Mining and quarrying — Code of practice
Foreword
Introduction

Mining and quarrying sector implies health and safety management in employment to prevent harm to employees at work. To do this it imposes duties on, and promotes excellent health and safety management by employers. The environmental issues, safety and human rights should be the major concern of employers during the whole process of mining and quarrying production.

The Code of Practice for Mines and quarries is designed to support the Mining law and includes other subjects that are not dealt with in the law that may have an influence in mineral traceability, transparency, good practice and on the environmental impact of mining operations.

The recommendations in this document may be helpful to all operators of the mining Industry in Rwanda.

Recommendations in the Code do not carry regulatory status, and a commitment by companies to implement the recommendations in the Code does not remove obligations for such companies to comply with all applicable legal requirements.
1 Scope

This standard establishes a best practice guide for facilitating and encouraging continual improvement in the management of health and safety of employees and in the environmental performance of mining facilities throughout the mine and quarry life cycle in Rwanda. It describes the major operational activities that occur and the environmental concerns associated with these activities. It then presents recommended best practices to minimize the environmental impacts associated with mining and quarrying operations.

It covers environmental aspects ranging from air, soil, water and waste management to biodiversity.

It is intended to be a resource for mine and quarry owners and operators and regulatory agencies, as well as the general public, particularly those people in communities potentially affected by mining and quarrying activities. It also covers principles for mineral traceability and transparency and overall good practice in mining operations. Hydrocarbons are not covered in this standard.

2 Normative references

The following referenced documents are indispensable for the application of this document.

RS 544:2010, Air quality— Tolerance limits of emissions discharged to the air by cement factories

RS 543:2011, Air quality— Specification

3 Terms and definitions

For the purpose of this standard, the following definitions apply.

3.1 mine
is a place, including buildings for administration, accommodation and associated facilities, where operations are carried on, continuously or from time to time, within the boundaries of land, on land adjoining or adjacent it

3.2 operations
are activities carried on in connection with extracting, loading, transporting, crushing, concentrating, storing, leaching and processing of minerals or hard rock and disposing of mineral or waste products

3.3 quarry
mineral or fossil substance not concerned with concession from the legal point of view. Technically, it is an open cast mine

3.4 safety and health
is the person’s safety and health to the extent it is or may be affected by operations or other activities at a mine

3.5 competence
is the demonstrated skill and knowledge required to carry out the task to a standard necessary for the safety and health of persons at a mine

3.6 consultation
Consultation with workers is discussion between the site supervisors and affected workers about a matter with the aim of reaching agreement about the matter

3.7 standard work instruction
is a documented way of working at the mine to achieve an acceptable level of risk, developed after consultation with workers

3.8 accident
is an event, or a series of events, at the mine causing injury to a person

3.9 serious accident
is an accident at a mine that causes the death of a person; or a person to be admitted to a hospital as an in-patient for treatment for the injury

3.10 high potential incident
is an event, or a series of events, that causes or has the potential to cause a significant adverse effect on the safety or health of a person

3.11 risk
the risk of injury or illness to a person arising out of a hazard and is measured in terms of consequences and likelihood

3.12 hazard
a thing or a situation with potential to cause injury or illness to a person

3.13 operator
the person in control of the mine
3.14 supervisor
a supervisor at a mine is a worker who is authorized by his superior to give directions to other workers

3.15 base metals
industrial non-ferrous (non-iron) metals excluding precious metals

3.16 bulk sampling
a method whereby a sample (also called a gross sample) is taken from a deposit lot for analysis and that sample is intended to be representative of the deposit

3.17 concentrate
the clean or final ore product recovered in the concentration or separation stage of the milling process

3.18 deposit
mineral deposit or ore deposit used to designate a natural occurrence of a useful mineral, or an ore, in sufficient extent and degree of concentration to invite exploitation

3.19 ecosystem
a dynamic complex of plant, animals and microorganism communities and their non-living environment interacting as a functional unit

3.20 effluent
a complex waste material that is a by-product of human activity (i.e. liquid industrial discharge or sewage) and is discharged to the environment

3.21 exploration
prospecting, sampling, mapping, drilling and other work involved in searching for ore and in some cases; exploratory mining is conducted in which small-scale mining activities are carried out to study potential ore deposits

3.22 geology
the science concerned with the study of the rocks that compose the earth
3.23
mineral
a naturally occurring homogeneous substance having definite physical properties and chemical composition and, if formed under favourable conditions, a definite crystal form

3.24
mining
process of extracting valuable metallic or non metallic minerals from the earth. Mining can be at the surface or open pit mine or an underground mine

3.25
open pit mining
term used to differentiate this form of mining from extractive methods that require tunnelling into the earth and these methods are used when deposits are found near the surface, where the overburden is relatively thin or the material of interest is structurally unsuitable for tunnelling

3.26
ore
a natural mineral deposit in which at least one mineral occurs in sufficient concentrations to make mining the mineral economically feasible

3.27
overburden
unconsolidated materials overlying the ore deposit, including soil, glacial deposits, sand, and sediment

3.28
reclamation
the process by which lands disturbed as a result of mining activity are returned to a beneficial land use. Reclamation activity may include the removal of buildings, equipment, machinery, other physical remnants of mining, leach pads and other mine features, and contouring, covering and revegetating waste rock piles and other disturbed areas

3.29
sediment
solid fragmental material that originates from weathering of rocks and is transported or deposited by air, water or ice, or that accumulated by other processes, such as chemical precipitation from solution or secretion by organisms

3.30
slurry
a fluid mixture of liquids and solids

3.31
tailings
the waste material and water mixture that is left over after the mill removes the valuable rocks
3.32 tailings management facility  
all components and facilities functionally pertaining to tailings management, including dams, spillways, decant structures, tailings lines, as well as settling and polishing ponds

3.33 trench  
a long, narrow excavation dug through overburden, or blasted out of rock, to expose a vein or ore structure

3.34 waste rock  
rock which does not contain any minerals in sufficient concentration to be considered ore, but which must be removed in the mining process to provide access to the ore

3.35 wastewater  
all water generated as part of a process prior to discharge as an effluent, including any mine and site runoff water

3.36 water body  
any significant accumulation of water, including lakes, ponds, wetlands, rivers, streams, canals, and other geographical features where water moves from one place to another

3.37 wetlands  
habitats where the influence of surface or groundwater has resulted in the development of plant or animal communities adapted to such aquatic or intermittently wet conditions

3.38 quarry product  
means conglomerate, sandstone, shale, basalt, andesite, trachyte, porphyry or other rock, or sand, clay, shale, gravel or peat, that is extracted or treated (or is intended to be extracted or treated) for commercial or industrial purpose

3.39 surface mine  
means that a mineral occurs fairly close to the surface in a massive or where the mineral itself is part of the surface soil or rock

3.40 underground mine  
means a mine in which persons are employed below ground when the mine is being worked
3.41 watercourse
means a river, creek or stream in which water flows permanently or intermittently in a visibly defined channel (natural, artificial or artificially improved) with clear bed and banks and evidence of biological dependence

4 General principles for mining and quarrying companies

The mining and quarrying companies shall comply with the following principles:

Principle 1

Origin and volumes of produced and traded goods as well as company payments to host government shall be transparent

1.1  The origin and production volume of minerals from the mine site throughout the trading chain shall be traceable.

1.2  Fiscal obligations required by national law shall be met.

1.3  The company shall publish all payments made to government in accordance with the standards.

1.4  The company shall actively oppose bribery and fraudulent payments.

Principle 2

The Company shall not use child labour and ensure fair remuneration and work conditions as well as continual improvement of health and safety measures for all.

