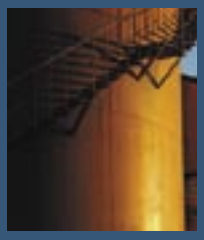
# MineSafe

Western Australia



## The case for safety cases?




Department of **Consumer and Employment Protection**
Government of **Western Australia**

Vol. 14, No. 3
**September 2005**

Resources Safety

# Contents




**Published by**
Resources Safety
Department of Consumer and Employment Protection
100 Plain Street
EAST PERTH WA 6004

Editor: Susan Ho
Tel: (08) 9222 3573
Email: sho@docep.wa.gov.au
TTY: (08) 9327 8838
Website: www.docep.wa.gov.au/ResourcesSafety

This publication is available on request in other formats for people with special needs





ISSN 1832-4762




Cover photo and photo on page 10 courtesy of Michael Lovitt

# In this issue

Now that Resources Safety has settled into its new home within the Department of Consumer and Employment Protection, the division is preparing for a number of important events and changes that will affect the mining industry.

The Mines Safety Improvement Group's (MSIG) recommendation for the implementation of a safety case regime in Western Australia is discussed on page 3. Safety case regimes have generally had success in other hazardous industries and, if implemented, would help to align all areas currently regulated by Resources Safety. Under a safety case regime, operators would be expected to take positive measures and be proactive about managing safety rather than relying on the regulator to enforce compliance. If adopted this approach means companies would develop risk and safety management systems tailored to their workplaces and particular needs.

Forthcoming changes to legislation governing the handling of security sensitive ammonium nitrate follow an agreement by the Council of Australian Governments that a national approach to restriction of access should be adopted. The State Government will still be responsible for the regulation of ammonium nitrate, but the national approach will help to ensure consistent security standards are applied across the states and territories. You can read more about security sensitive ammonium nitrate and the proposed changes on page 12.

These changes are a reminder that safety and health management and regulation are constantly evolving and improving, and it is important for those responsible for mine safety and health to ensure their knowledge is up-to-date. To help facilitate this, Resources Safety is conducting its inaugural Mines Safety Roadshow in October, travelling to the Pilbara, Kalgoorlie, Bunbury and Perth. The roadshow should be of particular interest to employers, managers, safety and health representatives and professionals and the workforce generally. The event is an opportunity for employers and employees to not only learn more about safety and health, but to network with others in the industry and provide feedback to Resources Safety. More information is provided on page 19, and I encourage all mining and exploration personnel to attend.

**Malcolm Russell**
Executive Director, Resources Safety
Department of Consumer and Employment Protection

# Useful websites

- **www.mirmgate.com.au** — Minerals Industry Risk Management gateway (MIRMgate). This site will connect you with good practice information to help reduce risks in mining, minerals processing, and quarrying operations.
- **www.minesafe.com.au** — MINEsafe draws on the extensive OH&S knowledge, expertise and data of the ILO, CFMEU, ICEM, Queensland Department of Natural Resources and Mines, New South Wales Department of Mineral Resources, Coal Services Pty Ltd, and the National Occupational Health and Safety Commission as a part of its comprehensive approach to OH&S information distribution.
- **www.standards.com.au** — Through this web store you can buy all Australian, ISO and IEC Standards, plus a range of publications from other national and international organisations.
- **www.msds.com.au** — Largest online collection of free Australian material safety data sheets. This site offers a comprehensive search facility to enable you to efficiently locate the MSDSs that you require.

# The case for safety cases?

## Impetus

Occupational safety and health in Western Australia's minerals industry have been the subject of extensive review in recent years and the latest inquiry, by Mark Ritter in 2004, resulted in a substantial overhaul being proposed.

The Mines Safety Improvement Group (MSIG), convened to advise the State Government on implementing recommendations in the Ritter Report, has put forward the introduction of a safety case regime as a key plank in this overhaul.

A safety case regime is an objective-based regime whereby legislation sets broad safety objectives and the operator, who accepts direct responsibility for the ongoing management of safety, develops the most appropriate methods to achieve those objectives. Essentially, the operator must make a 'case' demonstrating to the regulator how it is going to effectively manage safety at its facility.

The thinking behind a safety case regime is that safety is best managed through positive measures rather than a prescriptive 'one size fits all' mentality — that is, safety is best managed if companies anticipate possible risks instead of merely complying with prescribed technical rules. While regulators must ultimately accept or reject the safety case, it is up to the operator to be proactive rather than simply compliant in the safety management of its project.

## History of safety cases

A safety case regime has been used in the nuclear industry in various parts of the world for the past 40 years. Such regimes were brought to the fore in public safety issues in the United Kingdom following the Flixborough chemical plant event in 1974.

The methodology was introduced across Europe following the Seveso dioxin emission in northern Italy and the subsequent issue of the so-called 'Seveso Directive' in 1986 by the European Community (now European Union), although this directive, in its original form, specifically excluded mines and mineral exploration.

In 1988, following the Piper Alpha event in the North Sea — where 167 people died in an oil production platform fire — the methodology was introduced across the offshore petroleum and gas industry.

## Risk management

The safety case concept was developed to provide a system for managing risk to an 'acceptable' standard. The traditional aim of the safety case is to reduce the probability of a major accident or high consequence event occurring. However, it can be — and is now, under some circumstances — used to manage all aspects of safety in a holistic way, including traditional occupational safety and health elements.

## Safety case legislation

### Western Australia

In Western Australia, onshore petroleum operations and major hazard facilities are already regulated under a safety case regime by Resources Safety, while mines safety is regulated under general duty of care legislation.

