons are minimized.
- Damage to environment is minimized.
- Property loss is minimized.
- Relief and rehabilitation measures are effective and prompt.
- Minimize the outage duration of the facilities.

2.4 STRUCTURE OF THE DISASTER MANAGEMENT PLAN

This Disaster management plan basically comprises of the following elements:

- Outline of Disaster Management Plan
- System of Communication

- Consultative Committee
- Facilities and Accommodation
- First Aid & Medical facilities
- Transport Services
- Functions of Public Relations/Responsibility of Mine Management

2.4.1 Outline of Disaster Management Plan

The purpose of disaster management plan is to restore the normalcy for early resumption of mining operation due to an unexpected, sudden occurrence resulting to abnormalities in the course of mining activity leading to a serious danger to workers or any machinery or the environment. The following factors will play major role in the management strategy.

2.4.2 System of Communication

Where is an internal communication system for the department head and to their line of command with telephone. The telephone numbers and addresses of adjoining mines, rescue station, police station, fire service station, local hospital, electricity supply agency and standing consultative committee members are also maintained for any emergency requirement.

2.4.3 Consultative Committee

A standing consultative committee will be formed under the head of mines manager. The members consists of safety officer/medical officer/Asst. manager/public relation officer/Foreman and environmental engineer.

2.4.4 Facilities & Accommodation

Accommodation and facilities for medical centre, rescue room and for various working groups will be provided.

2.4.5 First Aid & medical facilities

The mine management will have first aid/medical centre for use in emergency situation. All casualties would be registered and will be given first aid. The centre will have facilities for first aid & minor treatment, ambulance and transport. It will have proper telephone/wireless set for quick communication with hospitals where the complicated cases are to be sent.

2.4.6 Transport services

A well defined transport control system will be provided to deal with the situation.

2.4.7 Functions of Public Relations/Responsibility of Mine Management

- To make a cordial relation with government officials and other social service organization and working groups.
- To liaise with representatives of the mine to ameliorate the situation of panic, tension, sentiments, grievances and misgivings created by any disaster.

- To ameliorate the injured, survivors and family members of affected persons by providing material, moral support and establishing contact with relatives of victims.

2.5 OFF-SITE EMERGENCY PLAN

Off-site emergency plan defining the various steps to tackle any off-site emergencies which may affect surrounding areas of the project has to be prepared after due final discussion with local panchayat and revenue officials. As per this plan, actions have to be promptly initiated to deal with any off-site disastrous situation, with help of collector and other officials.

3 OUTLINE OF DISASTER MANAGEMENT PLAN

3.1 INTRODUCTION

The district Sirmour is affected by natural disaster like floods, earthquake, landslides etc. as the state falls in the highest seismic risk zones of the country i.e. Zone IV.
The hazard which however, poses biggest threat to the State is the earthquake hazard. The disasters like floods, earthquake, landslides etc have caused immense loss of property, natural wealth, and human lives.

3.2 EARTHQUAKES

An earthquake is a phenomenon that occurs without warning and involves violent shaking of the ground and everything over it. It results from the release of accumulated stress of the moving lithospheric or crustal plates. The earth's crust is divided into seven major plates, that are about 50 miles thick, which move slowly and continuously over the earth's interior and several minor plates. Earthquakes are tectonic in origin; that is the moving plates are responsible for the occurrence of violent shakes. The occurrence of an earthquake in a populated area may cause numerous casualties and injuries as well as extensive damage to property.

The seismic zone map of India and Himachal Pradesh is given in **Figure-3** & **Figure-4** respectively.

