CMPA

Hazards In Drilling & Blasting

How to use these Hazards...

Summary of Key Areas:

- **Site Geology and Access**
- **Contractor Selection**
- **Profiling, Line Boring and Capping**
- **Tramming, Transportation, and Loading**
- **Drill Maintenance**
- **Drill Steels and Consumables**
- **Drilling Process**

Incidents Inside:

Entanglement 2

Unstable Tramming 4

Unsecured Drill Steel 6

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In 2002, the Victorian quarry industry was horrified to learn of the fatality of a quarry drill rig operator in the state.

As a response, the CMPA as the peak representative body invited all of the Victorian quarry blast hole drilling industry to a workshop in order to identify the hazards involved and how, with the present technology, these can be controlled.

Key Supporters of the Workshop

On March 26 2004, over 85 employers, employees, regulators, educators and manufacturers gathered at Komatsu Campbellfield to meet the challenge.

After many discussions and a site visit to the quarry at Cooper St Epping, the groups identified the following hazards and controls.

The next question is to how best incorporate these into your business' Occupational Health and Safety Management Systems.

It would be recommended that a Job Safety Analysis is conducted at your site. This would need to involve all persons involved in the drilling and blasting process—for example, the Quarry Manager, Driller, Shot Firer, their assistants, and others.

How to conduct a JSA will be discussed in a future training program however in the meantime, the CMPA recommends that you look at the information available from the WorkCover website.

Now that your company has carried out a JSA, did you identify any hazards that were not listed on the following pages? If so, drop the CMPA a line so that others can benefit from your experience.

When selecting controls, always remember to select in the following order:

1. *Elimination*
2. *Substitution*
3. *Engineering*
4. *Administrative*
5. *PPE*

Available Support Materials

The CMPA has now released three support materials that will assist in making quarry drilling a safer process.

The following documents support both the driller and the site when planning and conducting drilling operations.

1. Drill Rig Pre Start and End Day Safety Checklist
2. Checklist for the Selection of Quarry Drill Rigs or Drilling Contractors
3. Quarry Driller's Daily Blast Hole Report

These documents are released following rigorous review by the CMPA, its members, drill rig contractors, trainers, and the Department of Primary Industries. They will assist your site in developing or refining a good safety management system.

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Site Geology Considerations and Access

What needs to be investigated before a pattern is set?

Stability of rock face above and below the drill site

- Rock type: MSDS should define silica and asbestos content
- Rock structure - Slip potential
- Cavities
- Weak zones
- Groundwater situation
- Geotech report
- Location of previous drill holes
- Location of previously failed blasts
- Direction of shot

Intersection of cavities

Access and grade

- Surfacing of access
- Width
- Other traffic
- Drainage
- Stability
- Pit Design

Face edge

- Constrained
- Lack of stability both above and below
- Utilisation of scalps

Dust and its content

- Silica
- Asbestos
- Other dusts that may cause long term damage

Work Plan requirements

- Boundaries
- Face heights
- Bench widths

Above/Below Ground Services

- Power
- Gas
- Water

Reviewing site geology is essential prior to setting a pattern

Mr Steve

RM Drilling Pty Ltd

"Drillers should be ..warned to never attach rods, couplings or bits to a rotating part"

Case Study 1: Fatal Drilling Accident at a Quarry

Incident:

A driller sustained fatal injuries at a limestone quarry in Northland. No one witnessed the accident but it is evident that his overalls became entangled while he was attaching a new drill rod to the drills shank adopter. His body was found tightly bound onto the rotating drill rod.

Circumstances:

The machine was a hydraulic Ingersoll Rand XL 635 crawler rig, incorporating an automatic rod changer and an operator's cab from which the drilling operations are controlled.

To install a new rod into the automatic rod changer rack, it needs to be attached to the drills shank adapter first and he was doing this with the drill shank rotating at about 60 to 70 rpm.

The drill carriage was positioned about a metre above the ground surface.

