

**Guidance Note
QGN13**

***Safe Work near Drawpoints in
Underground Metalliferous Mines***

Mining and Quarrying Safety and Health Act 1999

March 2008

GUIDANCE NOTE – QGN13 SAFE WORK NEAR DRAWPOINTS IN UNDERGROUND METALLIFEROUS MINES

This Guidance Note for *Safe Work near Drawpoints in Underground Metalliferous Mines* will assist mine operators identify the hazards and possible controls associated with working in the vicinity of such openings.

This Guidance Note was developed after a recommendation from a Coronial Inquiry into the death of a mine worker who was struck by a rock deflecting out of a stope. It also includes information from a subsequent workshop facilitated by the Department of Mines and Energy Mines Inspectorate in October 2005.

While this Guidance Note deals largely with hazards from falling rocks, hazards from other falling debris should also be considered when you are establishing potential safe working controls.

This Guidance Note is not a Guideline as defined in the *Mining and Quarrying Safety and Health Act 1999*. In some circumstances, compliance with this Guidance Note may not be sufficient to ensure compliance with the requirements in the legislation.

Guidance Notes may be updated from time to time. To ensure you have the latest version, either check the Department of Mines and Energy website or contact your local inspector of mines.

<p>North Region PO Box 1752 Townsville Qld 4810 (07) 4760 7404 Fax (07) 4760 7400</p>	<p>North Region PO Box 334 Mount Isa Qld 4825 (07) 4747 2158 Fax (07) 4743 7165</p>	<p>North Region PO Box 210 Atherton Qld 4883 (07) 4095 7023 Fax (07) 4091 2844</p>
<p>Central Region PO Box 1801 Mackay Qld 4740 (07) 4953 0860 Fax (07) 4953 2761</p>	<p>Central Region PO Box 548 Rockhampton Qld 4700 (07) 4938 4187 Fax (07) 4938 4331</p>	<p>South Region PO Box 1475 Coorparoo Qld 4151 (07) 3238 3722 Fax (07) 3405 5346</p>

TABLE OF CONTENTS

1	PURPOSE AND SCOPE	4
2	LEGISLATIVE OBLIGATIONS AND RISK MANAGEMENT	4
3	WORKING NEAR DRAWPOINTS AND POTENTIAL CONTROLS FOR SAFE WORK.....	6
3.1	KEY RECOMMENDATIONS FOR SAFE WORK.....	6
4	GUIDANCE.....	7
4.1	REGISTER OF VERTICAL OPENINGS.....	7
4.2	DRAWPOINTS.....	7
4.2.1	WORKPLACE ASSESSMENT.....	8
4.3	<i>POTENTIAL CONTROLS</i>	<i>9</i>
4.3.1	<i>ELIMINATION OF THE HAZARD OR SUBSTITUTION WITH A LESSER HAZARD</i>	<i>9</i>
4.3.2	<i>SEPARATION OF WORKERS FROM THE HAZARD</i>	<i>9</i>
4.3.3	<i>ENGINEERING CONTROLS</i>	<i>11</i>
4.3.4	<i>ADMINISTRATIVE CONTROLS.....</i>	<i>11</i>
4.3.5	<i>PERSONAL PROTECTIVE EQUIPMENT.....</i>	<i>12</i>
5	DEFINITIONS.....	13
6	REFERENCES.....	13

1 PURPOSE AND SCOPE

This Guidance Note will assist mine operators to identify the main activities requiring personnel to work near drawpoints and stopes, and will help them identify potential controls when completing a risk assessment at their own mine sites.

2 LEGISLATIVE OBLIGATIONS AND RISK MANAGEMENT

This Guidance Note does not replace a mine operator's requirement to manage safety aspects around open voids using risk management, as provided by the *Mining and Quarrying Safety and Health Act 1999*.

The *Mining and Quarrying Safety and Health Act 1999* (MQSHA), Section 26, requires operational risk to persons to be at an 'Acceptable Level'. As such, risk management should incorporate as many controls as necessary, using the standard hierarchy of controls.

The *Mining and Quarrying Safety and Health Act 1999* provides the following specific requirement:

MQSHA, Section 26 What is an acceptable level of risk

(1) For risk to a person from operations to be at an 'acceptable level', the operations must be carried out so that the level of risk from the operations is—

- (a) within acceptable limits; and*
- (b) as low as reasonably achievable.*

(2) To decide whether risk is within acceptable limits and as low as reasonably achievable, regard must be had to—

- (a) the likelihood of injury or illness to a person arising out of the risk;*
- and*
- (b) the severity of the injury or illness.*

Each mine is different. Each must manage its own risks as outlined in the *Mining and Quarrying Safety and Health Regulation 2001* (MQSHR), Part 2, Sections 5–11, and establish solutions which apply the hierarchy of controls, (ref MQSHR, Part 2, Section 8).