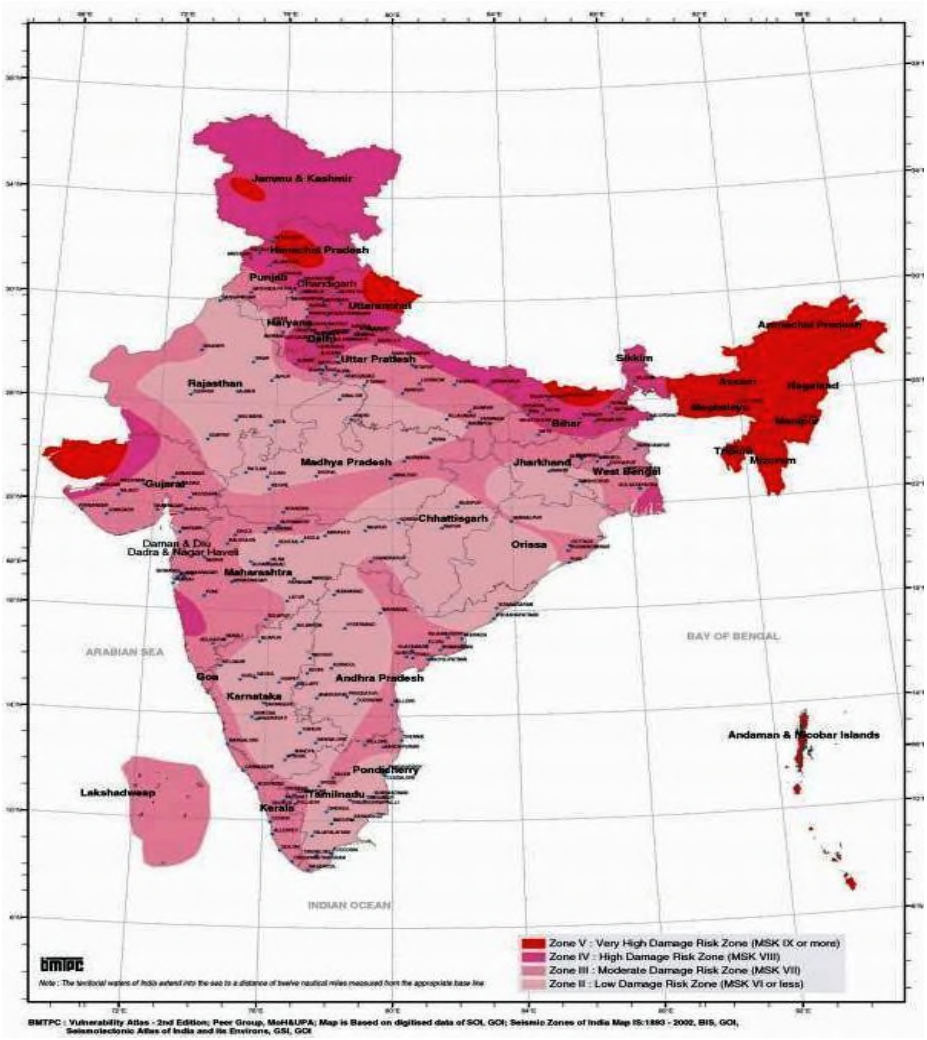

Figure 3: Seismic Zone Map of India (IS : 1893, 2002)