2.1  The company shall maintain salary or payment levels equal to or greater than those in comparable enterprises within Rwanda.

2.2  The company shall ensure that no child laborers work on company sites according to labor national law.

2.3  The company shall support workers’ organizations and collective bargaining.

2.4  The company shall provide essential protective and production services to support the work of their subcontractors if any.

2.5  The company shall ensure occupational health and safety in all company operations.

2.6  The company shall provide training for employees and contractors on safety, health and
effective use of on-site facilities.

**Principle 3**

The Company shall ensure security on company sites whilst respecting human rights

3.1 P The company shall provide sufficient and adequately trained security forces, also in ways that protect and promote human rights.

3.2 P The company shall undertake security risk assessments, prevention and management

**Principle 4**

The Company shall consult communities in which it shall operate and contribute to their social, economic and institutional development taking into account gender sensitive aspects and avoid any discrimination (e.g. people with disability).

4.1 P The company shall interact regularly with communities and local governments to address grievances and other common concerns

4.2 P The company shall support local enterprises to supply company operations

4.3 P The company shall implement integrated development programs in nearby communities for livelihood security, social and physical infrastructure and capacity building

4.4 P The company shall obtain free, prior and informed consent before acquiring land or property

4.5 P The company shall understand the situation and perspectives of the women in the company’s area of influence and design and implement company’s operations in a gender sensitive way

4.6 P The company shall carry out an assessment on human migratory streams created by company operations and develop an influx migration action plan

**Principle 5**

The Company shall seek continual improvement of its environmental performance

5.1 P The company shall carry out relevant environmental studies as the basis for developing
an environmental management, protection and strategic plan

5.2 P The company shall properly treat or dispose of hazardous material and waste from its site(s).

5.3 P The company shall make provision for the full cost of rehabilitation upon closure.

NOTE P is an identifier of principles

5 Mine life cycle activities

The mine life cycle is described in phases and consists of:
− the exploration and feasibility phase;
− the planning and construction phase;
− the mine operations phase; and
− the mine closure phase.

These phases and the associated key activities are illustrated in table 1

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<th>Phase</th>
<th>Activity</th>
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<td>- Discovery and sampling</td>
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<td>Closure phase</td>
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<td></td>
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5.1 Exploration and feasibility phase

5.1.1 Exploration

Initial exploration should be to identify and assess mineralized areas to determine whether more intensive exploration is warranted. The methods used in initial exploration include the following:

a) Prospecting and Geological Mapping: This can involve the mapping and sampling of targets identified in airborne geophysical surveys, regional-scale mapping and more detailed mapping of areas of particular interest. The objective is to provide a preliminary assessment of the potential for mineralization over a relatively large area.

b) Geochemical Surveys: A range of materials may be sampled, most commonly rocks and soil. Samples are sent for chemical analysis for metals of interest. Results of the analyses are compiled and compared with the results obtained from other exploration methods.

c) Geophysical Surveys: Geophysical survey techniques include magnetic, electromagnetic, electrical, radiometric and gravity techniques, and surveys can be conducted from the air or on the ground. These surveys provide information on potential targets for ground-based exploration.

d) Trenching: Trenches may be dug or areas of outcrop stripped of vegetation and soil to enable mapping of near-surface geology and for bulk sampling where ore and other geologic units may be very near the surface.

e) Drilling: Drills recover a core of rock, and cores from several holes allow geologists to build a three-dimensional picture of the local geology. Core samples are also subjected to chemical analysis.

In areas where the results of initial exploration are positive, advanced exploration may commence. The primary goals of advanced exploration are to define the quantity and quality of potential ore and the geometry of the deposit and to determine the most appropriate mining and processing methods. The establishment of small-scale underground or open pit mine workings is essential to provide the information needed to make decisions regarding further development at a site. Larger amounts of rock are removed during bulk sampling as part of advanced exploration. Valuable information can be obtained concerning rock quality, mineralogy and geochemistry.

If the quantity and quality of potential ore present are adequate to proceed to a feasibility study, the data from advanced exploration are used for preliminary planning of mine layout, ore processing design, and estimating the cost of developing and operating a mine.
5.1.2 Feasibility

Mineral deposits that are worthy of further evaluation following advanced exploration are subjected to a rigorous process to determine the feasibility of developing a mine at the site. This process involves an assessment of the technical, legal and economic feasibility of the envisaged project, including assessments of the mineral reserve and investment returns. The mineral reserve is estimated based on the results of advanced exploration. Mining methods are determined on the basis of safety, economics, practicality and environmental considerations.

Mineral exploration targets that are demonstrated to be viable and that receive the necessary funding and permits are ultimately brought into production. Once a decision has been made to proceed with production at a site, final site planning and engineering studies are completed in preparation for the beginning of mine construction.

5.2 Planning and construction

5.2.1 Planning

During the planning phase, which in practice may overlap with the completion of feasibility studies, all aspects of the mine are planned in detail. This includes planning related to mining and ore separation processes, as well as site infrastructure needs, schedules for construction and commissioning of facilities, and all planning associated with environmental aspects of operations.

5.2.2 Construction

The most significant activity during mine construction is the establishment of underground or surface mine workings to provide direct access to the ore body. Related activities include the construction of ore processing facilities, waste management areas, and site infrastructure. The scope and complexity of the works to be completed during this phase vary considerably from project to project; however, some elements are common to all mine construction projects. These key activities are briefly described below.

a) Site Preparation - Clearing, Stripping and Grading: The clearing and stripping of overburden is completed in preparation for the construction of various facilities on site. The overburden is typically stockpiled if it is suitable for later use in mine reclamation.

b) Construction of Mine Infrastructure: Most of the on-site facilities and utilities associated with the mine are developed during the construction phase. Depending on a number of factors, including the size of the operation, the location, and the proposed mining and milling processes to be used, infrastructure may include:

- transportation facilities, including access roads to the site, on-site roads, and in some cases rail line;
- ore handling and processing facilities;
- mine waste disposal facilities;
- water management and wastewater treatment systems;
- power infrastructure, including power distribution system and any on-site generation facilities;
- shops, offices, warehouses and accommodations;
- fuel supply and storage;
- vehicle storage and maintenance facilities;
- explosives storage facility;
- water supply, potable water treatment and distribution system; and
- waste treatment and disposal.

c) Establishment of Mine Workings: During the construction phase, underground or surface mine workings shall be established to provide direct access to the ore body. Surface mines, also known as open pit mines, shall be preferred for the extraction of ore close to the surface. Deeper or more irregularly shaped ore bodies should be mined by underground methods. The mine workings are excavated by drilling and blasting. Drills are used to drill patterns in the rock that, upon blasting, will fragment the rock. To fragment the rock, explosives are injected into drill holes and detonated. Once the rock is fractured it is removed from the mine. Most of the material removed during the construction phase is waste rock, and any ore that is removed should be stockpiled for later processing. Mine construction may also include some ore production for use in testing the ore handling and processing facilities.