The 3.66m long rods weight 43.5kg and being heavy, he was probably holding it up against his body at about hip level as he placed the end onto the rotating drill shank.

Recommendation:

Drillers should be alerted to the hazards of working near rotating drill steel and, in particular, warned never to attach rods, couplings or bits to a rotating part.

New Zealand Department of Labour, Extractive Industries Inspectorate

April 2002

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Contractor Selection resulting in On-Site Obligations

OHS Support in Quarries 01

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What does a site need to investigate before a driller comes on site?

Pre-selection of contractor

- What is the scope of work?
- The how, what, where, why, who, whom of the contractor
- Sub contractors to main contractors
- Capability to meet demands
- Quality of drilling
- Environmental conditions
- Insurances with photocopies endorsed by insurer
- Financial backing
- Proof of superannuation payments
- Industrial relations procedures

Legal liabilities of site

- Non compliance to legislative requirements

OH&S system

- Loss Time Injury statistics
- Third party accreditation
- Risk assessments
- Demonstrated safety systems prior to start
- Emergency systems
- Other environment/ quality systems

Competency

- Licences
- Certified Driller through competency, experience, or card
- Supplier training and machine orientation
- Age of operators

Fitness for work management

- Medical screening and bench marking
- Lifestyle drugs and alcohol testing
- Fatigue management through fixed hours of work
- Working alone

Risk of serious injury

- Unsafe working environment
- Operator risk

Site Access Method

- Induction
- Re-induction every 2 years
- Site sign in and out procedures
- Unauthorised site entry

Communication

- Chain of command
- Team work and employee awareness
- Communication methods

Equipment

- Unsafe equipment
- Damage to equipment
- Abuse of machinery
- Downtime and maintenance issues
- Wash machine prior to entry to site
- Maintenance access

Non-compliance to site procedures

- Unsafe practices
- Unqualified personnel
- Unsupervised drilling
- Personnel and/or equipment not fit for purpose

OAMPS
The Australian Insurance and Financial Solutions People

Both the principal and the contractor should be aware of risks both a job commences

Operator

It is essential that there is a good contractor-site fit

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ORICA
QUARRY
SERVICES

"Assume that water accumulations in a working area are deep enough to be a hazard"

Profiling, Line Boring and Capping

Communication

- Within the site
- Chain of command
- Understanding presented data
- Clearly marked holes

Manual handling

- Set up of equipment
- Removal of equipment

Dust

- Types
- Exposure levels
- Suppression methods

Fitness for Work

- Sun protection
- Noise exposure levels
- Exposure to the elements

Talk to your surveyor before commencing to load a shot to find out problems

Uneven terrain

- Site preparation

Traffic controls

- Where to park mobile equipment
- Signage
- Flashing beacons
- Flags
- Barricades
- Berm work areas

Falling when working close to face

- Equipment
- Tools
- People
- Angle of drill rig and people to face
- Distance of drill rig and people from face
- Restraint methods

Case Study 2: Drill Rig Tips Over into Water Ditch

Incident:

A drill rig was tramming between drill holes with the mast upright when it tipped over into a water filled ditch. Part of the cabin quickly filled with water and mud, and the drill rod fell out of the carousel onto the cabin door that the operator used to escape. The operator suffered serious facial injuries.

Equipment:

Ingersoll Rand DML 35 coal drill

Hazard:

Water filled ditch

Cause:

It was believed that the water was relatively shallow. With this in mind, no control measures were in place and the drill rig travelled too close to the edge of the ditch.

Comments & Recommendations:

Mobile equipment operators need to be aware of any conditions in the work area that could threaten the stability of their equipment. Each such work area needs to be examined thoroughly before work commences and risk control measures implemented where necessary.

Assume that water accumulations in a working area are deep enough to be a hazard unless clearly shown to be otherwise and include then in the risk assessment and consequential control measures.

