

7 ADDITIONAL STUDIES

7.0 PUBLIC CONSULTATION

The proposed project is required to obtain Environment Clearance as this project is covered under amended EIA Notification dated 14th September 2006, of the Ministry of Environment, Forests & Climate Change, Government of India, New Delhi.

The details and proceedings of public hearing have been incorporated in the **Annexure-13**.

7.1 RISK ANALYSIS & DISASTER MANAGEMENT PLAN (RA-DMP)

7.1.1 BACKGROUND

The methodology for the risk assessment has been based on the specific risk assessment guidance issued by the Directorate General of Mine Safety (DGMS), Dhanbad, vide Circular No.13 of 2002, dated 31st December, 2002. The DGMS risk assessment process is intended to identify existing and probable hazards in the work environment and all operations, and assess the risk levels of those hazards in order to prioritize those that need immediate attention. Further, mechanisms responsible for these hazards are identified and their control measures, set to timetable are recorded along with pinpointed responsibilities.

In the unlikely event that a consequence has occurred, disaster management kicks in this includes instituting procedures pertaining to a number of issues such as communication, rescue, and rehabilitation. These are addressed in the disaster management plan.

Both, the RA and DMP, are living documents and need to be updated whenever there are changes in operations, equipment, or procedures. Assessment is all about preventing accidents and taking necessary steps to prevent it from happening.

7.1.2 KEY DEFINITIONS

Hazard: Source of potential harm, injury, or loss.

Consequence: Size of the loss or damage. In terms of health and safety, it is the degree of harm that could be caused to people exposed to the hazard, the potential severity of injuries or ill health and / or the number of people who could be potentially affected. Consequence of a hazard need not only be in terms of safety criteria but could also be in terms of a money loss, incurred costs, loss of production, environmental impacts as well as public outrage.

Risk: Combination of the likelihood of a specific unwanted event and the potential consequences if it should occur.

Risk Assessment: Is a process that involves measurement of risk to determine priorities and to enable identification of appropriate level of risk treatment (used also to describe the overall process of risk management).

Risk Control: Implementation of strategies to prevent or control hazards

Risk Rating: The category, level, or risk assigned following risk assessment (e.g. High, Medium or Low).

Risk Management: Overall description of the steps taken to manage risk, by identifying hazards and implementing controls in the workplace.

Emergency: A situation of process deviation that, if uncontrolled, may lead to a major accident /disaster with potential short term and/or long term risk damage consequence to life and property in and/or around the workplace.

Disaster: A catastrophic consequence of a major emergency / accident that leads to not only extensive damage to life and property, but also disrupts all normal human activity for a significant period of time and requires a major national and / or international effort for rescue and rehabilitation of those affected.

7.1.3 SCOPE OF WORK FOR RA-DMP STUDY

The scope of work has been framed as per DGMS requirements for risk and safety studies in mines and includes the hazard identification, risk assessment, and ranking, resulting in treatment controls and action plans.

I. Level 1: Hazard Identification

Hazard identification includes:

✓ STUDY OF SAFETY ISSUES PERTAINING TO THE PROJECT

- Study of operational information, including safety concepts used in design of equipment and storages.
- Listing of hazardous inventory and identification of key hazardous substances to be used.

- Available procedures and the extent to which they are followed in operational mines by the same organization.
- Consultations with employees who carry out or are likely to carry out the jobs.
- Safety statistics for this and other mines, as applicable and available.
- Statutory mine inspection reports, where available.
- Past history of accidents and near misses.

The above are applicable to all the aspects of the mining activities including winning of minerals, crushing – sizing and transport.

✓ **IDENTIFICATION OF HAZARD SCENARIOS**

- Identification of scenarios that can cause damage to life & property.

II. Level 2: Risk Assessment & Ranking

✓ **RISK ASSESSMENT**

As defined earlier, risk is a function of likelihood and consequence. Likelihood is the chance that the hazard might occur. Since the risk of any hazard is dependent upon the chance that it will occur (likelihood) and the impact of an occurrence (consequence) therefore risk score will be:

Risk Score = Likelihood x Consequence

In some cases personnel are only exposed to the hazard for part of the time. Hence, a more detailed analysis of the risk ranking can be carried out by taking exposure (% time personnel are present) and probability (chance that they will be injured) into consideration.

Thus: **Risk Score = (Probability x Exposure) x Consequence**

The values used for likelihood, consequence, exposure or probability need to be agreed by the risk assessment team, and there is an element of professional judgment in exercising these choices.

✓ **RISK RANKING**

Risk ranking can be determined by qualitative and quantitative means. It should however be remembered that no one method is best. The best choice of method will depend on the circumstances and preferences at the mine, at the time the exercise is done. However, regardless of the method establishing risk ranking will set priorities for Hazard control. The most important purpose in hazard identification, risk assessment, and ranking is to draw up and implement plans to

control these hazards. However, keeping the acceptance of the participants during workshops conducted at different mines, DGMS has suggested a criteria table for quantitative risk ranking to be used as in **Table-7.1**:

Table7. 1: Risk Ranking Criteria

Scale for Consequence	Scale for Exposure	Scale for Probability
Several dead: 5	Continuous: 10	May well be expected: 10
One dead: 1	Frequent (daily): 5	Quite possible: 7
Significant fatality chance: 0.3	Seldom (Weekly): 3	Unusual but possible: 3
One permanent disability/ less chance of fatality: 0.1	Unusual (Monthly): 2.5	Only remotely possible: 2
Many lost time injuries: 0.01	Occasional (Yearly): 2	Conceivable but unlikely: 1
One lost time injury: 0.001	Once in 5 years: 1.5	Practically impossible: 0.5
Small injury: 0.0001	Once in 10 years: 0.5	Virtually impossible: 0.1
	Once in 100 years: 0.02	