The above requirements are legislated in MQSHR, Sections 7 and 8.

MQSHR, Section 7 Risk analysis

(1) A person who has an obligation under the Act to manage risk at a mine must analyse risk in the person's own work and activities to decide whether the risk is at an acceptable level.

(2) The person must have regard to the following in analysing the risk—

- (a) the results of hazard identification, risk monitoring and incident investigations carried out for the mine;*

- (b) the work environment and work methods for the mine's operations;*
- (c) the interaction of hazards present at the mine;*
- (d) the effectiveness and reliability of hazard controls in use at the mine;*
- (e) other reasonably available relevant information and data from, and practices in, other industries and mining operations.*

Where possible, risk should be eliminated before engineering controls are put in place. Engineering controls should be incorporated before adoption of soft administrative controls such as procedures and personal protective equipment.

Practices in other industries and mining operations are an important consideration when you are deciding whether risks are at an acceptable level.

MQSHR, Section 8 Risk reduction

(1) A person who has an obligation under the Act to manage risk at a mine must, as far as reasonably practicable, apply hazard controls in the following order—

- (a) elimination of the hazard;*
- (b) substitution with a lesser hazard;*
- (c) separation of persons from the hazard;*
- (d) engineering controls;*
 - Examples of engineering controls—*
 - 1 Using fans and ducting to remove dust.*
 - 2 Using guards on conveyors.*
- (e) administrative controls;*
 - Examples of administrative controls—*
 - 1 A restriction on the time a worker is exposed to a hazard.*
 - 2 A procedure or standard work instruction.*
- (f) personal protective equipment.*

(2) The site senior executive must ensure hazard controls used to reduce risk in the mine's work and local environments are appropriate, having regard to the following—

- (a) the interaction of hazards present in the environments;*
- (b) the effectiveness and reliability of the controls;*
- (c) other reasonably available relevant information and data from, and practices in, other industries and mining operations.*

3 WORKING NEAR DRAWPOINTS AND POTENTIAL CONTROLS FOR SAFE WORK

3.1 KEY RECOMMENDATIONS FOR SAFE WORK

The following work activities were identified as typical tasks that required workers to be in the vicinity of drawpoints and stope brows:

- Drilling
- Charging and blasting
- Mucking
- Filling process
- Surveying
- Geotechnical work
- Geological work
- Ventilation work

Where such work is required, this Guidance Note recommends that mines develop risk assessments as required under legislation that address the hazards of working near open brows of stopes and similar open excavations, and provide effective risk management strategies for delivering safe work outcomes.

Where possible the chosen risk management strategies should, in the first instance, search for mine and operational designs that negate the need for personnel to work near open brows or other similar open excavations, thereby minimising the exposure to workers.

If work near open brows of stopes and other similar excavations cannot be eliminated, other safeguards and operating procedures and standard work instructions shall be reviewed or developed to achieve safe work outcomes.

In these situations the prime hazard is of a worker being struck by falling rocks or other falling debris. It is unacceptable for workers to be directly inside a stope, under the brow of a drawpoint or close to a vertical overhead opening without an effective safeguard.

Following the death of a worker after being hit by rocks being ejected from open stopes into personnel access areas, operators must implement and enforce safe distances for personnel from open excavations.

The following provides guidance, information, potential suggestions and controls that should be considered in the preparation of safe working solutions before work is carried out near open brows of stopes and similar open excavations.

Because of the hazard potential, only competent persons should be involved in these activities.

4 GUIDANCE

4.1 REGISTER OF VERTICAL OPENINGS

A register of all vertical openings should be maintained, preferably on an updated mine plan readily available to mine workers. The register or mine plan should be kept where it can be easily referred to by the workforce and technical staff. The status of all vertical openings, e.g. planned stopes, open stopes, their drawpoints, filled stopes (including fill type), should be recorded on the plan.