One obvious advantage of the introduction of a safety case system into the Western Australian minerals industry is that it would align the regulation of all areas under the jurisdiction of Resources Safety.

### Other jurisdictions

Evidence of the benefits of safety case regimes in mining jurisdictions elsewhere is not widespread. However, although there has been little analysis of safety case regimes in the mining industry, they are generally considered a success in other hazardous industries.

▶▶

# What is a safety case?

Although a safety case contains a description of the safety management system (SMS), it is subordinate to the SMS. The SMS is the fundamental basis for ensuring safety at the facility. The safety case simply specifies and describes the SMS that applies. The safety case must contain:

**1. Facility description**

Range or scope of operation of the facility, including design philosophy, physical aspects, activities on the facility, surrounding activities, types and numbers of people present

**2. Summary of the formal safety assessment (FSA)**

Systematic risk assessment of those hazards on the facility that may have the most serious consequences for persons at or near the facility

**3. Summary of the SMS**

- Covers all activities on the facility as defined by the facility description
- Has the appropriate structure and processes to foster continual improvement on safety performance
- Is linked to the FSA in that management of critical risk control measures is given the appropriate priority.

*Source: National Offshore Petroleum Safety Authority (NOPSA) Safety Case Guidelines*

A study conducted in 1995 by Scotland's Aberdeen University, which assessed the costs and benefits of the safety case regime on the offshore oil and gas industry, concluded that it had a positive impact on safety in that industry — 'Particularly...a heightened awareness of, and more focused attention on risk, improvements in the management of safety and the better targeting of safety related expenditure,' the study said.

## Case for safety cases

In his 2002 paper 'Safety Cases: Success or Failure?' published by the National Research Centre for OHS Regulation, Peter Wilkinson of the Offshore Safety Section in the Commonwealth Department of Industry, Tourism and Resources, said that while safety cases are not infallible, there is now enough experience around to form the judgment that they are a success.

'All evidence from across a wide range of industries and from the most senior to junior staff, as well as from independent evaluations, points to their success and they have become the standard tool to manage major hazard industries,' Mr Wilkinson said.

Mr Wilkinson added that the benefits of safety cases come in a number of areas.

One of the main benefits is not the finished product but the actual process of preparing the safety case and having to identify hazards and review the installation design, construction and operation.

'Often the process of preparing the case has led to improvements being identified and implemented,' he said.

This flows through to treatment of safety cases as live documents. That is, there is usually a requirement to review and update safety cases every few years or when significant changes are made to a facility.

Finally, regulation can also benefit. Mr Wilkinson stated that safety cases make it possible for the regulator's interventions to be more effective because the safety case should identify the critical safety issues and the regulator can concentrate on these.

## Safety case issues

However, just as most mining operations are not perfect, neither are safety cases.

Some of the criticisms include difficulties in establishing the amount and level of detail required in some cases and, flowing on from this, the usefulness to an operator's workforce.

'The more general the statement, the more difficult it can be to make this judgment and to use it for enforcement. However, the more detail the case contains, the larger the documents become and they run risk of being less useful to the operator's staff,' Mr Wilkinson said.

But more recent evidence suggests that, while ensuring the needs of the regulator, safety cases are increasingly targeting the operator's workforce.

The use of quantitative risk assessment (QRA) is another problematic area. Although a commonly used and valuable tool in the production of safety cases, there is talk of QRA often being 'stretched' or 'massaged' beyond what the available data will support.

One crucial issue is the adequate resourcing of the regulator, but this is more about the incorrect implementation of safety case regimes rather than problems with safety cases.

The MSIG in its interim report says that unless the regime is well resourced it is likely to fail, in the sense that it will offer no advantages over and above non-safety case regimes.

'Evidence for this can be seen in the experience of the British rail system in which a safety case regime was introduced in 1996,' the MSIG interim report states.

'The regime was one which sought to minimise the role of the regulator in approving safety cases. There followed a series of catastrophic rail accidents.

'It would be overly simplistic to say that an inadequate safety case regime caused these accidents, but it can certainly be said that the safety case regime failed to prevent them,' the report said.

## Proposal for new authority

### Background

In conjunction with the proposed introduction of a safety case regime, the MSIG has proposed the setting up of a new authority that, if established, would be funded, in part, by an industry levy. While controversial, there are precedents for such a move.

Currently, Victoria's major hazard regulator recovers some of its costs from industry, and the National Offshore Petroleum Safety Authority (NOPSA) all of its costs.

The MSIG interim report says that the levy would work not only to secure a sufficiently funded regulator, but to act as a safeguard against budget cuts or competition for funding from other departments. It also argues that there is an economic imperative for companies to seek a well-resourced regulator.

'Safety case regimes are focused on the prevention of major accidents. Such accidents result not only in fatalities but also in major damage to plant and interruption to production.

'For example, the Esso gas plant explosion at Longford in Victoria not only cost two lives, but also cost the company many millions of dollars in lost production, and hundreds of millions of dollars to get the plant up and running again.

'A safety case regulator can, therefore, be seen as protecting not only the safety of the workforce but also the profits of the operator,' the report says.

### Benefits and concerns

Alan Gooch, Director of Resources Safety's Strategic Development Branch, says that while such a move would have a number of benefits — the overarching one being bringing Western Australia's mineral industry in line with current thinking on occupational

safety and health in hazardous industries — there are likely to be some concerns.

Cost is expected to be one of the big ones. It is acknowledged that safety cases are very specialised documents and require significant expertise for their preparation, making them costly. Mr Gooch sees most of the cost concern coming from the smaller mining companies.