On the basis of the above scoring format, and after a perusal of the resultant scores, professional judgment was exercised in selecting the following scale for assessing risk levels:

- Level 1: > 15; i.e., requiring immediate action
- Level 2: <15 but > 5; i.e., requiring management action
- Level 3: < 5; i.e., low risks requiring periodic review

III. Level 3: Treatment Controls & Action Plans

✓ TREATMENT CONTROLS

After examining the high priority risks, consideration is given to consider the potential to reduce or eliminate the risk by using the hierarchy of controls. This assists establishing methods to reduce the risk. From experience, the effectiveness of each method is given as a percentage after each of the control descriptions. The desirability of control plans (with reducing effectiveness) is given below:

- Elimination: Remove steps to eliminate the hazard completely.
- Substitution: Replace with less hazardous material, substance, or process.
- Separation: Isolate hazard from person by guarding, space, or time separation.
- Administration: Adjusting the time or conditions of risk exposures.
- Training: Improving skills making tasks less hazardous to persons involved.

- Personal protective equipment: Used as the last resort, appropriately designed and properly fitted equipment where other controls are not practicable.

Control measures can reduce either the likelihood or consequence of the event or both. Depending on the level of reduction of the hazard, there could still be a residual risk that needs to be monitored so that a secondary prevention process can be initiated when trigger points are reached.

✓ **ACTION PLANS**

The team should develop an action plan recommending actions, responsibilities and when it should be completed. These require to be put forward to the decision-making authority and get reviewed, if necessary before taking a decision to proceed.

IV. Level 4: Development of Disaster Management Plan

The suggested DMP has been organized in a Plan, Do, Check, Review (PDCR) cycle to enable effective implementation.

7.1.4 Hazard Identification

The proposed mining activities have been described in Chapter 2. The identification of hazards has been done considering these operations. The hazards have been covered under three broad activities that are part of the proposed surface mining operations: winning the mineral, transporting the mineral, and processing the mineral. While identifying the hazards, a consideration of issues discussed in Section 7.2.1 has been done. Hazard identifications under the three broad activities are discussed in subsequent paragraphs (with primary risk in brackets).

I. Hazards: Mineral Winning

a) Site Planning & Layout

- Travel in moving vehicles on uneven terrain (fall from height, hitting of head on vehicle body) for survey.

b) Laying Out of Site

- Moving vehicles on uneven terrain (fall from height, hitting of head on vehicle body)
- Operation of earthmoving equipment (fall from height, hitting of head on vehicle body)
- Blasting (hit by fly rock or exposure to overpressure)

c) Operations

TRANSPORT OF EXPLOSIVES

- Heavy impact during transport & handling (unintended explosion)

DRILLING OF HOLES

- Drilling holes for blasting will be done manually by using water hence generation of dust and noise dose not arise.
- Working near edge of bench and at height (fall from height)
- Dust generation during drilling operations (chronic or acute exposure)
- Drilling noise (chronic or acute exposure)
- Moving debris or projectiles (hit by fly rock)

CHARGING OF HOLES

- Unintended explosion or exposure (exposure to overpressure)

DETONATION

- Generation of noxious fumes (chronic or acute exposure)
- Noise (chronic or acute exposure)
- Fly rock (hit by fly rock)

MECHANIZED SIZING

- Generation of noise (chronic or acute exposure)
- Vibrations (chronic or acute exposure)
- Dust generation during crushing - sizing operations (chronic or acute exposure)
- Electrical Shock

LOADING

- Falling rock (hit by fly rock)
- Use of vehicle on uneven ground (fall from height, hitting of head on vehicle body)
- Fires involving fuel storages and transfer facilities (exposure to radiating heat)

GENERAL OPERATIONS: FACE STABILITY

- Working face in the mine will be quite stable and firm.
- Rock fall or slides (hit by rock)

INUNDATION DUE TO EXCESS WATER

- Flooding due to excessive rainfall (drowning)
- Area is located in very less rainfall prone area and hence this hazard possibility is less.
- However, in any event of excessive rainfall and storm water workers will be withdrawn from quarry area immediately.
- Flooding due to entry of storm water into working pit (drowning)

II. Hazards: Mineral Transport

- Vehicle roll over (impact on body)
- Vehicle collision (impact on body)
- Vehicle hitting pedestrians (impact on body of pedestrians)
- Vehicle related fires (burn injuries)
- Fuel related fires (exposure to radiating heat)
- Access & egress to cab (hitting of head on vehicle body)

7.1.5 RISK ASSESSMENT

On the basis of the discussions given in **Section-7.2**, a team comprising members amongst the project proponents, deliberated on the issues and carried out risk assessment for the subject mine, dwelling on the likely hazards faced by the site. The results of the risk assessment are given below in **Table-7.2**:

Table7. 2: Hazards Faced in Limestone Mining Operations

S.No.	Activity	Hazard Description (Risk)	Score				Risk Level
			Consequences	Exposure	Probability	Risk Score	