4.2 DRAWPOINTS

The main hazards associated with working near drawpoints include:

- Unstable backs and walls and or damaged ground support resulting in falls of rock or other debris striking personnel and or equipment.
- Rocks falling inside the stope or rolling down the muck pile/rill and deflecting out of the drawpoint striking personnel and or equipment.
 - Rocks rilling/deflecting from open stope drawpoints can and have caused at least one fatality within Queensland's metalliferous mining industry. It is not economical to stop rocks falling inside a stope, but rock falls can be reduced through good planning, workplace design and control.
- Because of this key hazard, it is unacceptable for workers to be directly under the brow or inside the stope, where the brow is the interface between the stope void and the drawpoint, as shown in Figure 1. Operators must adopt agreed safe distances to the drawpoint when working near them. When work is needed near the brow, the risks must be managed.

4.2.1 WORKPLACE ASSESSMENT

When conducting risk assessments and establishing potential controls to minimise the hazards of working near drawpoints, the following information ought to be considered.

- Changing conditions of the drawpoint – is there any material hung up, or has the stope just been blasted?
- Rock properties and changing ground conditions (geology) – soft/ hard rock, presence of bedding, joints, faults, water, and resulting stress redistribution.

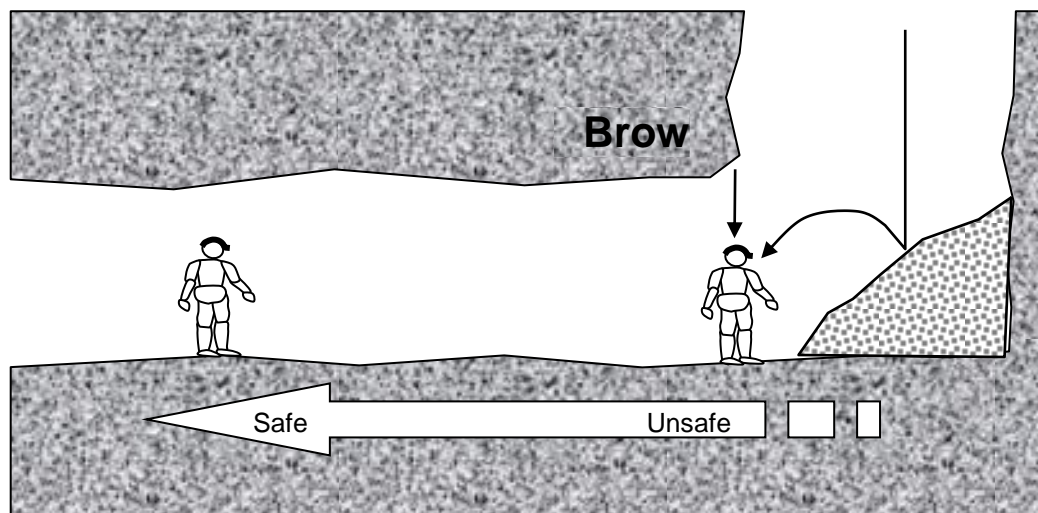


Figure 1 – Safe and unsafe location of personnel

- Evidence of any rocks/debris that may have been ejected from the stope or drawpoint onto the floor of the access point.
- Mining method and the rate at which mining/excavation progresses, resulting in changed conditions, geometry of rill pile and how rock behaves/shatters.
- Height of the stope, stope geometry and changes in stope geometry.
- Rock support method, and possible damage to roof support systems.
- Work activities above the stope.
- Required work activities and duration, and workers exposure, near the drawpoint.
- Potential communication difficulties – are 'two way' radios functional in the immediate area near the drawpoint?
- Emergency retreat – standing next to or preferably behind stationary mobile equipment located in the drive can guard personnel against injury from rocks spilling out of the drawpoint. Standing in front of the equipment does not provide any protection and could inhibit emergency retreat.

- Has enough material been bogged out from the stope so that the rill is well within the stope? This minimises the risk from rocks rolling down the rill and out into the access drive.
- Flat floor – rocks hitting a flat drawpoint floor can shatter and put people and equipment near the drawpoint at risk of impact injury and damage.
- Remote inspection systems such as cameras may make it difficult to judge safety of the stope.

4.3 POTENTIAL CONTROLS

Controls should be chosen based on the hierarchy of controls. Some of the potential controls given below could be listed under more than one heading of the hierarchy of controls.

Potential controls to consider can include:

4.3.1 ELIMINATION OF THE HAZARD OR SUBSTITUTION WITH A LESSER HAZARD

- **Stope design and planning practices** to minimise the need for workers to go near drawpoints and open stopes, particularly stope design, geotechnical assessment, and drill and blasting practices that proactively minimise blast damage.