Source: NDMA

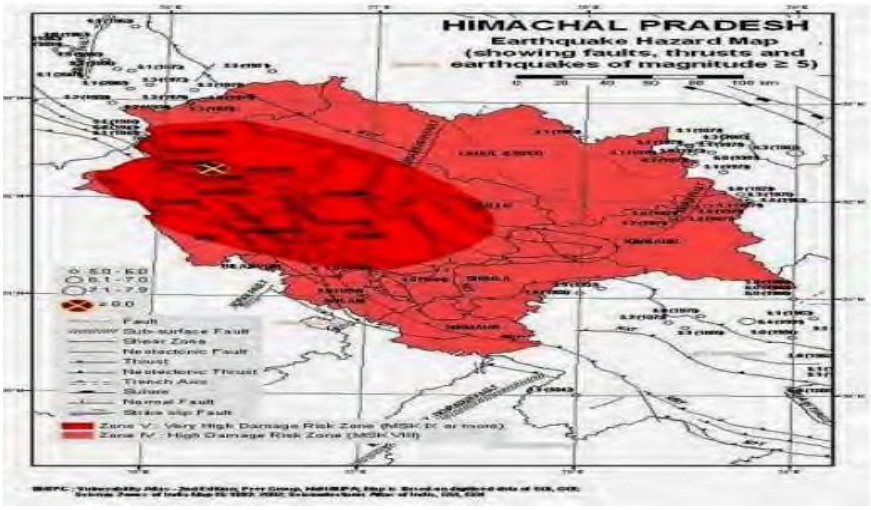

Figure 4: Earthquake Hazard Map of Himachal Pradesh

Source: NDMA

3.2.1 What to Do Before an Earthquake

- Repair deep plaster cracks in ceilings and foundations. Get expert advice if there are signs of structural defects.
- Anchor overhead lighting fixtures to the ceiling.
- Follow BIS codes relevant to your area for building standards
- Fasten shelves securely to walls.
- Place large or heavy objects on lower shelves.
- Store breakable items such as bottled foods, glass, and china in low, closed cabinets with latches.
- Hang heavy items such as pictures and mirrors away from beds, settees, and anywhere that people sit.
- Brace overhead light and fan fixtures.
- Repair defective electrical wiring and leaky gas connections. These are potential fire risks.
- Secure water heaters, LPG cylinders etc., by strapping them to the walls or bolting to the floor.
- Store weed killers, pesticides, and flammable products securely in closed cabinets with latches and on bottom shelves.
- Identify safe places indoors and outdoors.
- Under strong dining table, bed
- Against an inside wall
- Away from where glass could shatter around windows, mirrors, pictures, or where heavy bookcases or other heavy furniture could fall over
- In the open, away from buildings, trees, telephone and electrical lines, flyovers and bridges
- Know emergency telephone numbers (such as those of doctors, hospitals, the police, etc)
- Educate yourself and family members
- Awareness Generation Resources for Earthquake Diasaster Management
- Disaster(Earthquake) Resistant Construction Practice
- Techno Legal Regime for Safe Construction Practice (Model Amendment in Town & Country Planning Legislations, Regulation for Land Use Zoning and Building Byelaws for Structural Safety)
- Past Programmes/Projects, Resource Materials on Earthquake Risk Management.

3.2.2 Have a disaster emergency kit ready

- Battery operated torch with extra batteries
- Battery operated radio
- First aid kit and manual
- Emergency food (dry items) and water (packed and sealed)
- Candles and matches in a waterproof container
- Knife
- Chlorine tablets or powdered water purifiers
- Can opener.
- Essential medicines
- Cash and credit cards

- Thick ropes and cords
- Sturdy shoes

3.2.3 Develop an emergency communication plan

- In case family members are separated from one another during an earthquake (a real possibility during the day when adults are at work and children are at school), develop a plan for reuniting after the disaster.
- Ask an out-of-state relative or friend to serve as the 'family contact' after the disaster; it is often easier to call long distance. Make sure everyone in the family knows the name, address, and phone number of the contact person.

3.2.4 Help your community get ready

- Publish a special section in your local newspaper with emergency information on earthquakes. Localize the information by printing the phone numbers of local emergency services offices and hospitals.
- Conduct week-long series on locating hazards in the home.
- Work with local emergency services and officials to prepare special reports for people with mobility impairment on what to do during an earthquake.
- Provide tips on conducting earthquake drills in the home.
- Interview representatives of the gas, electric, and water companies about shutting off utilities.
- Work together in your community to apply your knowledge to building codes, retrofitting programmes, hazard hunts, and neighborhood and family emergency plans.

3.2.5 What to Do During an Earthquake

Stay as safe as possible during an earthquake. Be aware that some earthquakes are actually foreshocks and a larger earthquake might occur. Minimize your movements to a few steps that reach a nearby safe place and stay indoors until the shaking has stopped and you are sure exiting is safe.