'Most of the large mining companies will already have these types of safety management systems established and the safety case regime will simply mean a degree of formalising these with the regulator,' Mr Gooch said.

'The smaller mining companies, however, may not be as well prepared or have the resources readily at hand,' he said.

But the impact on the smaller miner might not be as big as envisaged.

In its recommendations to the Government, the MSIG says that, while safety cases should apply to all mines, it is on the understanding that the smaller and less complex the mine, the simpler the safety case should be.

The main challenge, Mr Gooch indicated, is in ensuring that a safety case regime is best suited to Western Australia's minerals industry.

'Specifically, the make-up of the State's resource industry is something that needs to be considered in the introduction of such a regime. Western Australia's resource industry is not only very large, it is also quite diverse,' he said.

### Relationship with current legislation

The MSIG believes that safety cases will be suited to the Western Australian minerals industry. The group says that a similar but 'rudimentary' safety case regime is already in place under the Mines Safety and Inspection Regulations 1995, which require a mine operator to provide a 'project management plan' to the regulator. That project management plan should identify potential major risks of the proposed operations and propose development of ongoing strategies to manage those risks. Furthermore, the project management plan must be judged acceptable by the regulator before permission to commence mining operations is granted.

The MSIG also states that the safety case regime would not replace the currently prescribed general duty of care legislation, which is already a part of the state's *Mines Safety and Inspection Act 1994*, but would add to it 'by indicating how operators can fulfill their duty of care'. The MSIG says that what is being proposed is to develop Western Australia's current resource safety system into a far more effective safety management strategy.

# Employee log book

Employees commonly attend occupational safety and health training and education programs. While there is a host of programs, with many levels of skills acquired, the certificates of participation that are issued may not express details of the knowledge gained by the employee. Depending on the employee's employment history, there may also be duplication of effort by different companies.

The last issue of *MineSafe* asked readers to tell us about safety or health solutions in the minerals industry that could benefit others. Signum Safety Support has developed an employee log book, a simple yet effective and portable mechanism to record safety and skills knowledge acquired by individuals, but with additional features. Some of the aims of this employee log book are to:

- standardise and streamline documentation of safety training between employers and industries
- document the owner's complete work history and expanding skills range
- ledger safety knowledge obtained via participation in various training programs and attendance at other functions, such as seminars
- provide a ready resource of safety topics that can be used as the basis for discussion
- reduce costs by obviating unnecessary repeat inductions and courses.

*Kingsley and Heinz Suessenbach of Signum Safety Support discuss the employee log book with Martin Knee (centre) from Resources Safety*

# Hearing Red

Every Friday around midday and midnight, Resources Safety presents a segment on radio station RedFM about safety and heath issues for the mining industry. RedFM broadcasts to regional towns and mine sites all over Western Australia. Check with RedFM for your local frequency, or listen online at www.redfm.com.au. If you haven't been tuning in, now's the time to start!

In the coming months we will be discussing issues arising from recent amendments to the *Mines Safety and Inspection Act*, including: duty of care provisions; election of safety and health representatives; improvement, prohibition and provisional improvement notices; and penalties.

If there are any topics you would like to hear discussed in the safety segment, please contact Kate Henry via email: khenry@docep.wa.gov.au, or telephone: 9222 3864.

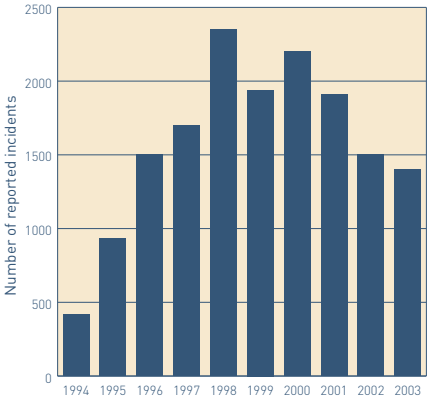
# Can Pareto's principle help miners?

The Western Australian minerals industry reports to Resources Safety on a range of occurrences or incidents causing injury, or having the potential to cause injury. Understanding the more frequently reported incidents can help direct our efforts to controlling hazards at mining operations and during mineral exploration.

Section 78 of the *Mines Safety and Inspection Act 1994* requires ten occurrence types to be reported to the district inspector for the mine, whether or not the incident caused any bodily injury to a person or damage to property. Section 79 of the Act requires a mine manager to report to the district inspector any occurrence that, in the manager's opinion, had the potential to cause serious injury or harm to health. This latter group of incidents can be thought of as 'near misses'.

Reported incidents for surface and underground activities are summarised here for 1994 to 2003, and have been categorised into similar events or causes to help analyse the data collected. It is recognised that not all incidents occurring on mines would be reported under sections 78 and 79 of the Act. Those occurrences not specifically listed in section 78(3) would probably not be reported. Also, if the manager was of the opinion that the incident would not cause serious injury or harm to health then it may not be reported. There is obviously no way of knowing the total number of occurrences at a mine — that is, the number of reported and unreported incidents.

Despite these limitations, the data do provide a good overview of the range of incidents that have been reported to Resources Safety. The incident data have been collated since mid-1994, with the total number of reported incidents from 1994 to 2003 being about 15,750.



