



# SAFETY ALERT

## Miner's arm injured using drill rig

### INCIDENT

A miner suffered serious injuries to his left arm when it became entangled in steel rib mesh and a rotating drill steel. The miner's lower left forearm was later amputated while in hospital.



The drill steel, drill bit and entangled rib mesh

### CIRCUMSTANCES

Initial investigations revealed that the injured miner's left arm became entangled in steel rib mesh and a drill steel. The continuous miner-mounted hydraulic roof bolter may have been inadvertently operated by the operator, or it may have inadvertently operated independent of the operator.

At the time of the incident the process being undertaken was to locate the roof mesh and the horizontal section of the rib mesh on top of the continuous miner-mounted temporary roof support, using the left and right hand drill steels as guides. This step was in preparation for the continuous miner to be trammed forward for the next roof support cycle.

The 1.3 metre drill steel located in the right hand outer drill rig was fitted with a butterfly drill bit. The rib mesh caught between the twin tips of the drill bit, causing the rib mesh to wrap around the drill steel when it was rotated. The injured miner had his left hand in close proximity to the rib mesh and drill steel at the time of the incident.

### INVESTIGATION

This incident is being investigated by the NSW DPI Investigation Unit.

## RECOMMENDATIONS

- a) **Employers and mine operators** are reminded of their OHS obligation under clause 136(3)(d) of the *Occupational Health and Safety Regulation 2001 (OHS Regulation)* which requires that:

*'persons do not operate, or pass in close proximity to, the plant unless the risk of entanglement is controlled by guarding that meets the requirements of clause 90(1) or the use of safe systems of work'*

- b) **Employers and mine operators** are also reminded of their OHS obligations under Chapter 2 of the OHS Regulation, which requires an employer to: identify hazards; assess risks; eliminate risks; review risk assessments and control measures; and provide instruction, training and information
- c) Clause 5 of OHS Regulation requires risks to be minimised to the lowest level reasonably practicable and controlled in a hierarchical order which requires engineering means to control risks in preference to safe work practices
- d) **Designers** are reminded of their OHS obligations under Chapter 5, Part 5.2, Division 1 '*Design of Plant*' of the OHS Regulation, which requires a designer to: identify hazards; assess risks; eliminate risks; review risk assessments; control risks; provide particular risk control measures in relation to guarding, operational controls, and emergency stops; specify working systems and operator competencies; provide and obtain information
- e) In accordance with Clause 12 of the OHS Regulation all **mine operators** should review their risk assessments for the installation of rib and roof mesh support systems to ensure that people are prevented from becoming entangled in either the mesh or the drilling plant.

This risk review should be undertaken in consultation with the drilling plant designers and manufacturers, supervisors and drilling rig operators and the risk review should consider:

- (i) the relevant obligations in the OHS Regulation
- (ii) the relevant requirements in Australian Standard AS 4024.1:2006 (*Series*), *Safety of Machinery*
- (iii) the relevant sections in *MDG 35.1 Guideline for bolting and drilling equipment mines, Part 1: Bolting equipment in underground coal mines – DRAFT*,
- (iv) persons involved with the installation of roof and/or rib mesh being made aware of the risk of:
  - drill rigs being operated inadvertently by operators, or inadvertently operating of their own accord
  - placing hands in contact with roof or rib mesh while there is a risk that the mesh may become entangled by a rotating drill steel
  - placing hands on rotating and sliding parts of the drill rig
- (v) current safe work practices in drilling and bolting operations

- (vi) mine standards for drilling equipment when it is being overhauled.
- f) In accordance with Clause 88 of the OHS Regulation **all designers**, should review their design risk assessments for the operation of drilling and bolting plant to ensure that people are prevented from becoming entangled. The risk review should consider:
- (i) the relevant obligations in the OHS Regulation
  - (ii) the relevant requirements in Australian Standard *AS 4024.1:2006 (Series), Safety of Machinery*
  - (iii) ensuring that the action of one of the operator's hands should not be able to injure the other hand, particularly with machine motions that operate at full speed
  - (iv) the relevant sections in *MDG 35.1, Guideline for bolting and drilling equipment mines, Part 1: Bolting equipment in underground coal mines – DRAFT*, including an appropriate combination of the following risk controls:
    - Rotation and drill feed manual controls being separated from each other such that these controls can not be operated simultaneously by one hand
    - Two-handed operation of primary manual controls being used to operate all drilling and bolting functions at normal operating speeds, unless the function is guarded in accordance with the requirements of AS 4024
    - Where one-handed manual operation of primary controls is used all drilling and bolting functions shall be limited to slow speed operation, with the exception of the rotation function.  