3.2.6 If indoors

- DROP to the ground; take COVER by getting under a sturdy table or other piece of furniture; and HOLD ON until the shaking stops. If there is no a table or desk near you, cover your face and head with your arms and crouch in an inside corner of the building.
- Protect yourself by staying under the lintel of an inner door, in the corner of a room, under a table or even under a bed.
- Stay away from glass, windows, outside doors and walls, and anything that could fall, (such as lighting fixtures or furniture).
- Stay in bed if you are there when the earthquake strikes. Hold on and protect your head with a pillow, unless you are under a heavy light fixture that could fall. In that case, move to the nearest safe place.
- Use a doorway for shelter only if it is in close proximity to you and if you know it is a strongly supported, load bearing doorway.

- Stay inside until the shaking stops and it is safe to go outside. Research has shown that most injuries occur when people inside buildings attempt to move to a different location inside the building or try to leave.
- Be aware that the electricity may go out or the sprinkler systems or fire alarms may turn on.

3.2.7 If outdoors

- Do not move from where you are. However, move away from buildings, trees, streetlights, and utility wires.
- If you are in open space, stay there until the shaking stops. The greatest danger exists directly outside buildings; at exits; and alongside exterior walls. Most earthquake-related casualties result from collapsing walls, flying glass, and falling objects.

3.2.8 If in a moving vehicle

- Stop as quickly as safety permits and stay in the vehicle. Avoid stopping near or under buildings, trees, overpasses, and utility wires.
- Proceed cautiously once the earthquake has stopped. Avoid roads, bridges, or ramps that might have been damaged by the earthquake.

3.2.9 If trapped under debris

- Do not light a match.
- Do not move about or kick up dust.
- Cover your mouth with a handkerchief or clothing.
- Tap on a pipe or wall so rescuers can locate you. Use a whistle if one is available. Shout only as a last resort. Shouting can cause you to inhale dangerous amounts of dust.

3.2.10 What to Do After an Earthquake?

3.2.10.1 DO'S

- If any damage is suspected, turn the system off from the main valve or, switch.
- Clean up household chemical spills, toxic and flammable materials to avoid any chain of unwanted events.
- Gather information and necessary instructions from battery operated radios.
- Obey Public safety precautions.
- Leave a message stating where you are going if you must evacuate your residence.
- Take your earthquake survival kit with you.
- It should contain all necessary items for your protection and comfort.
- Check your water and electrical lines for defects.

3.2.10.2 DON'T s

- Do not fill the overhead tank completely.
- Do not carry out haphazard repairs.
- Repairs should be done only under the supervision of a structural engineer.
- Do not put additional supports without the guidance of an experienced/qualified structural engineer.
- Do not use the lift until it has been checked and certified by thelift company.

3.2.11 Action Plan

The main features to be included in the plan are:

i. Training of trainers in professional and technical institutions.

ii. Launching demonstration projects to disseminate earthquake-resistant techniques.

iii. Launching public awareness campaigns on seismic safety and risk reduction and sensitising all stakeholders to earthquake mitigation.

iv. Developing an inventory of the existing built environment.

v. Preparing community and village level DM plans, with specific reference to management of earthquakes.

vi. Carrying out the vulnerability assessment of earthquake-prone areas and creating an inventory of resources for effective response.

vii. Operationalising the local companies of Home Guards and IRBs/Police for disaster response.

viii. Strengthening the medical preparedness for effective earthquake response, etc.

3.3 LANDSLIDES

The hills and mountains of District Sirmour are liable to suffer landslides during monsoons and also in high intensity earthquake.

The map showing the landslide zone of India and Sirmour district is given in **Figure-5** & **Figure-6**.

