Department of Mines
Western Australia

No. 3

S A F E T Y B U L L E T I N

VERTICAL OPENING SAFETY PRACTICE

PRELIMINARY

Vertical openings within underground mines, or into underground mines from the surface, (particularly opencuts), present a range of extremely serious hazards.

It is essential that all personnel are made fully aware of these hazards at induction, and that they are regularly given reminders, particularly when there are new developments or when operating procedures are changed or revised.

The purpose of this bulletin is to emphasise the nature of some of the more obvious hazards and to recommend procedures to avoid or minimise them.

A brief paper such as this can not be exhaustive, and each operation should produce its own specific set of vertical opening safety procedures under the authority of the Registered Manager.

The contents of this bulletin have been derived from extensive operating experience and are based on incidents and accidents known to the Inspectorate.

It is important to keep in mind that although the limitations and constraints imposed by having to mine the workplace underground out of solid rock do not allow the direct application of engineering standards in many situations, the principles of adherence to standard proven practice should be applied. Maximum use should be made of standard drawings and procedures for installations to avoid the consequences of improvisation.

APPROACH TO VERTICAL OPENING SAFETY PRACTICE

A common error made with vertical openings is that convenience of design and operation creates situations where the most effective safety precautions can not be applied.

Moreover many incidents and accidents which have occurred over the years were the result of a perceived time constraint on operations by those involved. In many situations the acceptance of some delays relating to operation procedures with vertical openings will be mandatory, in order to maintain safe operations.

There must therefore be a 'margin of safety' built into the operating performance plan at the design stage so that operators are not tempted to take risks to achieve production targets. With vertical openings it is all too often another person who is put at risk by rash or careless actions.

It is particularly important in the case of sub-level open stopes, (or other stoping systems where there may be access to vertical openings at a number of horizons), that well established Vertical Opening Safety Procedures are clearly promulgated and rigidly adhered to.

ORE PASS PROCEDURES

Location of Passes

Any access to the top, or to any other horizon which allows tipping into a pass (via a finger rise in the case of multi-level use of the pass) should be of an adequate length off the tramming level or decline; in the range of 5 to 10 m depending on the size of development headings and equipment used.

Pin holes should be drilled into the access walls at the entrance to allow for barricading off and the posting of signs.

The purpose served in locating the tip point off the tramming/haulage way in this fashion is:

- clearance of the vehicle to passing traffic while tipping;

- the risk to persons at a lower horizon due to spillage from passing vehicles falling into the pass is minimised;

- dust pumping out of the pass from tipping at other horizons is more readily controlled (eg. using sprays and flaps).

A stop log or other suitable structure should be placed at every tipping point.

The attached sketch illustrates these points in respect of passes.

Where location of a pass adjacent to a drive or travel way is unavoidable, (eg. due to previous mine design or existing development constraints), the pass must be protected by a raised concrete parapet. Where there is any danger of spillage from passing vehicles or persons falling into such a pass, a steel or timber cover, operated by mechanical means (air cylinder, rope, pulley, etc.) must be provided.

The tipping point into any pass must be fitted with adequate warnings to prevent inadvertent entry. Reflective signs and tape or safety mesh, (securely fastened), are required in addition to provision to securely barricade off the access when not in use.

Where passes are extracted at draw points, mill holes or grizzlies, the design and brow configuration must be such that persons passing through the area or working on extraction are not at risk from uncontrolled fall or discharge of rock.

Operation of Passes

Given that the ore pass system must be designed to suit the nature and scale of the mining method, it is essential that proper operating control is maintained on what is tipped into the pass. Excessive oversize creates hang ups, and bringing down of hung passes by blasting is in itself an additional introduced hazard, which should be minimised.

The addition of water to the top of passes to bring down hang ups can create an extremely hazardous situation. Lives have been lost as a result of "mud-rushes" from orepasses. Water should only be applied with the approval of, and under control of, a supervisor.

When blasting is essential to bring down any pass, meticulous care must be taken after the hang up is accurately identified, to warn and protect all persons who may be working adjacent to the pass on any horizon to which it connects, and at the extraction point if the charge is to be fired from any horizon above it. The size of such charges should be strictly limited, as determined by the Underground Manager.

Where finger rises are used to provide tipping points from a number of levels or sub-levels to a common ore pass, the finger rise itself should not be filled. That is, if the main pass is filled above the finger rise junction, then tipping into the finger rise should cease.

Experience has shown that filling of finger passes is a major cause of hang-ups, and that hazards have been created in bringing them down.

When a grizzly is installed on a pass provision of a safety belt, preferably the inertia reel type (eg. SALA BLOCK), is essential to ensure the safety of any person who works on the grizzly. This equipment must be properly installed, inspected and maintained, and inertia reels should be regularly checked by a competent person.