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1.	Site planning and layout	Travel in moving vehicle in uneven terrain	1	2	1	2	Level 3
2.	Storage of explosives	Unintended explosions (exposure to overpressure)	1	5	3	15	Level 1
3.	Charging of explosives	Unintended explosion or exposure (exposure to overpressure)	1	3	1	3	Level 3
4.	Blasting	Hit by fly rock (bodily injuries)	1	2	1	2	Level 3
5.	Bench Formation	Rock falls or slide due to lack of bench face stability (bodily injuries)	5	1.5	2	15	Level 1
6.	Crushing and sizing of ROM	Hit by Machineries – Electrical Equipment (bodily injuries)	1	3	3	9	Level 2
7.	Transportation of minerals	Vehicle Accident (bodily injuries)	5	5	2	50	Level 1
8.	Transportation of minerals	Accidental fire in vehicle (bodily injuries, exposure to heat radiation)	1	5	1	5	Level 3

By arranging the above hazards from highest to lowest, the hazards were re-arranged as per their risk levels. This is given in **Table-7.3:**

Table 7. 3: Hazards Ranked by Risk Level

S. No.	Activity	Hazard Description (Risk)	Risk Score	Risk Level
1.	Site planning and layout	Travel in moving vehicle in uneven terrain	2	Level 3
2.	Storage of explosives	Unintended explosions (exposure to overpressure)	15	Level 1
3.	Charging of explosives	Unintended explosion or Exposure (exposure to overpressure)	3	Level 3
4.	Blasting	Hit by fly rock (bodily injuries)	2	Level 3
5.	Bench Formation	Rock falls or slide due to lack of bench face stability(bodily injuries)	15	Level 1
6.	Crushing and sizing of	Hit by Machineries – Electrical Equipment	9	Level 2

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	ROM	(bodily injuries)		
7.	Transportation of minerals	Vehicle Accident (bodily injuries)	50	Level 1
8.	Transportation of minerals	Accidental fire in vehicle (bodily injuries, exposure to heat radiation)	5	Level 3

7.1.6 CONSEQUENCES OF MAXIMUM CREDIBLE LOSS SCENARIOS

Major consequences that can be modeled include:

- Explosion of material in the Main Magazine (6.5 METRIC TONS explosives), Service Magazine (0.9 explosives) and ANFO mixing shed (0.1 METRIC TONS explosives)
- Explosion of material being transported in explosives van (2.585 METRIC TONS explosives)

Consequences of the above scenarios were modeled using the software HAMS-GPS (originally developed based on funding by the MoEF&CC), which has a specific module on explosives (including ANFO based explosives). Outputs were as follows:

OUTPUTS

Magazines and explosive storage areas:

- Main Magazine: Maximum fatality distance: 29.0 m, maximum injury distance: 32.0 m
- Service Magazine: Maximum fatality distance: 13.8m, maximum injury distance: 13.8 m
- ANFO mixing shed: Maximum fatality distance: 7.7m, maximum injury distance: 7.7 m
- Explosive Transport Van: Maximum fatality distance :22.9 m,maximum injury distance :22.9 m

7.1.7 HAZARD ANALYSIS

Broadly, the hazards cover explosive material management, working at heights, slope and bench stability, mineral transport, mineral processing and force majeure conditions (rainfall & flooding).The mechanisms due to which hazards (coming under Risk Levels 1 & 2) may actually occur are covered in **Table-7.4:**

Table7. 4: Cause Analysis for Level 1 & Level 2 Hazards

S. No.	Hazard Description (Risk)	Risk Score	Risk Level	Cause Analysis
1	Travel in moving vehicle in	2	Level 3	• Poor visibility

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	uneven terrain			• Incompetent driver • Poorly maintained vehicles
2	Unintended explosions (exposure to overpressure)	15	Level 1	• Defective explosives • Outdated explosives • Improper storage of explosives • Force majeure conditions such as lightning strike • Fire (can be caused by unsafe practices or as ignition) • Sabotage
3	Unintended explosion or Exposure (exposure to overpressure)	3	Level 3	• Defective explosives • Outdated explosives • Improper storage of explosives • Force majeure conditions such as lightning strike • Fire (can be caused by unsafe practices or as arson) • Sabotage
4	Hit by fly rock (bodily injuries)	2	Level 3	• Poor access control of blast area • Poor blasting practices (leading to excessive fly rock)
5	Rock falls or slide due to lack of bench face stability (bodily injuries)	15	Level 1	• Improper design of bench • Force Majeure (such as heavy floods or rainfall) • Improper blasting practices • Incompetent blasting personnel
6	Hit by Machineries – Electrical Equipment (bodily injuries)	9	Level 2	• Improper design of equipment • Improper maintenance • Non usage of required PPE • Incompetent Personnel
7	Vehicle Accident (bodily injuries)	50	Level 1	• Head on collision between vehicle and another vehicle (due to poor visibility or incompetent drivers) • Poor vehicle maintenance
8	Accidental fire in vehicle (bodily injuries, exposure to	5	Level 3	• Accident to vehicle carrying fuel, and subsequent ignition of spilt fuel

	heat radiation)			• Improper storage of fuel, in MS drums, leading to spillage followed by ignition • Driving with loaded material on uneven terrain, and subsequent ignition of spilt fuel
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7.1.8 CONTROL & ACTION PLAN

To ensure that causes leading to the possible consequences are prevented from occurring, control and action plans are developed and suggested as described in **Table-7.5**. It is required that these control and action plans be implemented and reviewed at least annually and also when there are changes to the work plan.