Queensland Government; Department of Minerals and Energy

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Drill Tramming, Transportation and Loading

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Impact Drilling

Drill Tramming

Collisions - Other vehicles / plant

- Traffic control
- Site communications
- Distance maintained
- Designated work area
- Cleared pathways
- Flashing lights, alarms, reflective tapes
- Signage
- Rear vision (Clear path, mirrors)
- Reversing

Roll Over Potential

- Mast position / failure
- Carousel full
- Angle of incline/decline
- Ground stability
- Ground conditions
- Roll over protection

Ground Conditions

- Layout development / design
- Site and specifically bench preparation
- Weather conditions
- Track conditions. i.e. ditches, slippery
- Site inspection

Benches

- Stability
- Width
- Surface

Falling rock

- Exclusion zone
- Face inspections
- Bench design
- Drilling and blast design
- Plant design, 'FOPS'
- Drainage and bunding

Parking

- At end of shift
- For re-fuelling
- For loading onto transport

Drill Transport - Loading

Site Entry/Exit

- Communication points
- Traffic management
- Multi-tasking (i.e mobile phone and smoking and parking…)

Roll over

- Uneven ground, slopes

Falling off float

- Spotter/guide
- Ground conditions
- Float type and condition
- Training and procedures. I.e.: 'JSA', 'SOP'

Getting out of Cabin

- Working at heights
- Steps and hand grips
- Training or safe operating procedures
- Platform
- Adjustable float deck

Collision - Plant and equipment

- Dedicated loading area
- Traffic control
- Site and operator communications
- Site condition
- Tracks

Unsecured Load

- Tie down provisions and use
- Restrained storage of drills
- Appropriate chains
- Condition of float; specifically the deck

Load Restrictions

- Height
- Width

Loading a drill rig

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"The drill operator must inspect the drill rig and associated equipment prior to use"

Drill Maintenance

Accidental start up of machine

- No isolation

Slipping/tripping

- Surfaces uneven
- Falling off the machine during maintenance

Working at heights

- Working on mast or cabin roof
- Distance of drill rig and people from face
- Replacing consumables not at ground level (i.e fuel, oil, water, filters etc)

Dust

- Exposure levels
- Pre-maintenance wash down

Noise

- Exposure levels
- Key areas

Manual Handling

- Consumables
- Parts

High pressures

- Injection into eye/skin
- Air, water, oil, gas

Electrical hazards

- Poor isolation
- Battery explosion
- Acid burns

Contact with oils & chemicals

- Waste fluids
- Slips, trips and falls
- Exposure through skin, ingestion or injection

Burns

- Hot surfaces
- Exhaust
- Fumes
- Hot fluids
- Welding

Non compliance with manufacturer's specifications

- Operate machine outside specification/ recommended limits
- Not using manufacturer's servicing guidance
- Using non-genuine parts and consumables
- Lack of / poor training

Components of concern

- Drifter

Pre Start Inspections help monitor over time

- Air hoses
- Mast and boom access
- Track chains, feed chains
- Refuelling
- Track and boom pivot pins
- Feed holding bolts
- Breaking system

Case Study 3: Drill Steel fall from Carousel

Incident:

A contract driller was seriously injured while working at a surface mineral mine. The victim was assisting the drill operator at the time of the accident, was positioned in front of the drill when the last section of drill steel fell from the carousel and struck him on the head. The victim was transported to a local hospital, and then airlifted to the UVA Medical Centre.

Equipment:

Gill "Beetle" rock drill

Cause:

After lowering the drill mast, the spider hooks were closely examined, with the width between hook openings varying up to one-half inch, and two of the hooks were bent downward out of alignment. In addition, some drill cutting debris was found in the lower pod (cup) where the drill steel fell out of the carousel.