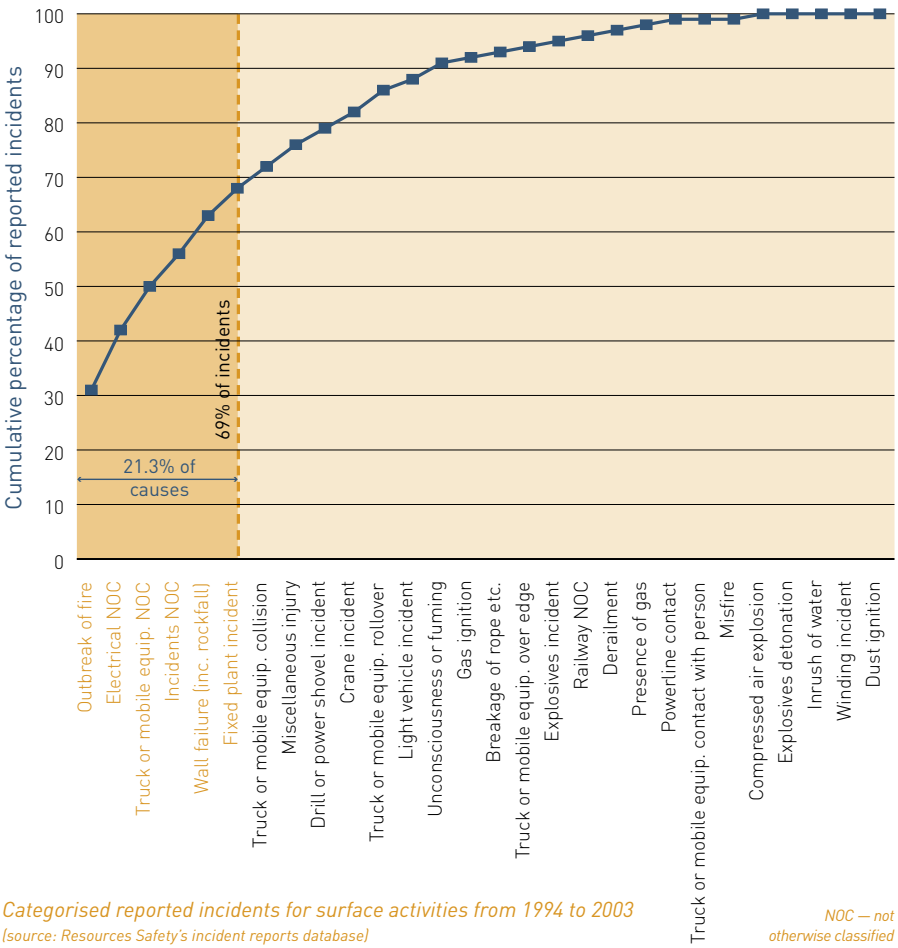

*Number of incidents reported annually from 1994 to 2003* (source: Resources Safety's incident reports database)

Surface activities include mineral exploration and those undertaken on the surface at facilities designated as mining operations, such as railways, ports, treatment plants, workshops and offices. Underground activities are those undertaken in underground workings.

The various categories of reported data for surface and underground incidents have been sorted into descending order from the largest, in terms of number of reports, to the smallest. The data are shown as a cumulative percentage for each category. Cumulative percentage plots are a way of expressing frequency distribution that allows easy comparison of datasets.

From 1994 to 2003, there were 12,961 reported incidents in 28 categories for surface activities, and 2,789 reported incidents in 27 categories for underground activities. How can Pareto's principle help to extract useful information from this vast data collection?

The Pareto principle was named after the Italian economist Vilfredo Pareto. In 1906, Pareto observed that about 20% of the population in Italy owned about 80% of the property. This was later generalised into the so-called Pareto principle, which maintains that 20% of causes are responsible for 80% of the consequences for a given situation. This is also known as the 80–20 rule.




*Categorised reported incidents for surface activities from 1994 to 2003* (source: Resources Safety's incident reports database)

*NOC — not otherwise classified*

For surface activities, there are 28 causes or categories of reported incidents. Applying the Pareto principle means that the six largest categories represent about 20% of the total [(6/28) x 100 = 21.4%]. These cover about 69% of the cumulative percentage for all reported incidents. In other words, for surface incidents, the six most common causes are responsible for about 69% of the reports from 1994 to 2003.

For underground activities, there are 27 categories of reported incidents. Applying the Pareto principle means that the five largest categories represent about 20% of the total [(5/27) x 100 = 18.5%]. These cover about 73% of the cumulative percentage for all reported incidents. So for underground incidents, the five most common causes are responsible for about 73% of the reports from 1994 to 2003.

In summary, Pareto's principle appears to apply reasonably well to reported incidents at surface and underground mines in Western Australia, as shown by data collected for 1994 to 2003.

What does this very basic analysis mean for miners? It suggests that the minerals industry may wish to look more closely at those categories of incidents — listed below — that give rise to the largest number of reports, with a view to determining what can be done to more effectively manage the risks that cause them.

Surface incidents:

- Outbreak of fire
- Electrical (not otherwise classified)
- Truck or mobile equipment (not otherwise classified)
- Incidents (not otherwise classified) — although this category covers a broad array of incidents, ranging from being struck by lightning to finding asbestos in the orebody
- Wall failure, including rockfall
- Fixed plant incident

Underground incidents:

- Outbreak of fire
- Rockfall, including wall failure
- Truck or mobile equipment collision
- Presence of gas
- Truck or mobile equipment (not otherwise classified)

## Section 78(3) of *Mines Safety and Inspection Act 1994*

This section applies to an occurrence of —

a) any extensive subsidence, settlement or fall of ground or any major collapse of any part of the operations of a mine, or any earth movement caused by a seismic event; or

b) any outbreak of fire above or below ground in any mine; or

c) any breakage of a rope, cable, chain or other gear by which persons are raised or lowered; or

d) any inrush of water from old underground operations or other source; or

e) any accidental ignition of dust below ground or the discovery of the presence of potentially harmful or asphyxiant gas or an outburst of such gas in any part of a mine; or

f) any accidental ignition or detonation of explosives, or any delayed or fast ignition of explosives; or