Note: The rotation function at full speed shall not be able to be operated by one-handed manual control unless guarded in accordance with AS 4024
    - The handles of primary bolting controls on bolting rigs should be individually shaped in accordance with the following:
      - rotation-three balls in line
      - feed control - round disk
      - timber jack – rectangle.  

Note: This is to allow different function to be able to be identified by feel, even when wearing gloves

**NOTE:** Please ensure all relevant people in your organisation receive a copy of this Safety Alert, and are informed of its content and recommendations. This Safety Alert should be processed in a systematic manner through the mine's information and communication process. It should also be placed on the mine's notice board.

**Signed**



**Rob Regan  
DIRECTOR  
MINE SAFETY OPERATIONS BRANCH  
NSW DEPARTMENT OF PRIMARY INDUSTRIES**

View more safety alerts at [www.dpi.nsw.gov.au/minerals/safety/safety-alerts](http://www.dpi.nsw.gov.au/minerals/safety/safety-alerts). If you would like to receive safety alerts by email, send your contact details to [mine.safetyalert@dpi.nsw.gov.au](mailto:mine.safetyalert@dpi.nsw.gov.au)

View MDG 35 at:

<http://www.dpi.nsw.gov.au/minerals/safety/publications/mdg>



# SAFETY ALERT

## Drill Rigs and Serious Injuries

### INCIDENT

A number of serious drill rig injuries have recently occurred at underground mines resulting in fractures, amputation of fingers, severe soft tissue damage, nerve damage, crush injuries, lacerations and strain.

### CIRCUMSTANCES

Most of the drill rig incidents involved one of the following:

- Interaction of part of the individual's body with the moving drill rig.
- Strain due to the load placed on the individual's body.
- Fall of roof or rib.

### INVESTIGATION

A total of 747 injuries involving roof and rib bolting were recorded by Coal Mines Insurance NSW for 1999 to 2004 inclusive. In excess of 250 of these involved machine mounted bolting rigs.

Issues which contributed to interaction accidents include:

- Accidental movement of controls by bumping or contact with cap lamp cord.
- Operator moving controls intentionally without realising part of his body would be injured.
- Moving the wrong control.
- One person operating controls whilst another person is at risk.
- The unplanned movement of equipment.
- The high degree of interaction required between the moving drill rig and the operator.
- The high speed of some of the motions of the drill rig.
- Bent or broken drill rod.

Some of the factors which contributed to strain injuries include:

- Dolly stuck in chuck.
- Drill steel stuck in chuck.
- Drill steel stuck in hole.
- Ergonomics of machine.

## RECOMMENDATIONS

Use appropriate Risk Management Process for drilling/bolting operations. Systems of work employed in providing rib and roof support must utilise fit for purpose equipment to provide a safe workplace. As far as practical comply with the intent of Australian Standard AS4024.1 'Safeguarding of machinery – General Principles'.

This standard is not confined to physical guards it includes other methods of minimising or eliminating hazards and risk such as:

- o 2 handed control;
- o reduced speed when using one handed control;
- o minimising nip and pinch points, self clearing mechanisms and use of non metallic pliable material;
- o Guarding controls or other means of reducing the risk of inadvertent operation;
- o using different physical shapes for different controls;
- o standardising control layouts;
- o Interlocked sensing of a persons body so the rig is prevented from operating when a dangerous situation exists;
- o reducing the need for some of the interaction between the operator and the moving rig; and
- o Automatic drill thrust and penetration rate control to minimise drill rods bending/breaking/becoming jammed.

Improve the design and maintenance of the following:

- o drill chucks;
- o drill rod drive shanks;
- o dolly ends or eliminate the dolly;
- o drill rig supports so drills do not jam;
- o water pressure/volume is maintained above a minimum; and
- o ergonomic aspects of the work area and drill rig. Need to minimal load on shoulder.