5.3 MINE OPERATIONS

The mine operations phase represents the period during which a mine produces and processes ore to produce a product for market. The mine operations phase includes both ore extraction and ore processing and associated activities. The key activities of the mine operations phase are illustrated in Figure 1.

5.3.1 ORE EXTRACTION

a) Surface mine

Surface mine should be the preferred method for the extraction of ore from deposits that are close to the surface, since the cost of ore mined is lower than that for underground mining. Other factors that may influence the decision about whether to mine using surface or underground methods include the ore grade, the geometry of the deposit, other physical characteristics, and site characteristics such as topography. Open pits are generally much wider than they are deep to ensure the stability of the pit walls. The stripping ratio (the ratio of waste rock to ore) varies dramatically over the life of an open pit mine and depends on the geometry of the ore body, ore grades, slope stability, site geology, and variations in the price of the metal.
b) Underground Mines

In underground mines, the ore should be extracted through a series of vertical shafts and ramps and horizontal drifts and adits. Extraction is more selective than in open pit mining, and the ratio of waste rock to ore generated is much lower. Waste rock should be used as mine backfill to provide roof and wall support underground. Waste rock that is not used for construction or as backfill may be disposed of on the surface.
Tunnel plans should include a hazard analysis section. This should be documented. Key areas to be included, but not limited to, in the plan hazard analysis are:

- Fire and explosion
- Inundation and water accumulation and flow
- Outburst/Rock burst
- Fall of ground
- Unsupported ground
- Openings, voids, stopes
- Location of old workings
- Spontaneous combustion
- Roadways and intersection design
- Pier size
- Lining and support system

5.3.2 ORE PROCESSING

Once ore is extracted from a mine it should be processed to recover the valuable minerals. Ore typically consists of small amounts of valuable minerals in close association with much larger amounts of waste minerals of no economic value (gangue). The valuable ore minerals should be separated (liberated) from the gangue in milling operations to obtain higher quality metal. Major steps in ore processing include grinding and crushing, chemical/physical separation and dewatering.

a) Crushing and Grinding

Grinding and crushing of ore should be undertaken to physically liberate valuable minerals prior to separation by physical and chemical processes. Crushing should be done dry, and should be used for coarse size reduction. Grinding should be used to achieve finer size reduction. Grinding should be conducted wet, and chemicals such as lime, soda ash, sodium cyanide, and sulphur dioxide may be added in the grinding circuit in preparation for ore separation. Ore must be ground fine enough to liberate the ore minerals from the gangue, or subsequent separation methods will not be as effective.

b) Ore Separation

Ore separation may be done using physical or chemical separation methods. The end product of ore separation is an ore concentrate. After separation, some ore concentrates are sent for further processing, such as smelting, to produce pure metal for sale.

A by-product of ore separation is tailings, which are a mixture of water and finely ground rock from which most of the minerals of value have been removed. Tailings may still contain metal-bearing minerals, and the mixture may also contain residues of reagents used in ore processing.
c) **Physical/Chemical Separation Processes:** Physical separation processes exploit differences in the physical properties or behaviour of mineral particles, such as size, density and surface energy. The bulk of the mineral is not chemically altered, although chemical reagents may be used to help in the separation process. Commonly used physical separation processes are as follows:

- **Gravity Separation:** Minerals can be separated on the basis of differences in density, particularly for iron ore and gold. Gravity separation may also be used to pre-concentrate metallic minerals prior to further processing. Gravity separation tends to require the use of smaller amounts of process reagents than some other ore separation methods.

- **Magnetic Separation:** Minerals can be separated on the basis of differences in magnetic susceptibility. Magnetic separation should be used to separate iron ore from waste minerals, to remove magnetite (iron oxide) and pyrrhotite (iron sulphide) from base metal ores prior to flotation. Like gravity separation, magnetic separation tends to require the use of smaller amounts of process reagents than some other ore separation methods.

- **Flotation Separation:** Flotation should be used for the separation of a wide variety of minerals on the basis of differences in surface properties of minerals in contact with air and water. It is the dominant process for the recovery of base metal ores. To separate minerals using flotation, fine air bubbles are introduced into a mixture of ground ore in water, known as a slurry. In this slurry, mineral particles collide with air bubbles, and minerals that favour contact with air attach to the air bubbles and float to the surface of the flotation cell. As air bubbles accumulate at the surface, a froth forms and eventually overflows as the flotation cell concentrate. Minerals that favour contact with water remain in the slurry and go to the flotation cell tailings. A number of chemical reagents are used to aid the process.

### 5.3.3 DEWATERING

The ore concentrates obtained from most physical ore separation processes are slurries with high water content that should be dewatered prior to further processing. Dewatering should involve two processes, i.e., thickening and filtration. In thickening, slurries are thickened by gravity settling. The excess water is decanted off and may be recycled in the milling processes. After thickening, the slurry is passed through a vacuum filter, which traps the particulates. Most of the remaining water is removed.

### 5.4 MINE CLOSURE

Mines should be closed when the ore minerals are completely exhausted or when it is no longer profitable to recover the minerals that remain. In some cases, mines may be closed temporarily and put into a status called “care and maintenance,” also known as temporary suspension. This can be done during periods of low commodity prices in the expectation that higher prices in the future will make further commercial operations financially viable. Eventually, ore reserves are depleted, and mines are permanently closed.

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6.0 Responsibility on health and safety in employment

The principal objective of health and safety in employment is to prevent harm to employees at work. To do this it imposes duties on, and promotes excellent health and safety management by employers.

6.1 Employers responsibilities

An employer shall have a general duty to take all practicable steps to ensure the safety and health of employees while at work. In particular, employers shall be required to take all practicable steps to:

- Provide and maintain a safe working environment
- Provide and maintain facilities for the safety and health of employees at work
- Ensure that machinery and equipment in the place of work is designed, made, set up, and maintained to be safe for employees
- Ensure that there are control measures in place for employees exposed to hazards in the course of their work.
- Develop procedures for dealing with emergencies that may arise while employees are at work
- Ensure that all employees are either initially trained/competent to operate plant and equipment or are clearly supervised by someone who is competent.
- Post procedures/working instructions in public places for easy accessibility
6.1.1 Hazard Prevention

Hazard prevention starts at the planning stage of a mining project and continues during operation, mine closure and after-care. Therefore effective public mechanisms should be in place which cover permitting and controlling, where the permitting process covers the entire lifecycle of a mining operation including the after-use.

