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# DEVELOPING CODES OF PRACTICE TO IMPROVE SAFETY

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## INTRODUCTION

Codes of Practice are a common tool in the mining and quarrying industries used to improve occupational health and safety practices as well as assisting employers to remain compliant with statutory legislation.
This paper outlines experiences gained in the development and application of Codes of Practice relating to geotechnical practices in quarries, combating slope instability or minimizing 'falls of ground'.

## INTERNATIONAL LEGISLATION

### United Kingdom

The Health and Safety Commission issued an 'Approved Code of Practice' for Health and Safety at Quarries in line with the total Quarries Regulations 1999.
Whilst this is a guide and one can use alternative methods to comply with the law, the ACOP has special legal status.
The parts that are relevant to Examining and Making Safe Quarries and Tips include:

- Part II Health and Safety Management
- Part III Risk Control
- Part V Explosives
- Part VI Excavations and Tips
- Appendix 3 Excavation and Tip Inspection Reports

In June 2009, the Quarries National Joint Advisory Committee issued a Guidance on Safe Face Management Operations in Quarries giving more practical advice.
The quarry operator needs to have a competent person carry out appraisals of the hazards and risks at appropriate intervals and, when significant hazards are identified, engage the services of a geotechnical specialist to review designs, methods, inspections and identify remedial measures.

### South Africa

The Mine Health and Safety Act provides for employers to conduct hazard identification, risk assessment plus develop strategies to minimize, eliminate or control the risks.
It also provides for employers to compile certain specific Mandatory Codes of Practice including "Combat rock falls and slope instability in Surface Mines" – commonly known as Fall of Ground (FOG).
The regulations under the Act include Chapter 14 – Falls of Ground. The employer has several duties to protect people, equipment, etc., but specifically has to appoint competent persons to examine, make safe and declare safe excavations, dumps, etc., prior to work commencing.

The competencies for appointees to do the examination are specified by the Mining Qualification Authority in the form of Skills Programmes consisting of several related unit standards. Candidates have to be trained towards these unit standards and assessed competent in the work place.
In addition, the employer has to involve a competent Rock Engineer in the designs of the excavations as well as the operating practices.
A major difference from UK practice, is that each operation has a site specific Code of Practice and although the structure is prescribed, the contents vary widely between operations.

## United States of America

Individual states have their own specific regulations and structures, e.g. California State Mining and Geology Board falls under the Department of Conservation.
The extent and detail of the various regulations appears to be allied to the amount of overall mining activity taking place in that particular state, e.g. Colorado has extensive regulations relating to slope stability.

## Australia

The West Australian legislation provides in 13.8 for Geotechnical considerations. The employer/manager must ensure that geotechnical aspects are considered relating to the design and operations at the quarry.
The responsible person(s) should consider a variety of measures relating to ground control including geology, rock mass classification, hydrogeology, rock support, slope stability, drilling/blasting practices and monitoring. Written safe working procedures are also required in certain circumstances.
Regulation 13.9 provides for Precautions in working faces and benches. Items covered are heights of quarry benches, scaling procedures, slope angles and safety berms/benches, drilling practices, undercutting.

## General

It is thus common for employers and managers to ensure that examinations and appraisals are carried out of rock fall and slope instability hazards and risks plus assessment of design and operating practices by a Rock Engineer or Geotechnical specialist. There is need to have competent people trained in this area of expertise as well as implementing written procedures.

## CODES OF PRACTICE – SLOPE INSTABILITY

In order to assess the effectiveness of these Codes of Practice (COP), the history of the South African mandatory COP is considered.
The regulations requiring competent persons to examine, make safe and declare safe came into force in January 2003.
A temporary provision allowed ‘blasters’ to carry out these duties whilst the unit standard based competencies were developed. In October 2004, the mandatory COP for combating slope instability was introduced.
These events created a hiatus for both the rock engineering consultants as well as the training providers to develop and deliver the COP documents, the training material plus carry out the learning and assessment.
The format and contents of the COP were specified in detail and included sections on:

- Locality
- Geological setting
- Mining environments
- Ground Control Districts
- Rock Fall/Slope Instability Incident Analysis

This technical background often occupies the bulk of the COP's contents.
The principal focus of the COP should be in the Risk Management sections, identification of hazards, the evaluation of the risks and the strategies to deal with them. These strategies should include the impact of quarrying operations with specific reference to Rockbreaking on slope instability as well as the bench designs and overall pit stability. The procedures for examination, monitoring and making safe as well as any support need to be spelt out.
In addition, the Code requires an implementation plan to be drawn up.
This Code should be reviewed annually and/or after each incident related to FOG.