Minimise the reliance on safe systems of work by giving preference to engineering solutions. Provide adequate protection from roof and rib falls for drill rig operators by applying temporary supports or other safeguards prior to commencement of drilling.

**NOTE:** Industry guideline MDG 35 covering drilling/bolting equipment will be released for public comment this year.



**William Barraclough**  
**A/Area Manager – South East**  
**MINE SAFETY OPERATIONS BRANCH**  
**NSW DEPARTMENT OF PRIMARY INDUSTRIES**

Mine Safety Report No:	SA05 - 05
File No:	C03/0398-01
Comet ID:	274778000001
Prepared by:	Wally J Koppe
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Date Created:	1/4/2006



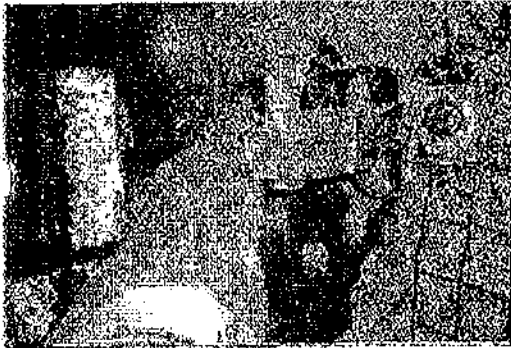
## Mechanical Engineering Newsflash No 21, April 2005

A Newsflash is to disseminate information to the mines quickly

### Employee's Arm Entrapped in Rib Bolter (Near Miss)

#### Incident

While removing rib support in preparation for trimming rib, an operator's arm was caught when retracting timber jack of rib bolter. The operator was reaching across the left hand rib borer of the Continuous Miner attempting to put the dolly onto a rib bolt he was intending to remove from the rib. His vision was obscured by the timber jack so he retracted the jack and in doing so, his right forearm became caught between the head plate and the striker switch beside the rib borer chuck.



#### Circumstances

The operator freed his arm and reported the incident to his supervisor who organized first aid treatment on site. He was then conveyed by ambulance to the hospital for medical assessment.

The operator's arm was not broken however there was bruising to the right forearm and a tingling sensation in the ring and little finger of right hand. He was able to return to work on restricted duties.

#### Investigation

The job was not a normal task and required a higher level of planning through use of the change management/hazard identification procedures.

The operator when interviewed said he was totally focused on the immediate task and was not aware that he had placed his arm in a vulnerable position.

Task observation by a third party could have identified the hazard.

The issues of pinch points on rib borers should be addressed with OEM's as a matter of priority.

#### Action

- The mine to conduct a review of the operational risk assessment for the roof/rib bolting operations
- OEMs notified and requested for a design risk assessment of their equipment with input from Mine personnel
- Review system & accountabilities for roadway alignment
- Develop procedures for the removal of strata support
- Conduct refresher training on change management/assessment of non-standard tasks
- Investigate alternative rib support
- The risk assessment to identify the hierarchy of controls and the operation of the drill and rib bolters which should be included in the operators training or procedures.

#### The investigation is ongoing

Contact Department of Primary Industries (Mineral Resources) @ the Maitland office. 02 49 31 6626. Gordon Jervis / Peter Sunol / Paul Drain. Newsflash 21.doc

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# SAFETY ALERT



## SERIOUS INJURY WHILE ROOF BOLTING

### INCIDENT

An operator suffered a fractured forearm and dislocated elbow while roof bolting on a continuous miner.

### CIRCUMSTANCES

While cleaning a blocked drill bit, the operator put the chuck end of the drill steel across the front of the bolting shield of the continuous miner towards the coal face.

A fall of roof in front of the supports being erected hit the chuck end of the drill steel. This forced the drill bit end of the drill steel upwards, hitting the operator on the forearm and elbow.

### INVESTIGATION

An accident is the result of an uncontrolled release of energy.

By placing part of the drill steel under unsupported roof this allowed the transfer of the energy back into the otherwise safe working environment.

Both the position of people and equipment when working near unsupported roof can be critical in avoiding accidents.