Table7. 5: Control & Action Plan

S.No	Hazard	Causes	Control	Relevant Legislation	Procedure	Existing Procedure(Y/N)	Responsible Person (Designation)
1	Unintended explosions (exposure to overpressure) during storage of explosives in magazines	Defective explosives	Explosive used should be purchased only from approved and licensed authority. If deteriorated or unserviceable explosive is found, seek advice of licensing authority	Metalliferous Mines Regulation – 1961 & Explosive act, 1884	If any defective explosive is found, it is returned back to the original supplier for disposal at their end as per Rule 16 of The Explosive Rules 1983	Y	Authorized supplier of explosives
		Outdated explosives	Records and accounts of explosive stock and issue are to be maintained. Stock should be drawn upon strict rotation Well planning for requirement of explosives shall be exercised.	Explosive act, 1884, MMR –1961.	Maintaining registers for Explosives receipt, issue and stock as per Reg. 154, 156 of MMR 1961.	Y	Mines Manager

S.No	Hazard	Causes	Control	Relevant Legislation	Procedure	Existing Procedure(Y/N)	Responsible Person (Designation)
			Disposal of outdated explosives as the chief controller or controller of explosive may issue				
		Improper storage of explosives	Detonators are to be stored separately. Explosives shall be stored in dry and well-ventilated area. Protect explosives from extreme temperatures	Explosive act, 1884,	Explosives and Detonators are stored separately as per approved design & licensed capacity of magazine under Explosive act, 1884	Y	Mines Manager
		Force majeure conditions such as lightning strike	Lightning conductor are to be installed on the top of magazine Lightning conductor should not have resistance more than 10 ohms	The Explosive Rules 1983	Lightning arrestors are provided and maintained as per the requirement under Rule 116 the Explosive Rules 1983	Y	Mines Manager
		Fire (can be caused by	Empty packages shall be removed	The Explosive Rules 1983 MMR -	Follow the instructions Specified	Y	Mines Manager, Mines

S.No	Hazard	Causes	Control	Relevant Legislation	Procedure	Existing Procedure(Y/N)	Responsible Person (Designation)
		un safe practices or action)	immediately and destroyed. No smoking or any source of light or fire shall be allowed near explosives storage	1961	in Rule 154, 156and 170 of MMR – 1961 for storage, and handling of Explosives. Rule 97and 101 of the ER 1983		Foreman(Blasting)
		Sabotage	Security shall be provided at the magazine. Shortage and theft of explosive shall be reported to the nearest police station and the licensing authority	The Explosive Rules,1983,	Round the clock security guards provided and immediate reporting to nearest Police Station and Licensing Authority done in case of thefts or sabotage as per Rule –123 of ER 1983	Y	Mines Manager
2	Rock falls or slide due to lack of bench face stability (bodily Injuries)	Improper design of bench	Proper catch bench design and proper blasting pattern reduces over break. Maintain the width to height ratio as per	MMR-1961	Procedure for opencast working as per Reg. 106	Y	Mines Manager

S.No	Hazard	Causes	Control	Relevant Legislation	Procedure	Existing Procedure(Y/N)	Responsible Person (Designation)
			DGMS				
		Force Majeure (such as heavy floods or rainfall)	Dewatering or culverting the storm, water may reduce slides of bench	MMR-1961.	Following procedures as per Reg. 127 and 130 of MMR -1961 for Dewatering or and culverting the water	Y	Mines Manager
		Improper blasting practices	Good design of blasting network is important to reduce rock fall and slides of bench face	MMR-1961.	Procedure for opencast working as per Reg. 106	Y	Mines Manager
		Incompetent blasting personnel	Shot firer should have shot firer's permit granted under explosive rules	MMR - 1961	Appointment of Shot firer as provided in Reg. 160 of MMR 1961	Y	Mines Manager
3	Vehicle accident (bodily injuries)	Head on collision between vehicle and another vehicle (due	Haul road should be sprinkled Regularly. Driving at night shall be avoided. Driver should be RTO licensed holder	MMR - 1961Motor Vehicle Act	Sprinkling of water in haul road as per Reg. 124MMR 1961 and appointment of RTO licensed drivers	Y	Mines Manager

S.No	Hazard	Causes	Control	Relevant Legislation	Procedure	Existing Procedure(Y/N)	Responsible Person (Designation)
		to poor visibility or incompetent drivers)	for driving vehicle				
		Poor vehicle maintenance	Periodic servicing of vehicle, Brakes and steering apparatus should be in good condition. Headlight and tail light of the vehicle should be in good condition	MMR 1961	Procedure for Maintenance of Vehicles under Reg. 176 of MMR -1961	Y	Mines Manager
4	Unintended explosion or exposure to overpressure, charging blast holes	Poor access control of blast area	Well planning is required before and after charging of blast holes. Blast sites should be secured and warning signs posted before loading boreholes.	MMR 1961	Procedure for drilling charging stemming and firing of holes as per Reg.162	Y	Mines Manager
		Incompetent blasting	Shot firer should have shot firer's	MMR 1961	Appointment of Shot fired as per Reg. 160	Y	Mines Manager