6.1.2 Hazard Management

Employers should identify hazards in the place of work (previously existing, new and potential) and regularly review these to see whether these hazards have changed and are significant and require further action. Where an accident results in harm to a person, an employer should record it in a register of the prescribed form. The employer should also investigate whether it was caused by a significant hazard.

This does not preclude responsibility on employees to participate in the hazard management process.

Where the hazard is significant, this standard sets out the steps an employer should take.

a) Where practicable, the hazard should be eliminated;
b) If elimination is not practicable, the hazard should be mitigated;

In addition,
The employer should, where appropriate:

- ensure that protective clothing and equipment is provided, accessible and used properly;
- monitor employees’ exposure to the hazard;
- regularly review the hazard to identify any changes in status

Employers should establish systems for this process of identifying and managing hazards.
6.1.2 Information for employees

Employers should inform their employees and health and safety representatives of:
- emergency procedures;
- hazards the employee may be exposed to while at work (ongoing);
- hazards the employee may create while at work which could harm other people;
- how to minimise the likelihood of these hazards becoming a source of harm to others;
- the location of safety equipment and how to use and maintain it.

The employer shall inform employees of the results of any monitoring of health and safety exposure in the workplace. In doing so, the privacy of individual employees should be protected.

The employer should ensure employees are either sufficiently competent to do their work safely or supervised by an experienced and trained person. In addition, the employee shall be adequately trained in the safe use of equipment in the place of work, including protective clothing and equipment.

An employer is also responsible for the health and safety of people who are not employees. An employer should take all practicable steps to ensure that an employee does not harm any other person while at work, including members of the public and other visitors.

6.2 Employees responsibilities

Effective health and safety management should involve everyone in the place of work. Key actions in meeting this requirement include:
- complying with instructions given by an employer or manager
- using and maintaining personal protective equipment provided
- working in a co-operative manner with an employer in health and safety management
- reporting hazards that you are unable to control individually
- exercising your right to refuse unsafe work
- reporting any accident occurred at the place of work
- ensure his own health and safety and for his/her colleague

6.3 Accident recording

Understanding the nature and frequency of accidents within your work area assists in the identification of actual or potential hazards in your workplace. The employers shall have responsibility to maintain a register of all accidents occurring at the place of work.
7.0 General Provisions

7.1 Health and Safety Management Systems

Effective management of health and safety relies on the presence of a health and safety management system. The nature and size of the operation will determine the complexity of this system.

The presence of a site or company specific health and safety management system gives a clear indication of the steps to be taken to effectively manage their health and safety issues.

7.2 Responsibilities of persons in relation to hazard control at work place

Any employee should, immediately before starting work in any area and frequently during work, carefully examine the area for potential hazards that may endanger the safety or health of any person.

Any person who finds or becomes aware of such a hazard should immediately take action (within their capability) to control the hazard so as to remove or reduce the risk of injury or illness.

If the elimination or avoidance of that hazard is not immediately possible, work should cease and the situation reported to a supervisor or manager.

Any person who becomes aware of a hazard presenting a serious and immediate danger at the workplace should immediately suspend any affected operations until the hazard is controlled and area made safe and then report the action taken and the examinations conducted.

No person should drink alcohol or take any drugs that may impair his or her capability of working or responding in an emergency.

7.3 The Hazard and risk management process for surface mines and quarries

The hazard and risk management process should be constant and ongoing and shall be applicable to all aspects of the business from organisation and equipment design to managing site behaviour on the job. It also includes the management of change in all its forms.

The process should be as follows:

- Identification of hazards and associated risks
- Assessment of the hazard and associated risks
- Determining what controls are required to manage the hazard and associated risks
- Developing a recovery plan to prevent escalation if the controls fail
- Monitoring and reviewing controls for effectiveness

The site manager being the person in control of site operations shall ensure that appropriate processes are in place for hazard and risk management.
7.3.1 Hazard and Risk Identification

These two principles should be adopted when approaching the identification of hazards and their associated risks in surface mines and quarries:

- Don’t expect one person to identify the hazards and risks; a team with a range of experience and expertise should be used.
- Use a systematic approach in sufficient detail to ensure all potential hazards identified and that the risks posed by them are confidently and adequately understood.

There are a range of hazard and risk identification methods. Typically a combination of methodologies shall need to be applied to ensure complete identification of hazards and risks. The following identification methods shall be used:
- Geotechnical Analysis
- Hazard and operability studies
- Task Analysis (Job Safety Analysis)
- Physical Inspection
- “What If” Analysis

7.3.2 Hazard and Risk Assessment

A hazard assessment should be carried out to determine which hazards are significant and the exact nature of the risk posed by them. The hazard assessment should:
- Be conducted consistent with recognised hazard and risk assessment approaches
- Take into account all relevant available information concerning the hazard and associated risks at the operation
- Identify and assess the nature and magnitude of all potential sources of the hazard and associated risks
- Include any assumptions made in relation to the identification and assessment of hazard and risks including initiating events
- Include, in relation to each identified hazard and risk, an assessment of the worst case position of the potential source of the hazard and risk having regard to such things as the nature of the operation, future operations, and any possible changes, geological or otherwise mining regulations should be taken into account throughout the assessment.

7.3.3 Hazard and Risk Control

Any measures used to control the hazard or risks posed by a hazard should be based on information obtained from the hazard assessment. The hazard controls shall:
- eliminate
- mitigate

The hazard control element of the hazard management process should:
- set out the measures to be taken to prevent the people coming into contact with hazard
provide for the identification and maintenance of hazard control zones between areas of work and each identified potential hazard if appropriate
include any special systems of working developed for the hazard.
include any assumptions made in the development of measures to control hazards and their risks
be maintained so that the best available knowledge of the risks control at the operation is at all times in practice
be reviewed and if required updated before the operation is developed into any new area

The hazard and associated risk controls should include provisions for reviews of the control’s effectiveness.
The manager should ensure that the persons performing duties as part of the hazard and associated risk control process are competent to carry out those duties and are given appropriate and continuing training.

7.3.4 Hazard monitoring and review

To be confident that the hazards and their associated risks are adequately managed, their status and the controls applied shall be monitored and reviewed. This is to ensure that:
the nature of the hazard or associated risk has not changed
the controls that have been applied are adequate to manage the hazard or associated risk in its current state.

7.3.5 Hazard management plans

Hazard management plans should reflect a hazard and risk management methodology and should include but not be restricted to the following areas:
- Geological phenomenon
- Underground workings
- Flooding and water management
- Hazardous substances
- Natural disasters
- Man Made disasters

For each of the above categories, appropriate technical expertise should be used to identify the presence of such hazards for individual sites. Then an assessment of the risks involved should be carried out.