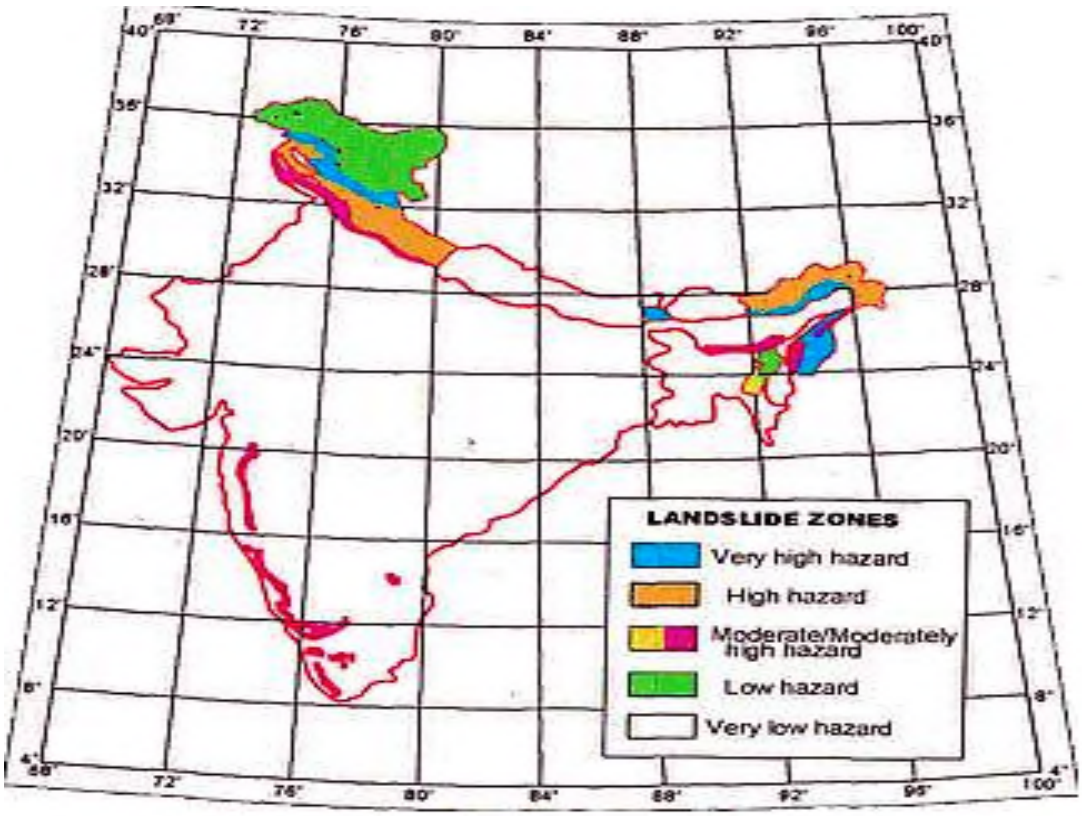

Figure 5: Map Showing Landslide Zone of India

Source: NDMA

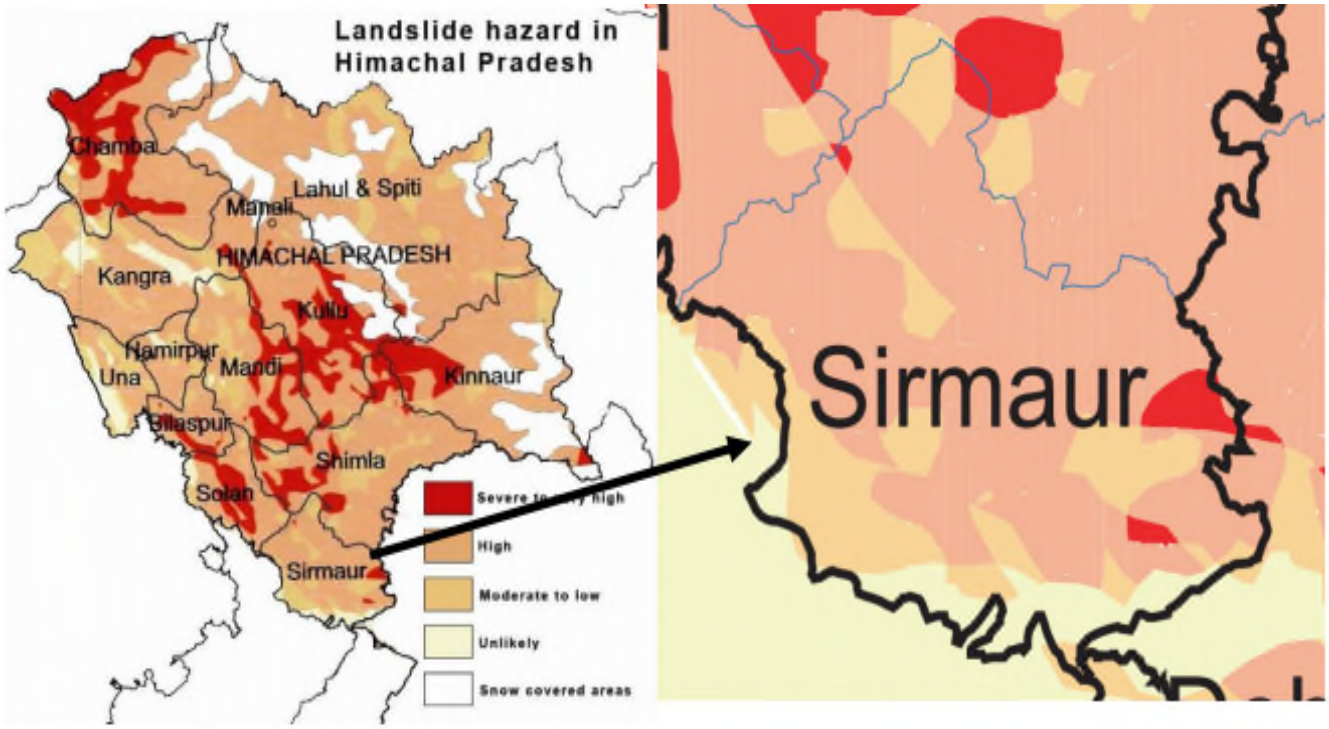

Figure 6: Map Showing Landslide Zone of Sirmour District

Source: HPSirmour DDMP

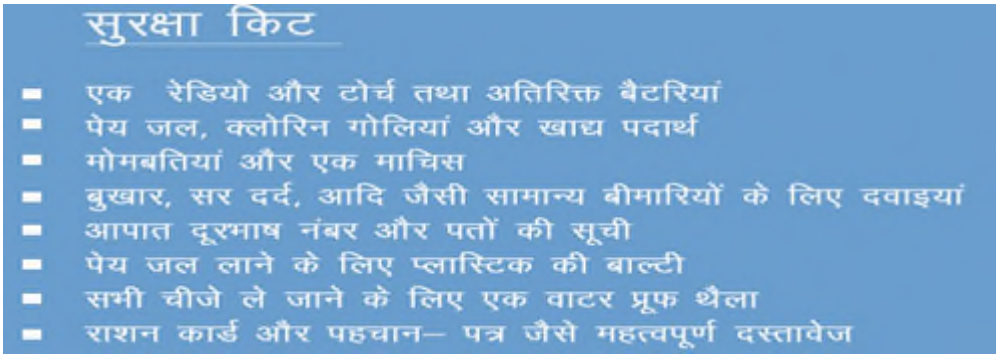

Figure 7: Emergency Kit

Source: NDMA

3.3.1 Do's

- Prepare tour to hilly region according to information given by weather department or news channel.
- Move away from landslide path or downstream valleys quickly without wasting time.
- Keep drains clean,
- Inspect drains for - litter, leaves, plastic bags, rubble etc.
- Keep the weep holes open.
- Grow more trees that can hold the soil through roots,
- Identify areas of rock fall and subsidence of buildings, cracks that indicate landslides and move to safer areas. Even muddy river waters indicate landslides upstream.
- Notice such signals and contact the nearest Tehsil or District Head Quarters.
- Ensure that toe of slope is not cut, remains protected, don't uproot trees unless re-vegetation is planned.
- Listen for unusual sounds such as trees cracking or boulders knocking together.
- Stay alert, awake and active (3A's) during the impact or probability of impact.
- Locate and go to shelters,
- Try to stay with your family and companions.
- Check for injured and trapped persons.
- Mark path of tracking so that you can't be lost in middle of the forest.
- Know how to give signs or how to communicate during emergency time to flying helicopters and rescue team.