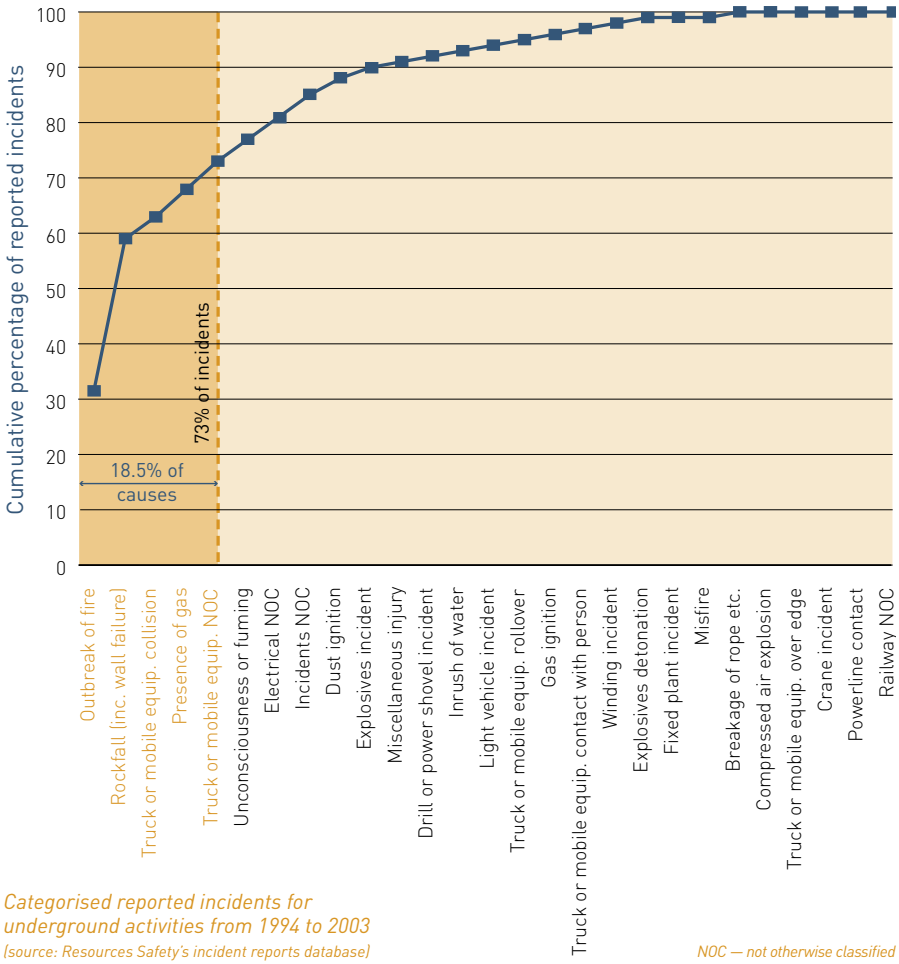
g) any explosion or bursting of compressed air receivers, boilers, or pressure vessels; or

h) every electric shock or burn to a person and every dangerous occurrence involving electricity; or

i) any incidence of a person being affected by poisoning or exposure to toxic gas or fumes; or

j) any loss of control of heavy earth moving equipment, including failure of braking or steering.

Note: The only authorised versions of the Act are those available from the State Law Publisher (www.slp.wa.gov.au), the official publisher of Western Australian legislation and statutory information.




*Categorised reported incidents for underground activities from 1994 to 2003*
*(source: Resources Safety's incident reports database)*

*NOC — not otherwise classified*

**As promised in the last issue of *MineSafe*, below is a complete listing of all safety bulletins and significant incident reports. They have been grouped into general topics for ease of use, with the most recent publications listed first. Some publications appear under more than one topic. All bulletins and reports are available in the mining safety and health publications section of our website.**

# Safety bulletins

### Outbreaks of fire

- SB10 Fires on 4x4 Light Vehicles

### Mobile plant incidents

- SB73 Loss of Control of On-highway Type Vehicles
- SB72 Loss of Control of Large Mobile Equipment on Gradients
- SB68 Death of Dozer Driver — Coronial Finding
- SB63 Dozer Safety in Open Cut Operations
- SB52 Operation of Water Trucks in Open Pit Mines (Quarries) — High Risk Incidents
- SB38 Use of Remotely Controlled Mobile Plant in Underground Mines
- SB34 Retrofitting of Roll-over Protective Structures (ROPs) to Mobile Equipment on Mines — Regulation 4.15
- SB33 Seat Belts and Anchorages for Vehicles on Mines
- SB28 Roll-over Protection for Surface Earth Moving Machinery
- SB20 Seat Belts and Restraining Harness in Heavy Earth Moving Equipment
- SB17 Use of the Bucket of a Loader as an Elevating Platform for Work in Underground Operations
- SB09 Off-highway Mobile Earthmoving Equipment — Tyre Maintenance Practices
- SB08 Recharging of Fixed Fire Suppression Systems on Mobile Equipment

### Electrical incidents

- SB56 Mining Industry Electrical Accidents
- SB51 Overhead Powerlines
- SB30 Ingress of Water into Electrical Equipment
- SB23 Manual Metal Arc Welding — Electrical Safety

### Wall failures

- SB69 Slope Stability in Open Cut Operations
- SB62 Hazards of Collapsing Ground in Mining Operations