All hazard management plans dealing with the above hazards and associated risks should be clearly documented and held on site for easy access.
Each hazard management plan should provide for reviews (internal and external as appropriate) of its contents no less than annually by a competent person and this should be documented.
The hazard management plans should clearly identify the roles, skill levels, and responsibilities required for their implementation.
7.3.6 Hazardous Substances

Key areas to consider when managing hazardous substance risk through hazard management plans include:

- Ensuring that persons responsible for managing Hazardous Substances are qualified at the appropriate level.
- Ensuring that hazardous substances are stored and used in a safe manner to ensure exposure is as low as reasonably practicable.
- A system for the medical monitoring of hazardous substance exposure should be in place and define the monitoring protocol and frequency for each substance.
- The provision of adequate Personal Protective Equipments, equipment and resources to carry out the work safely.
- Information contained in a hazardous substance’s safety data sheet should be considered in developing control measures.

7.3.7 Geological Management

The employer shall ensure a system to control any geological failure at the operation is in place. Key areas to consider when managing geological risks through hazard management plans include regular inspections of areas at risk of geological failure e.g. folds, faults, joints, dips, weathering. The greater the risk to the safety or health of persons at a place, the more frequent the inspections.
7.3.8 Flooding and Water Management

The employer should ensure that a system is in place to prevent the adverse effects of flooding or water breaches. Key areas to consider when managing the risks through hazard management and mine or quarry plans should include but not be restricted to the following:

- Water quality and quantity control
- Basins
- Saturation of slopes and machinery operation
- Design of water containment or diversion structures
- Competency of people carrying out the design and construction work
- Fencing or other forms of isolation
- Entrapment in unconsolidated silt
8.0 Mine and Quarry Environment

8.1 Lighting

The lighting provisions for all workplaces, travelling ways and fixed installations should be designed so that all activities can be carried out safely. Particular consideration should be given to highlighting hazardous areas and the provision of emergency lighting.

8.2 First Aid Facilities

In every operation first aid facilities should be provided. In particular; appropriate site specific first aid equipment and supplies should be kept in a position where they are immediately accessible. For every shift, holders of a current and competent first aid certificate should be available to render assistance in the event of an emergency. There should be planned means for getting emergency services or other means of assistance to any injured person.

A regular inspection of the first aid system, equipment and supplies should take place. A review as to the systems effectiveness should be carried out annually. This review should be carried out in conjunction with emergency response exercises as appropriate.

8.3 Air quality control

The employer should ensure that there is a dust, gas,dangerous elements control and ensure enough ventilation and monitoring system in place. This should focus on the health effects of exposure including respirable dust.

The purpose of ventilation in underground mining is to ensure that sufficient fresh air enters the underground environment to dilute, render harmless and remove any flammable or noxious gases and airborne dust. Fresh air should comply with RS 543.

8.4 Sanitation

The employer should ensure good hygienic and sanitary conditions in mining areas for the protection of health of miners. Adequate toilet facilities should be provided in an accessible proximity to working places.
9.0 Personnel

9.1 Pre employment health Screening

A suitable method of ensuring that a person work in a surface environment should be undertaken prior to commencement of employment. This should be based on specific hazards an employee may be exposed to and should involve examination by a medical practitioner or occupational health nurse.

9.2 Ongoing health monitoring

Ongoing monitoring to ensure fitness for work should be maintained and carried out at intervals reflecting the impact of the hazard.

9.3 Training

Employers should ensure that employees receive training or supervision appropriate and suitable to the level of the task(s) to be carried out.

9.3.1 Induction

All new employees should have an induction before start of work. This should include coverage of company procedures including site specific detail such as emergency response and high hazard areas.

All contractors and visitors who are visiting the operation should undergo an appropriate induction. If they are to be directly supervised this may be of a lesser nature than for employees.

9.4 Personal Protective Equipment

The provision of personal protective safety equipment shall be the responsibility of the employers. They should ensure that all people who are required to wear such equipment are trained in its correct use and maintenance.

The ongoing use and maintenance, where applicable, of personal protective equipment is the joint responsibility of the employer and individual employees.

Replacement cycles should be identified for all protective equipment. These should reflect the manufacturers/suppliers guidelines and the environment in which the equipment is used.

9.4.1 Types of protection

Personal Protective Equipment (PPE) shall be available for almost every part of the body and the type of equipment purchased shall depend on the protection that is required.
9.4.1.1 Head Protection

Miners shall be provided with, and shall wear, safety caps or hats which are approved in the jurisdiction in which the mine operates.

The cap or hat should be equipped with a lamp bracket and cord holder to permit mounting of a miner’s cap lamp. In areas of the mine where permanent lighting is not installed, the miner’s cap lamp is essential to permit the miner to move and work effectively and safely. The key requirements for a cap lamp are that it be rugged, easy to operate with gloved hands, provide sufficient light output for the full duration of a work shift (to illumination levels required by local regulation) and that it be as light as possible without sacrificing any of the above performance parameters.

9.4.1.2 Foot Protection

The mining work boot should be of either leather or rubber construction, depending on whether the mine is dry or wet. Minimum protective requirements for the boot include a full puncture-proof sole with a composite outer layer to prevent slipping.

9.4.1.3 Eye and Face Protection

Mining operations require the miner to wear safety spectacles, goggles, faceshields or a full face piece respirator, depending on the operations being performed and the combination of hazards to which the miner is exposed. For the majority of mining operations, safety spectacles with side shields provide suitable protection.

Goggles are not worn frequently below ground unless the particular operation poses a danger of chemical splash.

A faceshield may be worn where the miner requires full-face protection from weld spatter, grinding residues or other large flying particles which could be produced by cutting, chipping or scaling.

A full face piece respirator may be worn for face protection when there is also a requirement for respiratory protection against a substance which is irritating to the eyes. Such operations are more often encountered in the above ground mine processing than in the below ground mining operation itself.

9.4.1.4 Respiratory Protection

The respiratory protection needed in mining operations shall dust protection. The equipments should include: face masks, half face respirators, air filter units.

9.4.1.5 Hearing Protection
Underground vehicles, machinery and power tools generate high ambient noise levels which can create long-term damage to human hearing. Protection is normally provided by ear muff type protectors which are slot-mounted on the miner’s cap. Supplementary protection can be provided by wearing closed cell foam ear plugs in conjunction with the ear muffs. Ear plugs, either of the disposable foam cell variety or the reusable elastomeric variety, may be used on their own, either because of preference or because the accessory slot is being used to carry a face shield or other accessory.

9.4.1.6 Skin Protection

Certain mining operations may cause skin irritation. Work gloves should be worn whenever possible in such operations.