## RESPONSIBILITIES FOR CODE OF PRACTICE – SLOPE INSTABILITY

The manager, in conjunction with the Health and Safety Committee, must appoint a special committee to draw up this COP. This group must include a Rock Engineer.
The vast majority of quarry groups do not have in-house geotechnical practitioners and thus this work is generally given to a consultant. In consultation with management, the subject matter expert draws up the whole document for approval by the committee.
The regulations require the appointment of competent people to:

- Examine, make safe and declare safe
- Install, maintain and remove support
- Make geotechnical inputs to the design and operations related to slope stability.

The required competencies are specified in terms of either government Certificates of Competency or outcomes based qualifications.
The onus is on the employers and their appointed managers to ensure documents are drawn up, appointments made, quality assure the implementation of the Codes of Practice plus comply with the statutory regulations.

## PROBLEM AREAS

Some 6 years after promulgation, some employers are still struggling to implement and make effective use of these Codes of Practice.
Several areas have caused problems and these include:

- **Technical documentation**
  The geotechnical inputs become unduly large, complicated and contain discipline specific jargon or terms making them difficult to read and understand for the operating staff.
- **History of Incidents**
  Very few operations kept records of falls of ground and thus there was no history or classification of failure types to assist in the assessment of future failure types.
- **Hazard Identification and Risk Assessments**\
  The operating staff lacked focus on identifying the hazards and making assessments of the severity and consequence of the risks.

There tended to be either a very long list which included non-slope stability related aspects or a short list which missed out simple hazards.

- **Strategies to deal with risk**
  In general, these either lacked sufficient detail or contained too many safety related constraints which made the work "impractical" and led to non-adherence to the procedures.
  The examination procedures were often only in the form of a check list but gave no instructions/guidance on how best to carry them out.
  The processes for making safe were often restricted to use of an excavator to do face scaling.
  Any installations of support were left to the rock engineering consultant to specify if and when a 'special' risk area had been identified.
  Some operations had specified several Ground Control Districts where different failure modes occurred, e.g. wedge failures on the west wall and planar failures on the north wall. This became difficult for workers in the pit/quarry to distinguish which area they were working in and which procedures were applicable.
- **Monitoring**
  Larger/deeper pits and quarries have a wide variety of slope monitoring devices – prisms, laser scanning, digital photographs, "rock radar", etc. These are often installed and monitored by geotechnical staff. They also evaluate the results and provide data to the operations staff.
  This scenario tends to blur the responsibility for evaluating the faces and declaring them safe.
  Generally, the focus is on the current working faces and the accesses; but who is monitoring the dormant upper benches and/or final pit/quarry slopes needing higher factors of safety.
- **Ownership**
  The use of consultants to develop these COPs greatly assisted the employers to become compliant. However, the employees most affected had very little input and felt a lack of ownership.
  This situation becomes even more complicated when the quarry operator utilizes a variety of contractors. The drilling contractor has high risk exposure, the blasting contractor/explosives supplier to a lesser extent and the load and haul contractor can be working beneath the operations of both the drill and blast operators.
  The manager has a duty to make sure that workers are competent, and thus all contractors should be trained to evaluate the slope instability hazards and risks. In these forms of work organization, good communication and liaison is vital.
- **Implementation**
  This facet of the COP requirement was generally the weakest in that rarely were there plans to develop candidates with responsibilities against the specified competencies. The basics relating to Falls of Ground also need to be explained to the equipment operators and others working in risk areas.

## LESSONS LEARNT

- **Training**
  The delivery of the knowledge training has been rewarding. The phrase "Water is your enemy" has been hammered into in excess of 1200 candidates. They universally agree that their vision has been broadened and they now can identify the hazards/risks not seen before.
  There is still some way to go however in improving the skills or practical coaching on the job.
- **COP Development**
  The technical appraisals should be put into Appendices to avoid learners getting bogged down in technical detail.
  The procedures should also be put into separate appendices and issued to the various learners as appropriate.
  The employees working at the faces should take part in the process of identifying the hazards/risks as well as making inputs to the possible strategies to deal with them.
  This point has also been made in the latest document from UK's QNJAC.
- **Strategies**
  Procedures to deal with slope instability risks should be developed to suit the levels of hazards and competent persons.
  These however should not be overly complicated to implement. Some simple rules can be established for no-go areas based on the "traffic-light" system, e.g.
  - Red: No-go within 3m of crest; no-go within 10m of the toe of a face.
  - Amber: Only essential work in these areas, e.g. drilling, blasting, loading.
  - Green: Open areas.

History has shown that the major slope failures are generally related to presence of water, however, it is the unexpected minor rock fall which is more difficult to detect and can quickly turn into a disastrous fatality.

## CONCLUSION

In conclusion, there is a need to improve the processes to develop Codes of Practice, simplify the contents into easier to absorb sections plus intensify the skills development for all workers engaged in the excavation processes.

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