S.No	Hazard	Causes	Control	Relevant Legislation	Procedure	Existing Procedure(Y/N)	Responsible Person (Designation)
		personnel.	permit granted under explosive rules		as per MMR 1961		
		Poor blasting practices	Tamping rod of wood must be used; iron or steel rods should not be used. No smoking or any source of light or fire shall be allowed near explosives storage. Before loading the blast hole blaster should check the driller log. Blast sites should be secured and warning signs posted before loading boreholes.	MMR – 1961- The Explosive Rules,1983,	Procedure for drilling charging stemming and Firing of holes as per Reg.161, Rule 14 of ER ISO procedure QSP-760-06	Y	Certified Blaster
		Defective explosives	Explosive used should be purchased	The Explosive Rules,1983	Explosive are purchased from	Y	Mines Manager

S.No	Hazard	Causes	Control	Relevant Legislation	Procedure	Existing Procedure(Y/N)	Responsible Person (Designation)
			only from approved and licensed authority only. If deteriorated or unserviceable explosive is found, seek advice of licensing authority		Approved manufactured or authorized license holder from CCE.		
		Outdated explosives	Stock should be drawn upon strict rotation	The Explosive Rules,1983	Issue of explosives on first come first ISO procedure QSP-760-06	Y	Mines Manager
5	Hit by fly rock(bodily injuries)During blasting	Poor access control of blast area	Adequate blast area security must be provided. Blast sites should be secured and warning signs posted before loading boreholes. Post guards at the access points to prevent unauthorized entry	MMR – 1961	Procedure for tacking shelter etc. during drilling and blasting Reg. 164 of MMR 1961	Y	Mines Foreman (Blasting)

S.No	Hazard	Causes	Control	Relevant Legislation	Procedure	Existing Procedure(Y/N)	Responsible Person (Designation)
		Poor blasting practices (leading to excessive flyrock)	Burden, spacing, hole diameter, stemming, sub drilling, initiation system, and type of explosive used matched the characteristics of the rock formation. Adequate blasting Shelter must be used for the persons whose presence is required in blasting. Nobody should be present within 300 m radius of blasting site as per DGMS circular except blasting personnel. Practice for controlled blasting Technique with	DGMS/(Tech)Cir.No.2 of 2003	Procedure for drilling and blasting, tacking shelter etc. as per Reg. 164 MMR1961, DGMS(SOMA)/(Tech) Cir.No.2of 2003	Y	Certified Blaster (MMR)

S.No	Hazard	Causes	Control	Relevant Legislation	Procedure	Existing Procedure(Y/N)	Responsible Person (Designation)
			milli-second delay detonators/ electric shock tubes/ cord relays. Training of persons and their helpers engaged in such blasting operation.				
6	Hit by Machineries – Electrical Equipment (bodily injuries)	Poor machinery Maintenance	Periodic servicing of machineries. Periodic Inspection / Audit of Machineries and Structures Non Compliance to SOP.	MMR 1961	Procedure laid under Section 174 Chapter XVI – Machinery and Plant of MMR 1961	Y	Mines Manager
		Poor Cabling / Earthing To Rotating Equipments	Periodic servicing of electrical instruments. Periodic Inspection / Audit of Electrical equipments – cables and accessories Non Compliance to SOP.	Indian Electricity Rules 2003	Section VII – Works of Licensees of Indian Electricity Rules 2003	Y	Electrical In charge under Mines Rules 1951

7.1.9 DISASTER MANAGEMENT PLAN

The Disaster Management Plan (DMP) is a guide, giving general considerations, directions, and procedures for handling emergencies likely to arise from planned operations. The DMP has been prepared for the Saurashtra Chemicals on the basis of the Risk Assessment and related findings covered in the report.

I. Structure

The Disaster Management Plan (DMP) is supposed to be a dynamic, changing, document focusing on continual improvement of emergency response planning and arrangements. A structure working on a Plan, Do, Check & Review (PDCR) cycle has been therefore suggested. Another advantage of doing this is to have a system that is in synchronicity with commonly used SHE systems such as ISO 14001 and OHSAS 18001.

The DMP is covered in further detail in the remaining sections of this Chapter.

II. Policy

The Safety Health and Environmental (SHE) policy is existing & accessible to all at site and to other stakeholders. The policy has been framed considering legislative compliance, stakeholder involvement, continual improvement, and management by objectives.

III. Planning

Identification & Prevention of Possible Emergency Situations

Possible emergency situations can broadly be classified into unintended explosions, vehicle collision, and inundation. Additional emergency situations can be developed on the basis of audit or other procedures prior to commencement of operations.

✓ Emergency Prevention

Some of the ways of preventing emergencies are as follows:

- Preparation of a Preventive Maintenance Schedule Programme and also covering maintenance schedules for all critical equipments and instruments as per recommendations of the manufacturer's user manuals.
- Importantly, it is of great importance to collect and analyze information pertaining to minor incidents and accidents at the site, as well as for recording near-misses or emergencies that were averted. This information gives an indication of how likely or

unlikely it is for the site to face actual emergency and what shall be further action to prevent them from occurring.

- Establishment of an ongoing training and evaluation programme, incorporating the development of capabilities amongst employees about potential emergencies and ways and means of identifying and averting the same. Most emergencies do not occur without some incidence or an abnormal situation. So there is always sometime of few seconds to few minutes to arrest an incident of abnormal situation from turning in to an emergency. This is the role of the shift in-charge who is the incident controller (IC) along with his shift team.