### Rockfalls

- SB67 Open Pit Scaling
- SB62 Hazards of Collapsing Ground in Mining Operations
- SB59 Hazards from Falling Rock in Alminak and Gig Rising
- SB47 Rockfall — Dangerous Occurrence — Potential Serious Injury
- SB41 Death of Mine Surveyor in Rockfall
- SB35 Underground Rockfalls — Geotechnical Considerations
- SB29 Rock Stress Factors in Mine Design and Operation
- SB25 Rockbolt Failures — Underground
- SB19 Scaling and Rock Bolting in Large Stope and Development Headings
- SB14 Ground Support in Underground Mines

### Fixed plant incidents

- SB43 Structural Safety of Buildings and Plant
- SB42 Use of Air Hoists for Transportation of Personnel in Underground Mines
- SB26 Service Pipe Ranges
- SB24 Use of Propriety Air Hoists for Transportation of Personnel in Underground Mines
- SB13 Injuries Through Opening Enclosed Systems

### Crane incidents

- SB70 Franna Mobile Cranes — Uncontrolled Movement
- SB36 Split Rim Wheel and Tyre Assembly

### Drills and power shovels

- SB71 Booster Compressor Explosions — Reverse Circulation (RC) Drilling
- SB31 Accident and Incident Performance in the Drilling Industry
- SB21 Surface Drill Rigs — Protection from Rotating Parts
- SB18 Operating Practice with Drilling Jumbos in Development and Stope Headings
- SB04 Charging of Development or Production Holes Where Mechanised Jumbos are Used for Drilling

### Unconsciousness and fumings

- SB53 Particulate Emissions from Low Sulphur Diesel Fuel and Their Health Effects
- SB27 Diamond Drillers Intersecting Hazardous Gases
- SB15 Re-Entry after Blasting

### Light vehicle incidents

- SB48 Unloading Service Vehicles on Minesites
- SB45 Two Post Vehicle Hoists are Not Suitable for Lifting Certain Types of Vehicles
- SB11 Forklifts — Access Ramps to Road Haulage Trucks
- SB10 Fires on 4x4 Light Vehicles

### Explosives incidents

- SB66 Security, Storage and Control of Explosives
- SB58 Struck by Ventilation Doors — Death of Charge Up Assistant in a Blasting Accident
- SB54 Blast Initiation with Safety Fuse
- SB07 Earthing of ANFO Loaders Used Underground

### Gas or dust ignitions

- SB01 Sulphide Dust Explosion Hazards

### Presence of gas

- SB16 Hazard Alert — Use of Inert Gases in Mining/Industrial Processes
- SB06 Formation of Hydrogen Gas from Silicon Metal

### Breakage of rope

- SB61 Precautions for the Use of Gig Rising

### Tyre and wheel incidents

- SB36 Split Rim Wheel and Tyre Assembly
- SB09 Off-highway Mobile Earthmoving Equipment — Tyre Maintenance Practices

### Working at height

- SB17 Use of the Bucket of a Loader as an Elevating Platform for Work in Underground Operations
- SB42 Use of Air Hoists for Transportation of Personnel in Underground Mines
- SB39 Vertical Opening Development in Underground Mines (Rise Development)
- SB24 Use of Propriety Air Hoists for Transportation of Personnel in Underground Mines
- SB22 Access Ladderways
- SB03 Vertical Opening Safety Practice

### Other incidents

- SB65 Design and Operation of Dredges on Ponds
- SB64 Safety Issues Associated With Hydraulic Backfill
- SB60 Lightning Strikes — Managing the Risks
- SB57 Mine Surveying — Risks in Loss of Accuracy and Integrity
- SB55 Potential Hazards Associated with Mine Fill
- SB50 Crushed by Mesh Sheets — Fatal Accident
- SB49 Use of Compressed Air for Cleaning Purposes
- SB46 Lightning — Hazards and Safeguards
- SB44 Radio-Frequency Energy — Hazards and Safeguards
- SB40 Induction, Training and Assessment of the Competency of Employees in the Mining Industry
- SB37 Shift Work and Rostering Practices
- SB32 The 'Millennium Bug' — Possible Implications for Safety and Health
- SB12 Effects of Tiredness, Drugs and Alcohol
- SB05 Annual Road Closures for Mining Tenements
- SB02 Emergency Stops and PLCs

# Significant incident **reports**

### Outbreaks of fire

- SIR131 Drill Rig Fire — Self-Rescuer Failed
- SIR098 Jumbo Drilling Rig — Underground Fire
- SIR081 Serious Burns Involving Disposable Overalls
- SIR069 ANFO Mixing Vehicle Fire
- SIR064 Fire on Front End Loader
- SIR043 Remote Control Loader Fire in an Open Stope
- SIR034 Underground Vehicle Fire
- SIR023 Underground Fires
- SIR020 Drilling Rig Fire

### Mobile plant incidents

- SIR128 Steering Failures on Haul Trucks
- SIR118 Grader Incident — Loss of Control
- SIR133 Use of Torque Multiplier — Fatal Accident
- SIR132 Mine Haul Truck Runs Over a Light Vehicle Following a Driver Change
- SIR130 Employee Sprayed with Rocks when a Truck Tyre Failed
- SIR125 Vehicle Incident Involving Transportation of Explosives Underground
- SIR124 Tyre Inflation Fatal Accident
- SIR122 Dump Truck Tyre Failure
- SIR121 Haul Road Stability in Open Cut Operations
- SIR116 Operator Safety — Earthmoving Scrapers
- SIR115 Tyre Rolling Down a Ramp
- SIR112 Loading Service Vehicle Onto Trailer
- SIR101 Lime Tanker Pressure Piping Connection Failure
- SIR099 Remotely Operated LHD — 'Runaway'
- SIR096 Remotely Operated LHD — Brake Failure
- SIR089 Remotely Operated LHD Machine — Fatal Accident
- SIR088 Remotely Operated LHD — Dangerous Occurrences
- SIR084 Loss of Control of Watercart — Fatal Accident