3.3.2 Don'ts

- Try to avoid construction and staying in vulnerable areas.
- Do not panic and loose energy by crying.
- Do not touch or walk over loose material and electrical wiring or pole.
- Do not built houses near steep slopes and near drainage path.
- Do not drink contaminated water directly from rivers, springs, wells but rain water if collected directly without is fine.
- Do not move an injured person without rendering first aid unless the casualty is in immediate danger.

3.3.3 Action Plan:

The main features to be included in the plan are:

i. Wide dissemination of model land use practices in hilly areas.
ii. Training of trainers in professional and technical institutions.
iii. Training of professionals like engineers and geologists for landslide mapping, investigation techniques, analysis, and observational practices.
iv. Establishing appropriate mechanisms for compliance reviews of all land use bye-laws in hilly areas.
v. Preparing an inventory of existing landslides, active or inactive, in the area.
vi. Developing an inventory of the existing built environment in areas around existing landslides and in high hazard zones as per the LHZ maps.
vii. Assessing the status of risk and vulnerability of the existing built environment.
viii. Strengthening the EOC and communication network.

4 EMERGENCY SYSTEM OF COMMUNICATION

4.1 EMERGENCY ORGANIZATION & RESPONSIBILITIES

In case of an emergency at Mine site, the On-site Emergency Plan will come into action.

Effective emergency plan requires that, in the event of an accident, nominated functionaries to be given specific responsibilities, often separate from their day-to-day activities.

Emergency control organization has been designed by identifying the safe transition from normal condition to emergency condition. For this purpose an emergency response organization with appropriate lines of authority with succession planning and actuating the response management has been formed.

4.1.1 Emergency Organization

Overall objectives of the emergency control organization are as follows:

- To promptly control problems as they develop at the scene.
- To prevent or limit the impact on other areas and offsite.
- To provide emergency personnel, selecting them for duties compatible with their normal work functions wherever feasible.

The organizational chart is given with contact detail as follows in **Figure** given below.