✓ **Emergency Plan Objectives**

Specific objectives of the Emergency Response Plan are to be clearly listed with regards to the responses desired for successful management of the possible emergency situations. Suggested objectives could include:

- To define and assess emergencies, including risk and environmental impact assessment.
- To control and contain incidents.
- To safeguard employees.
- To minimize damage to property or / and the environment.
- To inform employees, the general public and the authority on the hazards / risks assessed.
- Safeguard provided residual risk if any and the role to be played by them in the event of emergency.
- To inform authorities like Safety and Fire Department and Mutual Aid Centers to come up for help.
- For effective rescue and treatment of casualties and to count the injured.
- To identify and list fatal accidents if any.
- To secure the safe rehabilitation of affected areas and to restore normally.
- To provide authoritative information to the news media.
- To preserve records, equipments etc. and to organize investigation into the cause of the emergency and preventive measures to stop its recurrence.
- To ensure safety of staff and patients and resume work.
- To work out a plan with all provisions to handle emergencies and to provide for emergency
- Preparedness and the periodical rehearsal of the plan.

The objectives are suggested in emergency preparedness plan of Saurashtra Chemicals. Responsibilities, resources and timeframes require to be allocated for implementing the objectives.

IV. Implementation

✓ Allocation of Resources

Key Personnel are identified for carrying out specific and assigned duties in case of any kind of Emergency. All such key personnel shall be available on call on holidays and off duty also.

- Commander (Manager Quarries)
- Deputy commander (Personnel Officer)
- Site Incident Controller (Shift in charge)
- Deputy Incident Controller (Senior Mining Mate)
- Other key personnel
- Essential workers

✓ RESPONSIBILITIES OF COMMANDER / DEPUTY COMMANDER

- To take charge at the place of incident.
- To activate the Emergency Preparedness Plan according to severity of situation.
- Inform all the employees and relatives of the affected employees.
- Call all key personnel and inform Doctor to be ready for treatment.
- Commander shall deploy staff carry out following functions -
 - To coordinate and reinforce Emergency Combat at Site along with Site Incident Controller
 - To liaise with other Departments and guide their personnel
 - To supervise Assembly and Evacuation at all points
 - To look after Patients who are bed ridden and any Casualties and give psychological support
- Activate Assembly and Evacuation Plan if required as per situation by ordering Site Incident Controller

- Inform and liaise with Chief Operating Officer, Police department and District Emergency Authority.
- Arrange for chronological records of emergency to be maintained.
- Issue authorized statements to News Media.
- Ensure that proper consideration is given for preservation of evidence and arrange for video shooting / photographs.
- Deputy Commander shall carry out the responsibilities of Commander in his absence and assist him in his duties when present.
- Assign Medicare and Emergency Management tasks to all persons of management cadre

✓ **RESPONSIBILITIES OF MINES FOREMAN**

- To take immediate charge at the site of incident.
- Ensure that immediate steps as per Emergency Preparedness Plan are taken and direct the worker staff.
- Inform Commander, Deputy Commander and other key personnel's.
- Shall blow the Siren / Hooter as per situation to declare Emergency.
- Supervise assembly and evacuation as per plan, if required.
- Appoint more than one Deputy Incident Controller to take charge if emergency occurs at more than one place.
- Ensure that Commander has been alerted.
- Take decisions for controlling the emergency till arrival by Commander.
- Ensure that casualties are receiving adequate attention and medical care.
- Ensure accounting for personnel and rescue of missing persons.
- Control traffic movement in Quarry premises.
- When emergency is prolonged arrange for relief of rescue workers and catering facilities.
- Deputy Incident Controller shall take charge at site of emergency in the absence of Site Incident Controller.
- In the presence of same, he shall assist Site Incident Controller or take charge at another location, if emergency exists in more than one place.

✓ **RESPONSIBILITIES OF ESSENTIAL WORKERS**

A task force of essential trained staff is made available to get work done by Incident Controllers. Such work shall include -

- Firefighting and spill control till fire brigade takes the charge.

- To help the fire brigade, if it is so required.
- Emergency engineering work e.g. isolating equipment, materials, urgent repairing or replacement, electrical work etc.
- Provision of emergency power, water, lighting, material, etc.
- Movement of equipment, special vehicle and transport to or from the scene of the incident.
- Search, evacuation, rescue and welfare. First - Aid and medical help.
- Manning of assembly points to record the arrival of evacuated personnel. Manning of outside shelters and welfare of evacuated persons there.
- Assistance at casualty's reception areas to record details of casualties.
- Assistance at communication center to handle outgoing and incoming calls and to act as messengers if necessary.
- Control of traffic at Quarry premises.

V. Setting-up of Emergency Infrastructure

To enable the key persons to implement the DMP, the following infrastructure will require to be set up:

✓ ASSEMBLY POINTS

In case of emergency the site needs to be evacuated immediately. On evacuation people will go to pre-assigned assembly points. The charge will be taken by shift in charge and in his absence person deployed by Commander will be in charge of respective assembly points and will supervise Assembly and Head Count. A Board indicating the Assembly Point having relevant information is placed at point for guidance.

✓ LIAISON WITH STATE AUTHORITIES

Government authorities, local hospital, police fire services, taluka mamlatdar, district collector will be kept informed about the occurrence and development of any incident by Commander and procure necessary help and guidance from these authorities.

✓ TASK FORCE OF ESSENTIAL STAFF

A task force of essential trained staff is made available to get work done by the Commander. Task Force personnel shall be trained to perform tasks as mentioned above.