Work gloves shall be worn for hand protection

9.4.1.7 Clothing

Ordinary cotton coveralls or treated flame-resistant cotton coveralls should be the normal work wear in mines. Strips of reflective material should be added to make the miner more visible to drivers of moving underground vehicles. Miners working with heavy equipment may also wear rain suits over their coveralls to protect against cutting fluid, hydraulic oil and lubricating oils, which can spray or leak from the equipment.

9.4.1.8 Belts and Harnesses

The belt and harnesses should be worn for protecting miners against falls.

9.4.1.9 Protection from Heat and Cold

In open-pit mines in cold climates, miners shall have winter clothing including thermal socks, underwear and gloves, wind resistant pants or over-pants, a lined parka with hood and a winter liner to wear with the safety cap.

In underground mines, heat is more of a problem than cold. Ambient temperatures may be high because of the depth of the mine below ground or because it is located in a hot climate. Protection from heat stress and potential heat stroke can be provided by special garments or undergarments which can accommodate frozen gel packs or which are constructed with a network of cooling tubes to circulate cooling fluids over the surface of the body and then through an external heat exchanger. In situations where the rock itself is hot, heat resistant gloves, socks and boots are worn. Drinking water or, preferably, drinking water with added electrolytes must be available and must be consumed to replace lost body fluids.

9.4.1.10 Other Protective Equipment
Depending on local regulations and the type of mine, miners may be required to carry a self-rescue device. This is a respiratory protection device which will help the miner to escape from the mine in the event of a mine fire or explosion that renders the atmosphere unbreathable because of carbon monoxide, smoke and other toxic contaminants. The self-rescuer may be a filtration type device with a catalyst for carbon monoxide conversion or it may be a self-contained self-rescuer, i.e., a closed-cycle breathing apparatus which chemically regenerates oxygen from exhaled breath.

9.5 Communications

Suitable means of communication should be provided and maintained throughout the operation. These may include the following:
- Signs
- Alarms
- Lights
- Radios
- Telephones

For people who are required to work alone, appropriate procedures for regular communication with another person should be in place. This may involve the use of a mobile phone or radio.

10.0 Surface Plans

10.1 Site Plan

In order to prevent personal injury, damage to services and to facilitate emergency response, accurate plans of the surface area of the site should be prepared and held on site in a place accessible to all employees. This information should be communicated to all potentially affected people. The plans should be to scale and should include:

- The boundaries of the surface area
- Offices, buildings, processes, workshops, explosives magazines, fuel storage, emergency assembly areas, underground workings, access roads and any other permanent structures
- Utilities infrastructure including:
  i. The high voltage reticulation system
  ii. Buried and overhead electrical services
  iii. Gas lines
  iv. Water lines
  v. Sewerage lines
  vi. Communications cables
  vii. This plan must be reviewed and updated when changes to any of the above occur.

10.2 Plans of Workings
In some instances it is appropriate to develop plans of surface or underground workings. These should be updated to reflect changing operations. The nature of the operation (size and potential hazards) will determine the necessity of having such a plan and the frequency of the plan reviews. This plan may include but not be limited to the following:
- Roadways
- Pits
- Slope
- Water courses
- Stockpiles
- Overburden dumps
- Ponds

10.3 Surface Plan Identification

All current site plans should be identified as such. They should have the date they were finalised and indicate the review schedule in a clearly visible place. Each plan is to be signed by a competent person responsible for the planning process and its accuracy.

11.0 Environmental management practices

11.1 Land disturbance

The company should ensure that the area and duration of disturbance to land and vegetation is minimised.
To minimise the area and duration of disturbance to land and vegetation the following measures or similar measures can be used:
- avoid disturbing large and/or mature trees;
- select specific trees to be cleared and avoid causing damage to surrounding vegetation;
- where practical leave the rootstock intact to promote regeneration and regrowth.

11.2 Air quality

The company should comply with RS 544:2010.

To prevent causing an unreasonable release of emissions; the following measures or similar measures can be used:
- altering work practices to avoid or minimise the generation of dust;
- scheduling activities for times when they will have least impact;
- spraying water on roads and tracks;
- revegetating disturbed areas as soon as practicable;
- leaving or creating wind breaks or screening; and
- installing pollution control equipment (e.g. fitting bag filters or a cyclone to dust generating equipment).

11.3 Noise emissions and vibrations
The company should not cause unreasonable noise at a noise sensitive place. Mines in areas where ground vibration and noise from blasting are not regulated; there should be the design of their blasts so that the following criteria are not exceeded at or beyond the boundaries of the mine property:

- ground vibration of 12.5 mm/sec peak particle velocity measured below grade or less than 1 metre above grade; and
- concussion noise of a maximum of 128 dB.

In residential areas adjacent to mine sites, the equilibrium sound pressure level (Leq) from mining activities should not exceed 55 dBA during the day and 45 dBA at night. Ambient noise can also affect wildlife. Sites in remote locations should also work to meet these objectives for off-site ambient noise levels.

To prevent causing unreasonable noise at a noise sensitive place the following measures or similar measures can be used:
- construct and maintain noise barriers and enclosures around noisy equipment or along the noise transmission path;
- implement noise reduction measures at noise sensitive places;
- provide and maintain low noise equipment;
- carry out routine maintenance on fans to minimise bearing noise; and
- repair or replace defective mufflers of vehicles and plant with suitable effective mufflers;
- limit the hours of operation of the project

11.4 Erosion and sediment control

The company should design, install and maintain adequate banks and/or diversion drains to minimise the potential for storm water runoff to enter disturbed areas.

The company should also design, install and maintain adequate erosion and sediment controls wherever necessary to prevent erosion of disturbed areas and sedimentation of any Watercourse.

Regularly clean out sediment traps, ponds and drains and maintain them in effective working order, until erosion stability has been achieved in disturbed areas.

11.5 Topsoil and Overburden Management

The company should ensure that topsoil is removed and stockpiled prior to carrying out any mining activity. Prevent or minimise the mixing and erosion of topsoil and Overburden stockpiles.

To separate topsoil and overburden and to prevent or minimise the erosion of these stockpiles the following measures or similar measures can be used:
- identify topsoil and overburden layers before stripping topsoil;
- store topsoil and overburden in separate stockpiles;
- where practicable; reuse topsoil stockpiles;
- establish and maintain a temporary cover crop on stockpiles; and
- limit the height of topsoil stockpiles to 2 metres.

11.6 Hazardous substances

The company should ensure that spills of hazardous contaminants are cleaned up as quickly as practicable. Such spillage must not be cleaned up by hosing, sweeping or otherwise releasing such contaminants to any watercourse, waterway, groundwater, wetland or lake.

11.7 Stability of mining infrastructure

11.7.1 Construction of new roads and tracks

When constructing new roads and tracks, the company should ensure that the area and duration of disturbance to land, vegetation and watercourses is minimised.