Where ore passes have a number of fingers, those not in use should be scaled down, blown off and bulkheaded off, and the fact that this has been done recorded.

When ore passes (or any vertical opening) are to be closed off, whether on a temporary or a permanent basis, details of the status of the pass or opening must be recorded on plans and written records.

Working in Passes

No person should move on to or stand on broken rock in any ore pass, nor should he attempt to do any work in such a position until stringent safety precautions have been taken.

A check should be made to determine whether where is any possibility of a hang up in the pass, resulting in a void in the pass below the working horizon which may suddenly collapse.

- The chute, draw point, chain control or other extraction system on the pass must be locked out, barricaded and sign posted to prevent inadvertent drawdown.

- Where feasible, a staging should be constructed which is supported independent of the loose rock in the pass.

- Properly rigged safety belts or harnesses, preferably with inertia safety reels, must be provided.

- The work must be undertaken under supervision.

If work is required within a pass, in addition to the above measures, a safe means of entry from the top must be provided and the whole of the pass made safe down to the working area. Suitable overhead protection must be provided, signs posted, and effective communication provided to a safety man who will remain at the top of the pass during the work.

Where work is to be carried out in an open pass, overhead protection in the form of a constructed penthouse may be necessary, or a Trelleborg type shaft closing bladder may be used.

PROCEDURES FOR OPEN STOPES

No material should ever be thrown into open stopes by any persons except where waste rock or scrap metal or steel pipe is being disposed of in a completed stope prior to filling, when such work will be supervised after a clearance procedure has been followed. No organic or combustible material should be disposed of in a stope, except timber in a stope, to be tight filled with hydraulically placed sand or tailings.

Any person who is to work closer than 10m to the edge of a stope, (other than the miner or ring blasting crew who normally operate in the stope and the extraction horizon crew), should do so subject to a vertical opening procedure.

Precautions must be taken to protect ring blasting crews charging rings in open stopes. When the brow has been overpulled at stope draw points the brow should be closed by bringing down the rill, or other measures taken to provide protection. If there is any opening at the brow during charging, "Danger Men Working Below" signs must be installed on all stope accesses above.

Similar precautions are required for any rock bolting or services crew doing work in the drawpoint; such work should normally be done when the brow is choked except where it must be done immediately for the security of persons required to work in the area.

No mucking unit should be allowed to rip or push ore into an open stope without the permission of the underground manager.

At any place where ore may rill accidentally into a stope, an appropriate barricade must be erected.

LADDERWAYS

There are a number of Regulations under the Mines Regulation Act which pertain specifically to ladderways.

These include: 12.18
12.19
12.21
12.22
12.23

It is essential that all ladderways are constructed and maintained to a safe standard.

The top of a ladderway which is a regular travelling route between levels or part of the escape route, must be properly constructed and decked to prevent any material from being inadvertently dropped or dislodged into the ladderway.

Adequate clearance must be provided for persons using the ladderway from pipes, cables or other services which are installed in it.

No material must be dropped down any ladderway.

No material shall be raised or lowered in the ladderway while any person is using the ladderway.

Both hands must be free when climbing or descending on ladders. Any load slung on the back and shoulders must be secured safely and not be of such bulk or weight as to present a risk of falling. Heavy or bulky loads must be hoisted. Where a ladderway is equipped with a slide for landing materials with a winch or by a hand ropes, no person may travel in the ladderway during the haulage of material.

Every ladderway must afford a safe means of entering and leaving it at any sub level to which it gives access, as well as the top and bottom entry. Access ladderways to stopes must have a safe means of entering and leaving the ladderway, and protection or covering, (readily removable for the transfer of equipment), to prevent persons from falling when crossing it while working in the stope.

CHANGING RAISE DRILL HEADS OR THE CUTTERS.

When a raise drill head is lowered to the bottom of the rise for the purpose of changing cutters or removing the head, protection should be afforded against rock fall while the crew are so engaged. This may consist of a canopy secured to the drill string or shaft closing bladder designed to fit around the drill string.

No water should be allowed to drain into the raise from the drill chamber during such activity.

VERTICAL OPENING PROCEDURE

The operation of a system for vertical opening safety procedures requires that there be set up a written system for charting, notifying and recording any work that is to be done in and around stopes and passes particularly where there are multiple access horizons.

The intent is that in the case of supervisors and personnel who normally operate at the extraction horizon, and those who normally are involved in production (ring blasting crew or sub level mining areas), such work continues without the need for a formal procedure log.

For all other persons or groups who work within 10 metres of the stope, pass system etc. on any horizon, a systematic recorded log of planned work is maintained, and communicated to all persons involved, including particularly the extraction crew, and ring firers or miners.

All start time, completion times, and communications must be logged, together with the recording of approvals given to front line supervision to begin work.

This procedure must apply to all personnel including, survey, geological, rock mechanics etc., who may be working within the 10 metre range.

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