4.3.2 SEPARATION OF WORKERS FROM THE HAZARD

- Maintain an adequate buffer of drilled production rings at the brow behind the last ring fired as this will minimise the requirement for personnel to work close to the brow. Buffers should also be considered for drilling down holes from sublevels.
- Inspect the drawpoint from within the safety of the cabin of heavy equipment (e.g. a loader) fitted with FOPS (falling object protective structure).
- Provide clear visual guidance to indicate proximity to the drawpoint opening.
- Use an elevated work platform (EWP) for inspection and work at the brow.
- Physical barriers, i.e. bunding in front of the brow, which prevent interaction between workers and or mobile equipment and the drawpoint and stope opening, and also prevent rocks spilling out of the drawpoint.
 - Correctly placed bunds provide protection by preventing people and equipment from accessing the drawpoint. If sufficiently high and placed just outside the brow, bunds are also able to ‘catch’ rocks that may rill from the muck pile.
 - As a minimum, place a bund of at least one metre high across the full drive width and with the bund’s crown/crest directly under the brow (see Figure 2).
 - Placement of the bund at some agreed distance away should stop any rock that may be ejected out of the opening (see Figure 2).

Suggested distance for placement of a bund is 'twice the height' of the access drive to the brow.

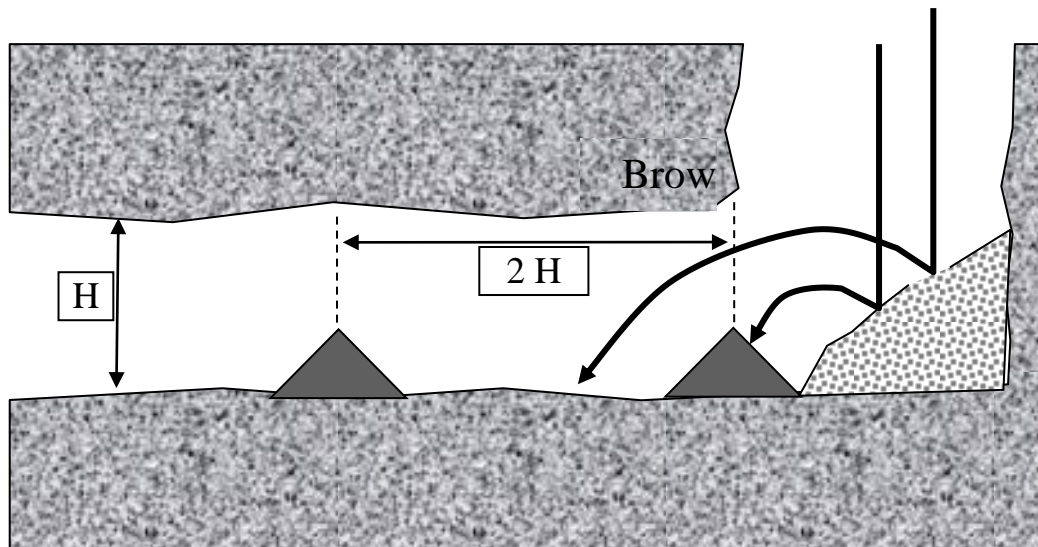


Figure 2 - Possible placement of bunds

- The bund should be installed before loader operators leave the area.

Note: the bund should be placed so that falling rocks and other debris are 'caught' by the bund and cannot deflect over the bund and into the drive.

- No person shall position him/herself on foot near a drawpoint closer than an agreed and well communicated standoff distance if a bund is not in place. If there is no bund, a Job Safety Analysis is required and an authorised person must approve the bund's absence, and proposed/agreed actions from the JSA that flow on into approved and communicated procedures and authorisations.
- No one should walk around, or climb over a drawpoint bund and into the space between the drawpoint opening and the bund.
- The ring firer must ensure a bund is in place at the designed final brow location on the extraction horizon before preparing a stope for charging.
- Barricading – erect barricades and signs to inform personnel of the drawpoint, or that operations are in progress above the opening.
 - All drawpoints to be barricaded and appropriately signed. Before a stope is prepared for charging, the ring firer must ensure appropriate signage is in place before leaving the area. Note: barricading does not offer the same level of protection against injury as a bund.
- Location of rill in relation to the brow of the stope
 - Avoid working near an open brow unless the rill is a minimum 10 metres from the brow inside the stope. The height of the rill should be as low as possible and as close to a flat floor as practical to reduce the potential of rocks rolling towards and out into the opening of the access.
- Location of brow – the planning engineer should indicate on the stope firing plans where the designed stope final brow will be located on the extraction horizon.