### RECOMMENDATIONS

- Mine sites to assess the potential for energy transfer (resulting from a fall of ground striking plant or equipment into the work environment) in the design of their safe working systems to manage strata control risks, Coal Mines (General) Regulation Clause 6.
- Mine sites to review their existing Job Safety Analyses (JSAs) or to conduct JSAs relating to roof support practices with particular regard to the positioning of people, equipment and materials and their exposure to impact by falling ground, either directly or indirectly. This would be done to achieve the provision of safe, effective and systematic work methods for roadway support, Coal Mines (Underground) Regulation Clause 48(e).
- In the training of employees in roadway support practices, potential injury mechanisms and site/task risk assessment principles be included in the support system, Coal Mines (Underground) Regulation Clause 48(h).

For further information contact David Carey, Inspector of Coal Mines, Lithgow, on (02) 6351 3052.

APPROVED

R Regan  
ASSISTANT DIRECTOR SAFETY OPERATIONS



# SAFETY ALERT



## CONTINUOUS MINER DRILL RIG FATALLY CRUSHES TRADESMAN

### INCIDENT

A mechanical tradesman was fatally injured as a result of the inadvertent/accidental operation of a continuous miner's roof bolting rig.

### CIRCUMSTANCES

The fitter was carrying out maintenance tasks to the roof bolting rig attached to the right hand side of a Joy 12CM29 continuous miner. He suffered crush injuries as a result of being caught between the the rig and the superstructure of the continuous miner. He was working alone at the time, during a meal break, and it appears there were no direct witnesses to the immediate accident.

### INVESTIGATION

An investigation by the Investigation Unit of the NSW Department of Mineral Resources is underway to determine the factors involved in this incident.

### RECOMMENDATION(S)

Managers and Engineers of Coal Mines are reminded of Safety Alert SA 99/12 dated 14/07/99.

The circumstances are similar. The recommendations are also directly applicable. In particular isolation procedures need to be reviewed or developed to have particular concern with restoring power for adjustments. Managers should also address basic hazard recognition and control skills training as a priority.

For more information contact Ray Smith, Inspector of Mechanical Engineering, on (02) 65721899 or mobile 0418 681023.

P. Healey  
CHIEF INSPECTOR OF COAL MINES



Coal Mining  
Inspectorate,  
Department of  
Mineral Resources  
NSW

# SIGNIFICANT INCIDENT REPORT

Report No: SIR 94/4

File No: G93/0298

## OPERATOR INJURED BY DRILL RIG

**INCIDENT:** A drill operator was injured when the rotation-motor assembly shot forward while he was working on the guides of the boom.

**CIRCUMSTANCE:** The operator was in the process of picking up the rear of the uncoupled lead drill rod when the drill rotation slide assembly inadvertently moved forward quickly. The movement resulting in the amputation of the operators left finger.

### INVESTIGATION:

1. The drill consisted of a mobile rubber tyred vehicle containing an electric motor which provided power to a hydraulic power pack for drilling operations.
2. Although the operator was positioned on the drill guide the electric power driving the hydraulic pump to the drill rig had not been isolated.
3. The controls provided for drilling operations remained in the set position once selected and required manual effort to alter them.
4. If the power was removed and then re-established the rig would operate as previously set.
5. The drill feed control was not proportional over its full operating range. It varied from inch control to fast movement for a short movement of the control lever.
6. The operator was able to reach and activate controls by coming in contact with them with his foot or other parts of his body.

### RECOMMENDATIONS:

Management should ensure that drill rigs in use at their mines comply with the following:

1. All controls shall spring return to neutral or be protected by other means to prevent injury.
2. Restoration of power shall not cause a hazard as stated by Australian Standard AS2671; Fluid Power - Hydraulic System and Components. When restarting power, resetting of control to achieve motion is required.
3. Where possible/practical controls should not be in a position where the operator can come in contact with them while working on parts of the machine which may move.  
Inching controls need not comply with this recommendation.
4. Controls should be guarded to such an extent that they can not be accidentally bumped by an operator or activated by falling roof or rib material.

*Bruce McKensy*  
13-10-95  
B. R. McKensy  
Chief Inspector of Coal Mines