✓ EMERGENCY CONTROL CENTER

Manager-Quarry Office will act as Emergency Control Center and provided with required communication facilities. The Control Center is situated in an area of minimum risk and close to the road to allow for ready access by a vehicle if other systems fail or extra communication facilities are needed to be set up. The Emergency control center should consist of following items:

- External telephones
- Internal telephones
- E-Mail facilities
- Emergency plan
- Stationeries
- Torches and emergency lights

VI. Fire Fighting

Person noticing the fire shall immediately raise alarm and ask the nearest person to inform Matron and Manager-Quarry.

Portable Fire Extinguisher shall be used in an attempt to extinguish the fire, by the person at site. Matron shall assess the severity of fire and if likely to be severe shall take following steps –

- Call fire tenders and mobile trailer pump from nearby fire department.
- Call for assembly of all persons at assembly points
- Arrange for turning "OFF" main switch of electricity supply.
- Manager-Quarry shall review the steps taken by Matron in his capacity as COMMANDER and establish a "Control Room" in his office.

✓ IMMEDIATE STEP IN CASE OF EXPLOSION:

- At first the concerned security guard should inform about it to the shift-in-charge and Mgr.-Quarry.
- They will take the precaution described in the Work Instruction.

✓ FURTHER STEPS IN CASE OF FIRE SPREADING

Commander shall continuously assess the situation and if it is not being controlled then ensure:

- Assembly of all persons at the assembly points.
- Arrival of fire tenders and / or Mobile Trailer Pump.
- Ensure evacuation in orderly fashion.
- Ensure that any vehicle parked near the Fire Site is taken away to safe area.

- Carry out responsibilities as detailed as above.

VII. Emergency Preparedness for Electrical Shock / Accident (Applicable in Case of Mechanized Sizing)

- Source of power should be put off immediately in case of any electrical shock.
- Injured person should be shifted to safe place.
- Persons engaged in rescuing operation should use all PPEs and take appropriate precaution while removing the injured persons.
- Trained persons are engaged to give first-aid treatment to injured persons.
- In case of major injury the injured is shifted to the Dispensary/Hospital.
- In case of electrical fire, only CO2 type Fire Extinguisher is used.
- Accident report in prescribed form is sent to appropriate authority in case of reportable injury.
- All the persons engaged to carry out this operation should be equipped with appropriate PPEs (Personal Protective Equipments) like safety shoes, helmets, dust masks etc.

VIII. Natural Disasters

Quarry being a single story building, built on elevated base is structurally safe from effects of Natural Disasters. It affords shelter against cyclone and flood.

✓ **CYCLONE AND FLOOD**

- When warning of cyclone or heavy rains is received from Local Administration, the Commander shall alert Staff to be prepared.
- Matron shall withdraw the entire person from work place and accumulate them in quarry building.
- All the equipment should be withdrawn from mine and kept in a higher site.
- The Quarry Manager may advise to leave the staff depending on security of situation.

✓ **EARTHQUAKE**

- When earthquake hits, all persons shall be encouraged to run out in the open areas designated as Assembly Points.
- All the electrical supply should be disconnected by the electrical department.
- All key personnel shall reach Quarry immediately and carry out designated responsibilities
- All the electrical supply should be disconnected by the electrical department.
- Steps detailed in Emergency preparedness are to be carried out.
- As soon as earthquake tremor stops - Site Incident Controller (Matron) shall :

- Check all areas to ensure that all fires are doused.
- Check all areas for persons trapped inside.
- Search and Rescue Operation shall be launched with help of Workers, if there is obvious damage to building.

IX. First Aid

Basic items in a first aid kit consist of items listed in **Table-7.6**.

Table7. 6: Suggested Items in First Aid Kit

S. No.	Description	Quantity
1.	First aid leaflet	1 copy
2.	Sterilized finger dressing	10 nos.
3.	Sterilized hand or foot dressing	10 nos.
4.	Sterilized body or large dressing	6 nos.
5.	Sterilized burns dressing - small	4 nos.
6.	Sterilized burns dressing - large	2 nos.
7.	Sterilized burns dressing – extra large	6 nos.
8.	Sterilized cotton wool (25 gm)	2 tubes
9.	Cetavolon (28 gm)	2 tubes
10.	Eye pads	6 nos.
11.	Adhesive plaster	1 spool
12.	Assorted roller bandage	6 nos.
13.	Triangular bandages	6 nos.
14.	Safety pins	6 nos.
15.	Scissors, ordinary, 12.7cms, both sides sharp	1 pair
16.	Savlon liquid, 150 ml, or equivalent	2 nos.
17.	Cotton wool for padding, 100 gm	2 packets
18.	Eye Ointment of sulphacetamide preparation	1 tube
19.	Loose woven gauze (28"x8"), compressed pack	1 packet
20.	Aspirin, 300 mg (10 tablets)	5 strips
21.	Scribbling Pad, 4"x 6" with a pencil in a plastic cover	1 no.
22.	Adhesive dressing strips	10 strips
23.	Field dressing of modified army pattern	3 nos.