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Drill Steel Handling and Consumables

Correct collaring of hole

- Cleaning rocks away

Wear limits

- When to replace
- Limitations of drill steel
- Lubricant
- Life of other consumables

Disposal of used consumables

- Recycling
- Removal off site

Selection must be correct

- Fuel/oil type
- Dimensions (i.e. drill steel)

Availability of consumables

- Ordering—delivery timeframe

Loading/unloading process

- Weight of consumables
- Manual handling
- Transportation on/off drill
- Transportation whilst loaded into drill rig

Rotation / feed of drill steels

- Loose clothing
- Anti clockwise
- Entrapment
- Feed chain / rope
- Emergency stop systems
- Carrousel security
- Worn threads

Couplings

- Heat and other damage
- Spilt

Bleed plugs

Changing shank

- Manual handling
- Catching loose clothing

Caps on drill steel

- Removal method

Method to change bits

- Manual handling
- Catching loose clothing

PPE. bit changes

- Lack of PPE
- How is injury caused?

Fuel / water pressure vessel

- Method of fuelling
- Ground level
- Location drill and fuel truck
- Signage

OHS and Maintenance

- Decrease risks through increased maintenance
- Noise, dusts, etc
- MSDS for all chemicals
- Team work

Team work make a job both easier and safer in most cases

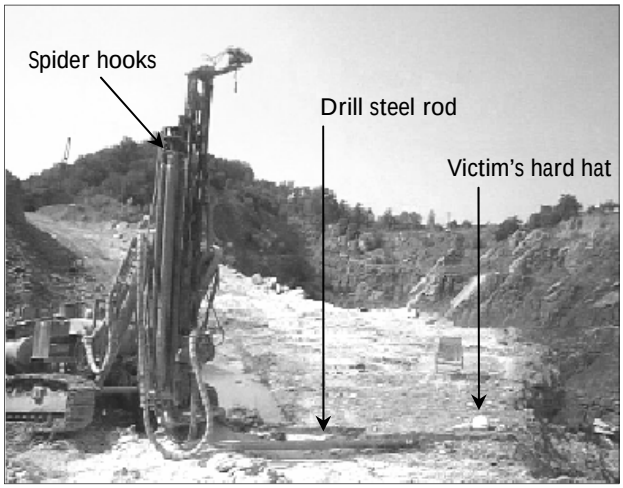
Case Study 3: *Continued*

Recommendation:

To prevent similar accidents from occurring, the drill operator must inspect the drill rig and associated equipment (e.g. the top plate, spider hooks, pods, and other components) prior to use each shift to ensure safe operating condition. During drilling operations, the driller and/or helper should ensure that the drill steels in the carousel are properly secured.

United States of American

Virginia Department of Mines, Minerals and Energy



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Hazards In Drilling & Blasting

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KOMATSU

Drilling Process

Weather
- Lightening
- Heavy rain
- Bad light
- Heat and sun

Site preparation
- Drill penetration rate
- Benches

Communications
- Lack of / poor communications
- Site requirements
- Lone workers

Be very aware of your surroundings when working on a shot

Attire
- Loose clothing
- PPE

Machine capabilities
- ROPS and FOPS

Drill area demarcation

Working at heights
- Angle of drill rig and people to face
- Distance of drill rig and people from face
- Climbing on cabin roof

Noise
- Dangerous times- start up, maintenance, shut down

Dust
- Exposure levels
- Dust from rear of drill rig
- Combined effect of smoking and dust

Fire
- On machine caused by hot engines and/or compressors

Housekeeping
- Slips, trips and falls
- Poor vision
- Manual handling

Drill orientation
- Poor - what can that cause?
- Training

Traffic controls
- Signage
- Flashing beacons
- Flags
- Barricade or berm work areas
- Entry and exit

Reversing
- Pedestrians
- Other vehicles or obstructions
- Slopes or batters
- Uneven ground

Roll over
- Numerous causes

Pressure vessels
- Hydraulic pressure
- Blown hoses

Entanglement
- Changing rods and bits
- Rotation of drill steels
- Between mast and rod

Drill rig operation
- Towing or lifting with the drill rig
- Open door whilst operating
- Spectators
- Boom through operator's window
- Drill steel breaking whilst in hole
- Deviation of drill steel

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Disclaimer

This "Hazards: In Drilling & Blasting" has been prepared by the Construction Material Processors Association.

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