When planning and constructing new roads and tracks the following measures or similar measures can be used to minimise the area and duration of disturbance of land, vegetation and watercourses:
− wherever possible use or upgrade existing roads and tracks;
− construct roads and tracks along natural grades;
− minimise the width of roads and tracks;
− avoid constructing roads or tracks that run straight down the bank to the crossing;
− do not disadvantage other users of existing public roads & tracks;
− construct a bed level causeway, a culvert or a bridge where natural bed conditions within a watercourse will not carry the intended traffic load or where crossing of the bed will generate a significant increase in turbidity;
− position crossings to prevent flow being directed towards the banks and provide erosion resistance to the bed and banks downstream of a crossing for a distance equal to the width of the normal flow channel;

− do not create any downstream or upstream drops at the lip of culverts or causeways;
− regularly clean out culverts, bridges and causeways to prevent flow being impeded or redirected; and
− construct in-stream crossings outside of main fish migration periods.

11.7.2 Access to and from underground workings

Where a mine or tunnel or a new section of a mine is being developed, single access is sufficient, but a second means of egress, independent and separate from the primary access shall be provided and put in place as soon as practicable.

An appropriate ladder of footway shall be provided in every shaft being sunk for person ascending or descending, unless other means of travel is provided.

11.7.3 Washing plants and ponds
In washing plants moving machine parts on trommels, screw classifiers, pumps etc. need guarding. Walkways may require skid resistant surfaces and warnings of possible slippery surfaces. Where deep ponds create a potential drowning hazard they should be fenced off and warning signs posted. Barriers such as windrows are required where vehicle traffic moves adjacent to deep ponds. Regular inspections may be necessary to assess stability in areas where erosion could undercut and weaken embankments.

11.7.4 Electricity

Electrical work can only be done by qualified electricians but operators should make regular visual checks to ensure that equipment is in a safe condition and that cables remain properly supported and well protected. Overhead and underground cables should be marked on a plan and precautions taken to avoid contact with machines e.g. visible markings. Electrical safe distances between any live overhead electric line and any part of a mobile plant (or load carried) should be at least 4 metres, unless the operator has received written consent from the line owner. If mobile plant is to be used in the proximity of overhead electric lines a warning notice should be conspicuously posted in the cab in view of the operator.

Fires are often caused by faulty electrical equipment and suitable fire extinguishing capability should be readily available. Electrical installation rooms shall be kept dry and clear of combustible materials and shall not be used for general storage. Isolating transformers or earth leakage protection should be used for work with electrical hand tools.

Elevated fixed platforms, walkways and access stairways should be provided with protection rails and toe-boards. Inspections should take place with sufficient frequency to ensure that the floors, railings are sound and safe from moving machinery. Climbing up or walking on places and equipment that were not designed for the purpose should be prohibited. Portable ladders should be of industrial type.

Elevating work platforms such as cherry-pickers and scissor-hoists may be used by operators who have been trained in set-up and operation procedures. Scaffolding shall be properly constructed using material that has the strength to cater for all loading that it may be subjected to.

Suitable barriers or exclusion zones should be in place to prevent falls into crushers and other dangerous machinery. Note that the use of a harness and fall arrest device is a specialised area and should only be undertaken by people who have been suitably trained.

Emergency procedures shall be in place to enable a rescue within a few minutes of any fall occurring.

11.8 Waste management
The company should not directly or indirectly release waste from the project area to any watercourse, waterway, groundwater, wetland or lake. When managing waste materials the following strategy should be adopted:
- waste minimization;
- waste recycling and reuse
- waste treatment and disposal;

The company must not directly or indirectly release wastewater to any watercourse, waterway, groundwater, wetland or lake. To prevent the direct or indirect release of waste water to any watercourse, waterway or groundwater, wetland or lake the following measures or similar measures can be used:
- where practical recycle all waste water;
- Wastewater recycling and reuse
- Wastewater treatment and disposal

With regard to the on site management of water refer to RS 463:2009 the Permissible limits for industrial wastewater.

11.9 Sludge management

Sludge that is a by-product of the treatment of mine effluent should be managed so that it will remain in a physically and chemically stable state. In this regard, a mine owner/operator should:
- characterize treatment sludge to determine whether there are potential leaching concerns;
- avoid disposal of treatment sludge with potentially acid generating wastes;
- dispose of sludge in a physically secure facility under conditions that will maintain the chemical stability of the sludge; and
- treat and monitor wastewater from the sludge management facility as necessary to ensure regulatory requirements are met.

In cases where a mine is predicted to produce large volumes of sludge over an extended period of time, the mine owner/operator should consider using a treatment process that produces a denser, lower volume sludge.

11.10 Service, Maintenance and Storage Areas

The company should not directly or indirectly release fuels, oils, lubricants or other contaminants to any watercourse, waterway, groundwater, wetland or lake. To prevent the direct or indirect release of fuels, lubricants or other contaminants to any watercourse, waterway, groundwater, wetland or lake the following measures or similar measures can be used:
- maintain all refuelling equipment in good working order;
- use groundsheets or drip trays to capture spillage during maintenance of machinery and vehicles;
- locate all fuel storages within an impermeable bund;
- ensure all liquid containment, including fuel tank bunds and process water ponds, have a volume at least equal to the design volume plus an additional 10% of that volume; and
- where practical, undertake all refuelling and routine maintenance of vehicles within designated service areas.

11.11 Drilling, excavating and sampling

The company should ensure:
- all marker pegs are marked with contrasting colour so as to be clearly visible;
- all marker pegs are removed from the tenement at the completion of exploration activities;
- all permanent markers (example, concrete plugs or steel plates) are installed at ground level and made safe.

When drilling, excavating or sampling, the company should ensure that the area and duration of disturbance to land and vegetation is minimised.

- When drilling, excavating or sampling the following measures or similar measures can be used to minimise the area and duration of disturbance to land and vegetation:
  - consider seasonal influences, such as rainfall before excavating or establishing a drill site;
  - construct drill pads no larger than necessary to safely accommodate the drilling rigs and ancillary equipment;
  - use excavators or backhoes wherever possible in preference to bulldozers; and
  - use drilling fluids and other process fluids which are non-toxic.

- Install and maintain adequate warning signs, fences and rock bunds to exclude people, livestock and native animals from excavations and shafts.
- Provide safe access to water for livestock and native animals by:
  - providing hard surfaces around water storage areas; and
  - fencing off any soft areas around the edge of water storage areas.

The company should not drill, excavate or clear vegetation:
- in standing waters, wetlands or lakes; or
- on the sloped banks or within 3m of the top of the bank or 5m of the toe of the bank; or
- within, or on the levee banks of the normal flow channel.

11.12 Climate change

Strategies for reducing GHG releases to the atmosphere should be considered and implemented throughout all phases of the mine life cycle. Carbon reduction opportunities should include the use of heavy equipment and vehicles that are fuel efficient and/or use alternative fuel.

In planning all aspects of mine operations, particularly water management and mine waste management, the potential impacts of climate change should be considered. Regional long-term predictions of climate change should be consulted, and predicted changes with respect to temperature, precipitation and extreme weather events should be taken into account.