- A workplace inspection is essential before work starts, the inspection is to verify the last ring fired from the charge plans and true edge.
- Remote control mucking - use of "tele-remote" equipment is preferred over "line of sight" remote equipment.

4.3.3 ENGINEERING CONTROLS

- Use Cavity Monitoring Systems to assess integrity of the void.
- Use additional ground support during development to minimise rehabilitation requirements, particularly at the location of planned stope brows.
- Ensure good illumination. This is essential when assessing the condition of the stope and its brow.

4.3.4 ADMINISTRATIVE CONTROLS

- In a stoping system with workers access to drawpoints, risk based processes and procedures must be developed, supervised and followed. Development of these procedures and processes should apply the hierarchy of controls, as per MQSHR, Section 8.
- Persons who work closer than a site-nominated distance to the opening of such a drawpoint should only do so subject to a procedure. The procedure should distinguish minimum safe actions taken for banded (guarded), unbanded (unguarded), barricaded and open access to the drawpoint or similar openings.
- The number of workers and the amount of time they are near drawpoints and open stopes should be minimised. Where possible, reduce this time by careful task planning.
- Authorisations and Job Safety Analysis are to be performed by the mine workers involved in the task, and reviewed and authorised by a competent person.
- After blasting and before work commences, introducing a procedure for re-entry and inspection of the stope by competent persons. It is important to locate the last ring fired, to assist in avoiding bridges and verandas.
- Where possible, only view the stope from the level above and provided adequate safeguards are taken.
- Location and height of rill – an agreed and well communicated/documented procedure for the minimum distance and height of the rill from the brow (flat base stope) must be established before allowing persons to approach.
- A clear and agreed procedure as to when conventional (manned) bogging is to stop and remote (unmanned) bogging should commence.
- An agreed and well communicated/documented stand-off distance from the brow. The distance should be based on the actual height of the drawpoint or stope opening.
- A clear line of retreat must be achieved so that unhindered emergency withdrawal is possible.
- Marking of ring numbers – it is suggested to mark the location of blast rings and paint line on wall.

- General awareness – use your hearing. Be alert to noises other than noise from the equipment in use. Listen for falling rocks and other debris. When approaching the drawpoint, look for material spilt out into the access drive.

4.3.5 PERSONAL PROTECTIVE EQUIPMENT

As per mine site standard. However, in case of any fall of material, personal protective equipment will provide negligible protection.

5 DEFINITIONS

May:	Indicates that a statement is discretionary.
Must:	Indicates that a statement is mandatory in all cases and is an obligation imposed by the Mining and Quarrying Safety and Health legislation.
Plant:	Machinery, equipment, appliance, pressure vessel, implement, tool, personal protective equipment, or a component of plant and a fitting, connection, accessory or adjunct to plant.
Procedure:	Set of directions for a job (set of related tasks) for use by the persons or group involved. May include standard work instructions for some of the tasks forming part of the job.
Process:	Series of actions to achieve an objective.
Risk:	The risk of injury or illness to a person arising out of a hazard, measured in terms of consequences and likelihood.
Risk, acceptable level of:	Risk that is within acceptable limits and as low as reasonably practicable.
Shall:	Indicates that the statement is mandatory for the purposes of this Guidance Note.
Should:	Indicates that the statement is a recommendation.
Standard work instruction:	Concise set of directions for a task, for use in the field by an individual or small group of persons.

6 REFERENCES

Significant Incident Report No. 64, Fatal Accident – Miner Struck by Flying Rock Deflecting Out of Stope, Queensland Government, Natural Resources and Mines, 2005. available at

http://www.dme.qld.gov.au/zone_files/inspectorate_pdf/incident_report064.pdf

Open stopes workshop, 13 October 2005, Department of Natural Resources, Mines and Energy, Queensland.

Dr Shaun Belward, 2004, *Likely trajectories of rockfall from stopes to drives*, School of Mathematical and Physical Sciences, James Cook University, Queensland.

Guideline – Vertical opening safety practice in underground mines, Department of Industry and Resources, Safety and Health Division, Western Australia. available at http://www.docep.wa.gov.au/resourcesSafety/PDF/Guidelines/MS_GMP_Guide_VO SP.pdf

Safety Bulletin No. 3 – Vertical opening safety practice, 1990, Department of Mines, Western Australia, available at http://www.docep.wa.gov.au/ResourcesSafety/PDF/Bulletins/MS_GMP_SB_03verticalopeningsafety.pdf