- SIR083 Explosion of Split-Ring Tyre Assemblies
- SIR082 Crushed in Articulation Point of LHD
- SIR080 Overheating Radiator — Burn Injury
- SIR074 Driver Killed in Tractor Roll-over
- SIR066 Structural Failure of Bucketwheel Reclaimer — Fatal Accident
- SIR063 Remotely Operated Underground LHD — Near Miss
- SIR057 Remotely Operated Mobile Machinery — Fatal Accident
- SIR045 Fatal Agricultural Tractor Accident in Quarry
- SIR042 Remotely Operated Machinery — Fatal Accident
- SIR041 Haul Truck Rear Wheel Falls Off
- SIR039 Uncontrolled Movement of 'Cherry Picker'
- SIR038 Uncontrolled Movement of Mobile Unit During Maintenance
- SIR026 Truck Toppled Over Edge of Stockpile
- SIR021 Operator Safety— Earthmoving Scrapers
- SIR019 Explosion of a Drill Steel Subject to High Temperature
- SIR015 Haul Truck Tyre Explosion

### Electrical incidents

- SIR117 Underground Electrical Equipment — Fatal Accident
- SIR068 Electrical Test Instrument — Serious Accident
- SIR067 High Voltage Circuit Switched to Earth
- SIR050 Trailing Cable Coupler — Electrical Accident
- SIR046 Contact with Overhead Powerline — Fatal Accident
- SIR035 Safe Welding Practice
- SIR025 Buried Electric Cable — Fatal Accident
- SIR024 Crane Dogman Survives Shock From 22kV Transformer
- SIR016 Substation Transformer Explosion
- SIR014 Electric Shock Involving P&H Shovel
- SIR004 Welding Equipment Electrocution — Fatal Accident

### Wall failures

- SIR071 Sudden Collapse of Ground — Sinkhole Formation
- SIR012 Slope Failure — Open Pit Mine

### Rockfalls

- SIR090 Remotely Operated Machinery — Rockfall — Fatal Accident
- SIR044 Rockfall — Fatal Accident
- SIR029 Stope Draw-Point (Mill Hole) — Fatal Accident
- SIR027 Shrink Stope — Fatal Accident
- SIR008 Rockbolting Underground — Fatal Accident

### Fixed plant incidents

- SIR100 Pressure Vessel Entry — Scalding Injury
- SIR073 Conveyor Belt Failure
- SIR058 Removal of a Rise Ladder — Fatal Accident
- SIR055 Conveyor Belt — Fatal Accident
- SIR054 Structural Collapse of an Iron Ore Stacker
- SIR033 Passenger Lift — Serious Accident
- SIR032 Storage Tank Explosion
- SIR031 Hot Oil Boiler — Potential Explosion
- SIR013 Tramp Metal 'Fired' from Jaw Crusher
- SIR002 Conveyor Belt — Fatal Accident

### Crane incidents

- SIR129 Derailment and Fall of Overhead Crane
- SIR104 Dislodgement of a Crane Load Above a Person — Serious Accident
- SIR097 Radio Operated Crane — Uncontrolled Movement
- SIR086 Structural Failures of Large Span Semi-Portal Gantry Cranes
- SIR072 Split Wheel Rim — Fatal Accident

### Drills and power shovels

- SIR135 Aluminium Drill Rod Failure
- SIR119 Driller's Offsider Blasted With Sample Dust Under Pressure
- SIR113 Driller's Offsider Struck by 'Stillson' Type Wrench
- SIR109 Fitting of Tile Boxes on Drilling Rigs
- SIR092 RC Drill Rig 3" Sample Hose Connection — Serious Accident
- SIR087 Drill Rod Handling — Serious Accident
- SIR079 Exploration Drill Hole Intersection

- SIR077 Hazardous Drill Hole Intersection
- SIR061 Caught in a Rotating Drill Rod — Fatal Accident
- SIR052 Rope Power Shovel Maintenance — Fatal Accident
- SIR051 Failure of Mast Supports on Drill Rigs
- SIR047 Injuries Sustained While Working on Drilling Mast
- SIR036 Injuries Sustained Whilst Working on Drilling Mast
- SIR017 Caught By Rock Drill
- SIR005 Split Ring Tyre Assembly Explosion
- SIR003 Compressed Air Hose Connection — Fatal Accident

### Unconsciousness and fumings

- SIR120 Contamination of High Pressure Compressed Air in Plant
- SIR111 Mine Rescue Team Members Collapse During Exercise Underground
- SIR107 Multiple Fuming and Gas Explosion
- SIR010 Cyanide Poisoning

### Light vehicle incidents

- SIR123 Road Traffic Accident at Intersection of Mine Road and Bush Track
- SIR110 Vehicle Over Stope Edge
- SIR059 Offloading Unpalletised Articles