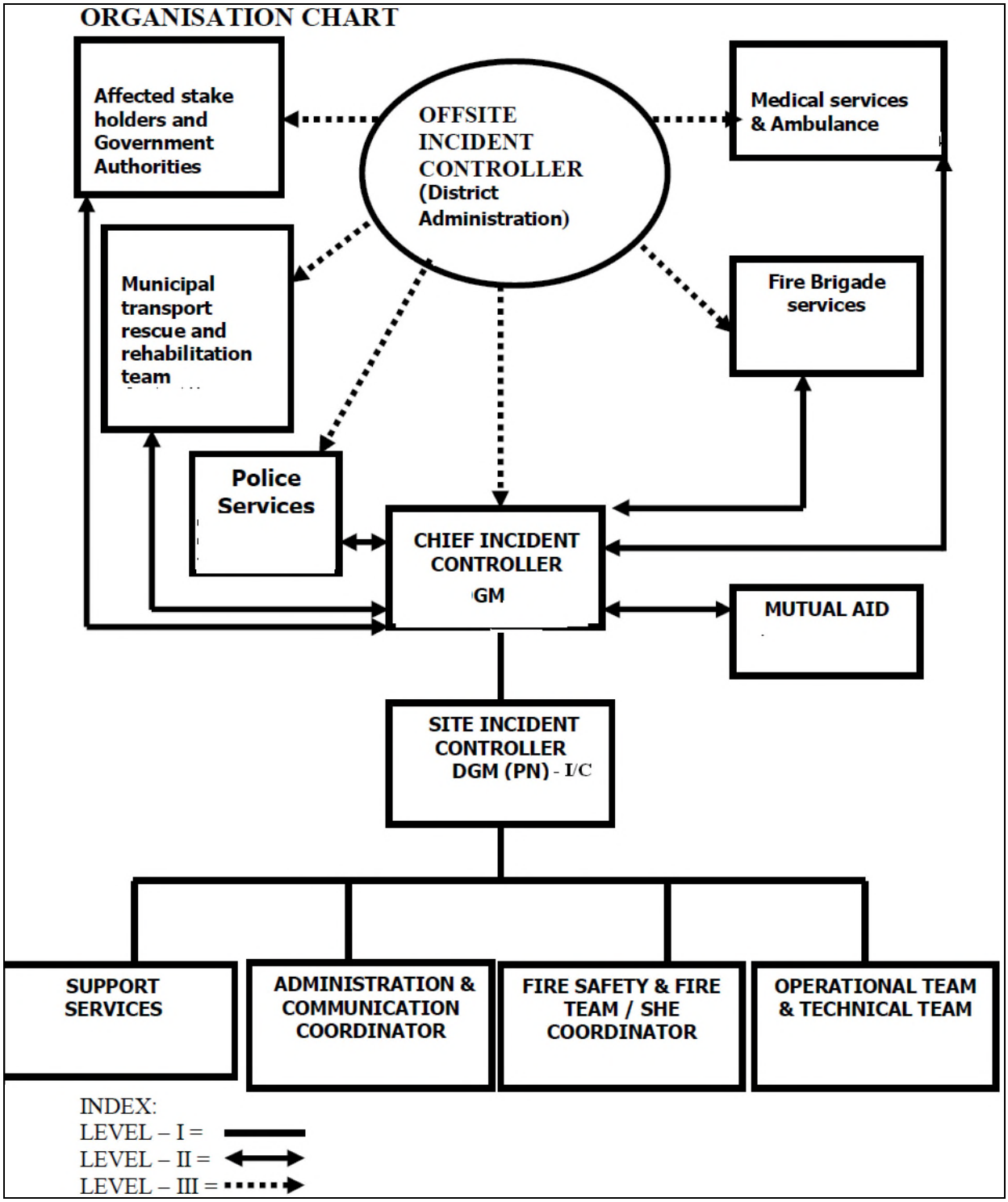

Figure 8: Organization Chart with Contact Details of On-site and Off-site personnel

4.2 DISASTER AWARENESS

4.2.1 Public Awareness System

The safety measures to be taken in the event of an emergency shall be made, known to the general public who are likely to be affected.

For disclosure of information to the public of the mine site they are briefed about our preparedness and measures taken to face any disaster situation. They are also explained about the Disaster Warning Signals and measures to be taken in case of any disaster in the location and any possible emergency.

Or disclosure of the information, particularly during the disaster situation, the Public announcements are being done by Communication Department. To avoid any panic, it is been considered that the necessary announcement will be made for working personnel on-site/off-site of mine lease area and nearby villagers too.

4.2.2 The use of Electronic Media

For bringing the awareness among the external public at large, the use of electronic media like TV, Air & Press coverage is used. The Welfare & Media co-ordinator prepares the Press release to the issued for the local press & other important dailies.

5 EMERGENCY RESPONSE PROCEDURES

5.1 BACKGROUND

Disaster management committee plays a crucial role during emergency in systematic and proper way. In addition, the implementation of an Emergency Response Plan relies on a number of response functions, which deals with different aspects given as follows-

- Communication and co-ordination
- Medical Services
- Security
- Administration (Logistics and Welfare)
- Co-ordination with external agencies

5.2 EMERGENCY CONTROL CENTRE

The Emergency Control Centre (ECC) is established for emergency operations are directed and co-ordinated. The ECC will be activated as soon as emergency is declared. During emergency all emergency staff will gather in ECC.

The ECC staff is as follows-

- Site Main Controller (SMC)
- Assistant to SMC
- Telephone Attendant
- Messengers
- Key Personnel & Team (Monitoring & Warning Committee Manager, Incident controller & Rescue Team Manager, Relief Team) as per the Disaster Management Committee.

5.2.1 Emergency Control Centre's planning during disaster

The ECC will always be ready for operation and provided with the equipment and supplies necessary during the emergency, which is given as-

- Rescue Tubes & Rescue Cans
- Rescue Ring Buoys
- Dive Bricks & Dive Rings
- Swim Safety Buoys & Pool

- Lifelines
- Spin boards & Head
- Immobilizers
- First Aid Kit

Except all of these facilities, ECC will have its own lightning facility during emergency.