S. No.	Description	Quantity
24.	Record cards in a plastic cover	1 set
25.	Torch, medium size without cells	1 no.
26.	Eye wash	1 no.
27.	Wooden splints, small	1 set
28.	Wooden splints, big	1 set

✓ **Treatment of Affected Persons**

- Injured / Affected persons shall be provided suitable first-aid treatment and sent to Co.'s Doctor for further treatment depending on injury.
- Patients requiring further treatment shall be sent in Ambulances to Hospitals in Porbandar.
- Patients suffering from minor problems shall be discharged and sent home after preliminary treatment

X. Post Emergency Activities

- **Medical checkup:** Medical checkup of affected persons if any and suitable medical aid shall be provided.
- **Collection of Records:** Exact information shall be collected regarding cause of Emergency and remedial measures suggested preventing recurrence.
- **Inquiry:** Detailed inquiry shall be carried out to find out cause which will be in the form of fact finding and recommendations made to suitable authority.
- **Insurance Claims (if any):** Insurance claims for damage due to consequences of emergency shall be filed.

XI. Mock Drill

Full scale mock drill shall be conducted at least once a year in coordination with Safety Department.

Manager-Quarry shall declare the emergency for mock drill and all persons concerned shall perform duties as per Responsibilities given in this Plan.

XII. Training

Regular training of all concerned personnel will be conducted to enable the Staff to face any type of Emergency be it Natural Disasters, Fire in Equipment, Building or any explosion in quarry.

XIII. DMP Audit, Non Conformance & Corrective Action & Preventive Action

Since this DMP has been designed as a dynamic document, it is required that its performance be audited at regular intervals. Ideally, persons auditing the DMP should be external auditors (i.e. not employed at the site being audited).

Audits will be periodic, at intervals that are decided by the Head Office. Audit reports shall state the exact non-compliance with the particular clause of this DMP, and should include steps to be taken to attain compliance, through corrective and preventive actions.

XIV. Review of Emergency Performance

The site / head office management will review the findings of the audit and the non-compliances. It will consider whether the DMP is providing adequate safety assurance to the management, delivering performance as desired, and whether it continues to be in the spirit of Environment, Health and Safety Policies, and changing requirements. On the basis of these, the management will record its decisions and consider modifying the DMP, as deemed appropriate.

7.2 NATURAL RESOURCE CONSERVATION

As far as possible, efforts shall be made to minimize the use of natural resources like fuel, mineral etc. A conservation strategy shall be followed according to which the use of energy will be minimized at all level of organization. All the machineries and equipments shall be properly maintained so as to reduce the greenhouse gas emissions and to conserve the fuel & energy.

7.3 REHABILITATION & RESETTLEMENT

Mine lease area is an existing mine lease granted by the state government in the year 1959. The mine site is free from habitation and settlements; hence no rehabilitation & resettlement (R&R) Plan is needed.

7.4 CORPORATE SOCIAL RESPONSIBILITY (CSR)

SAUKEM will organize Medical Camps for the employees of the project and for the people in the nearby area of mine lease area. It will be done with coordination of the Government Hospital in the nearby area whose equipment facilities can be used for this purpose. Medicines will be provided free of cost. Training of employed workers to improve their skills for safe workings will be given. Free medical camp will be organized for the villagers. Company will co-operate with the Government for the development of the area, nearby schools and basic amenities.

7.5 PUBLIC HEARING

As per the Ministry of Environment, Forest & Climate Change, Government of India, New Delhi vide its notification no. S.O. 1533(E) dated 14th September 2006 and its amendment S.O. 3067(E) dated 01.12.2009 the procedure prescribed therein, the Gujarat State Pollution Control Board has conducted the public hearing on 16th September, 2016 at 11:00 A.M. at site of M/s Saurashtra Chemicals Division of Nirma Limited, S. No. 37/2P & 55/1P, Lalpur Road, Village-Ranavav, Tehsil- Ranavav and District-Porbandar, under the chairmanship of Sh. Dinesh Patel, (IAS), District Magistrate & Collector, Porbandar and Sh. B.L. Maru, regional officer & representative of Member Secretary, GPCB.

As per the requirements of public hearing process, an advertisement in English was published in 'The Indian Express' and in Gujarati in 'Sandesh' both dated 13.08.2016.

The issues raised during the public hearing along with action plan are as follows;-

Sl. No.	Name and address	Point Raised	Reply by Project Proponent	Action Plan
1.	Shri Naranbhai Ramjibhai Shiyani, Village-Bhod	He stated that mining should start as early as possible so that we will get employment opportunity. We also believe that there will be no adverse impact on environment due to his mining project as per our knowledge.	Company Representative Shree G.J, Aadroja (Vice President) thanks all of them. He stated that we will start this mining project as soon as possible after obtaining required Government	The mining activity shall be started as soon as all the requisite clearance from the competent authorities is obtained including Environmental Clearance, Wildlife Clearance and all the other NOCs from GPCP/MoEF&CC.
2.	Shree Keshubhai Kanabhai Village-Ranavav	He stated that we do not have any objection if mining will start. We believe that there will not be any impact on environment due to this mining project.	permissions. He also added employment shall be provided to local people as per requirement.	
3.	Shri Bhimabhai Ranmal	He stated that if mining will start early, we will		

	Village-Bhod	get employment opportunity.		
4.	Shree Ramesh Kanhabhai Jadhav, Village-Ranavav	He stated that if mining will start early, we will get employment opportunity in the nearby areas & not require migrating for employment.		
5.	Shree Dineshbhai Gokuldas Joshi, Village-Ranavav	He stated that we do not have any objection if mining will start. We believe that there will not be any impact on environment due to this mining project.		
6.	Shree Ramabhai Babubhai Waghela, Village-Bhod	He stated that if mining will start early, we will get employment opportunity in the nearby areas & not require migrating for employment.		