Any aspects of site infrastructure that could be affected by climate change should be planned, constructed and operated in a manner that will reduce or eliminate the potential impacts associated with climate change.
12.0 Emergencies

A system that deals with emergencies shall be in place and have been communicated to everyone on the site. Employees should be given opportunity to participate in the development of this system. This system should clearly state the methods and process to be used in the tasks of the emergency. It should cover but not be limited to the following:

- Emergencies that may be encountered at the site
- General emergency procedures including evacuation to assembly areas
- Provision for the transport of sick or injured persons
- Isolation and control of access to the incident area
- Appointment of duties to be carried out by designated individuals
- The supply and maintenance and training in the use of emergency equipment
- Provision and supply of water storage and reticulation for fire fighting
- Reporting and replacement of damaged equipment
- Liaison and working with Emergency Services, including guidance to the site, as appropriate
- Methods of communication between all parties involved in an emergency
- The emergency response system for permanent sites should be tested and reviewed in a live simulation at least once per year.

13.0 Explosives

Procedures should be developed, implemented and monitored to ensure that only an approved handler may store, transport, initiate, and dispose of explosives. Procedures should include the following:

selection of explosives
- Selection of explosives
- Storage of explosives
- Transport of explosives
- Preparation and charging of explosives
- Initiation of explosives
- Treatment of misfires
- Disposal of unwanted or deteriorated explosives

NOTE Mines using ammonium-based explosives should adopt best management practices for blasting and for the handling of these explosives to avoid spillage and minimize ammonium residue remaining after blasting, thereby lowering the potential for ammonium contamination.
14.0 Equipment and Machinery

14.1 Stationary plant

14.1.1 General

All exposed and dangerous parts of machinery or plant should be kept securely fenced or guarded so as to prevent any person from coming into contact with them. Emergency stop facilities, which enable power to be promptly cut off in the event of imminent danger, should be provided within reach on all plant or equipment that may pose a danger.

A warning system prior to start-up should be used in all instances.

All pipes used to carry compressed air, water, gas or other hazardous substances should be clearly identified and should be checked at regular intervals along the pipe system.

A system of managing defects that may affect the safety of electrical, hydraulic or mechanical equipment should be in place and cover:

- The prevention of use of that plant or equipment
- The means by which that defect is repaired
- The recording of the defect and repair

Each site should have a preventative testing and inspection system for the safety related aspects of equipment and machinery. Records of all such activities should be kept.

14.1.2 Isolation and Lockout

Procedures shall be developed, implemented and monitored to ensure that potentially damaging energy is isolated from persons who have to work on electrical, hydraulic or mechanical plant or equipment.

These procedures should include the requirement that isolations are carried out:

Prior to any work commencing and that those isolations attain a state of zero energy.

Any stored energy is made safe and confirmed as such.

14.1.3 Conveyor belt

The area in which the conveyor is used should be of sufficient width to allow inspection and maintenance. Access ways beneath conveyors should have adequate overhead protection. Conveyors should be kept free of flammable material, rubbish and spillage.

The belt and its load should also remain clear of any other structures such as cable trays and power lines.
Regular inspections should be carried out to ensure undue heating of either the belt or spillage does not occur and potentially present a fire risk and that other points referred to in this section are adhered to.
Conveyors, where accessible, should have an emergency stop device along their entire length. Where appropriate rollback/anti-runaway devices should be fitted.

14.1.4 Crushing & Screening unit

The area in which the crusher or screen is located should be sufficient to allow inspection and maintenance.
Crusher and screening platforms should be kept free of spillage and other debris.
Daily documented inspections should be carried out to ensure crushers and screens are safe to operate.
Crushers and screens should be isolated and locked out prior to undertaking maintenance.
Appropriate precautions must be taken to eliminate or minimise exposure to noise and dust. Where exposed suitable protection should be supplied.
Detailed information may be obtained from the guideline for identifying hazards associated with crushing and screening plants in mines and quarries.

14.2 Mobile Plant

14.2.1 General

Only competent persons authorised by the manager may operate mobile plant.
All vehicles shall be fitted with seatbelts of the appropriate standard for the driver and any passengers. Seatbelts shall be worn at all times when a vehicle is in operation. Passengers shall only be carried where a seat fitted with seatbelt is provided.
Mobile plant that operates in an environment in which people are working should be fitted with the following items:
− Adequate lights
− A suitable fail-to-safe braking system
− An effective method for ensuring the vehicle is visible under all circumstances. This may include flashing lights, pole flags, running lights.
− Suitable fire fighting equipment
− A reverse warning system
− Comprehensive vision forward and back
− A suitable washing and wiping system for operator visibility

14.2.2 Testing of Mobile Plant

− Pre-operational checks should be carried out and recorded by operators every shift
Provisions should be made for the systematic testing and inspection of all mobile plant by a competent person. All inspections and tests should conform to a schedule of examinations and tests and be documented and records held.

Inspection and testing should include:
- The thorough examination and testing of all mobile plant at an interval appropriate to the type of transport and according to the manufacturers’ guidelines
- Steering and lighting systems
- The inspection of all moving parts of mobile plant that are practically accessible to establish that they are moving freely and without obstruction
- The thorough examination of all parts of the mechanical braking system of the mobile plant, including:
  i. Braking surfaces (pads, blocks and similar parts) to ensure they are not excessively worn
  ii. Brake actuators to ensure that they are operating satisfactorily
  iii. The testing of all braking systems of mobile plant shall follow manufacturer’s instructions/specifications.

14.2.3 Trains

A set of plans showing all parts of the railway system of the mine or quarry operation should be prepared and held at the site office. Rules and procedures determining shunting and loading operations shall be documented and communicated to all affected personnel. These should include responsibilities and authorities.

14.2.4 Traffic Control and Roadway Conditions

In relation to all mobile plant, rules should be documented and communicated to all parties involved. These should include but not necessarily be limited to the following:

a. The conditions under which mobile plant is used

b. Measures taken to keep roadways clear of debris or other materials that may negatively impact on mobile plant

c. Ensuring the safe operation of the mobile plant by providing for the following:

i. The maximum loads (by reference to weight, dimensions, number or other criteria) that may be carried in or towed by mobile plant

ii. The areas in which speed restrictions apply and the nature of the restrictions

iii. The conditions under which a person may work on or adjacent to a roadway to be used for mobile plant

iv. Parking procedures for transport or haulage
The safe refuelling of mobile plant

vi. Inter-vehicle communication

vii. Overhead obstacles

viii. Traffic flow requirements

All roadways on which mobile plant operates shall be maintained to standards consistent with the safe operation of that mobile plant. In particular:

a. The roadway should be clearly defined at all times

b. Signs indicating speed limits should be placed in strategic positions

c. The roadway should be wide enough to accommodate all traffic potentially using it.
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