### Explosives incidents

- SIR134 Detonator Found Inside ANFO Loader
- SIR126 Accidental Initiation of Explosives During Blasting in a Development Heading
- SIR108 Detonation of Misfire in Pit Floor
- SIR075 Explosion in Underground Magazine
- SIR093 Ventilation Doors — Fatal Accident
- SIR078 Blasting Accidents
- SIR056 Uncontrolled Discharge of Stored Energy Source— Fatal Accident
- SIR049 Hazard Alert — Auger Mixers
- SIR040 Near Miss Underground Blasting Incident
- SIR037 Lead-Acid Battery Explodes
- SIR009 Gold Room Explosion — Molten Metal Burns

### Gas or dust ignitions

- SIR114 Use of Wrong Gas During a Routine Inert Gas Purge Resulting in Burns to an Employee
- SIR102 Fatal Methane Gas Explosion — South Africa
- SIR085 Explosion of Flammable Gas in Underground Stope Void
- SIR070 Thermal Lancing of Crusher Concaves — Serious Accident

### Breakage of rope

- SIR094 Fall From Height in Gig Rise — Fatal Accident
- SIR062 Anchorage of Underground Scraper Hoists
- SIR022 Winding Rope Detachment

### Tyre and wheel incidents

- SIR130 Employee Sprayed with Rocks when a Truck Tyre Failed
- SIR124 Tyre Inflation Fatal Accident
- SIR122 Dump Truck Tyre Failure
- SIR115 Tyre Rolling Down a Ramp
- SIR083 Explosion of Split-Ring Tyre Assemblies
- SIR041 Haul Truck Rear Wheel Falls Off
- SIR015 Haul Truck Tyre Explosion
- SIR072 Split Wheel Rim — Fatal Accident
- SIR005 Split Ring Tyre Assembly Explosion

### Working at height

- SIR127 Operator Tipped Out of Elevating Work Platform
- SIR094 Fall From Height in Gig Rise — Fatal Accident
- SIR060 Uncontrolled Movement of Elevating Work Platform

- SIR053 Elevated Work Platform Falling
- SIR048 Elevating Work Platform Users Tipped from Basket
- SIR030 Elevating Platform Operation — Serious Injury

### Other incidents

- SIR106 Operator Trapped by Suction Hose
- SIR103 Hazards Associated with Dehydration
- SIR095 Death of Exploration Worker
- SIR091 Fall of Material — Fatal Accident
- SIR076 Storm Water Inflow into Decline Mine
- SIR065 Children Exposed to Hazards at Unattended Mine
- SIR028 Mud Rush — Fatal Accident
- SIR018 High Pressure Water Jetting
- SIR011 Emu Mine Disaster
- SIR007 Chemical Handling — Caustic Burn
- SIR006 Safe Use of Radiation Gauges
- SIR001 Pressurised Gearbox Explosion

# Proposed new regulations to control security sensitive ammonium nitrate

### National initiative

In June 2004, in response to the use of ammonium nitrate by terrorists to manufacture bombs, the Council of Australian Governments (COAG), comprising the Prime Minister, state premiers, territory chief ministers and the president of the Australian Local Government Association, agreed to take a national approach to restrict access to ammonium nitrate to those with a legitimate need. The agreement also required the upgrading of security for explosives in general.

While regulation is a state and territory responsibility, the national approach developed by COAG will ensure security standards for handling ammonium nitrate are the same Australia-wide, and will restrict access to it by other than specifically authorised users.

Each state and territory is introducing legislation to give effect to the COAG agreement, and establish a licensing regime that controls the use, manufacture, storage, transport, selling, supply, purchase, import, export and disposal of ammonium nitrate.

### Who uses ammonium nitrate?

Each year, Western Australia's mining industry uses some 600,000 tonnes of ammonium nitrate, with about 45% being manufactured under tight security at Kwinana, and the balance imported by sea.

Ammonium nitrate is also used as a fertiliser by some farmers, and the Australian Government has worked with the Fertiliser Industry Federation of Australia to develop a licensing system that controls access by primary producers. As a result, all products containing more than 45 per cent ammonium nitrate — regardless of quantity — are now designated as security sensitive ammonium nitrate (SSAN) and will be subject to strict regulation throughout Australia.

The COAG definition of SSAN includes the ammonium nitrate emulsions, suspensions and gels that are the precursors to many blasting explosives. However, aqueous solutions are exempt and their use as fertilisers will be unrestricted.

### New regulations

Regulations controlling the import, export, manufacture, sale, transport, storage and use of ammonium nitrate will be proclaimed in Western Australia in late 2005 or early 2006 as part of new Explosives Regulations. The State will also have a new code of practice for the safe storage of solid ammonium nitrate.

The new Explosives Regulations being developed under the *Dangerous Goods Safety Act 2004* will use a licensing regime to control the

## Ammonium nitrate's big bang not a theory

Our nation leads the world in developing explosives technology to improve the safety and efficiency of blasting operations. But many would be surprised to learn that the chief ingredient used in today's mining explosive of choice — ammonium nitrate — was created more than 200 years before dynamite was patented in 1867.

In 1659, around the time Western Australia was being discovered and mapped by Hartog, Houtman, Nuyts, Vlaming, Tasman and others, ammonium nitrate was first synthesised by German chemist Johann Glauber, when he combined ammonium carbonate and nitric acid.

In 1867, the Swedish chemists CJ Ohlsson and JH Norrbin patented an explosive called ammoniakkrut, which consisted of ammonium nitrate mixed with charcoal, sawdust, naphthalene, picric acid, nitroglycerine or nitrobenzene.

Alfred Nobel acquired the patent for ammoniakkrut and soon registered his own invention consisting of ammonium nitrate explosives he called 'extra dynamites', which were mixtures of nitroglycerine, collodion cotton, charcoal and ammonium nitrate.

These developments introduced the most economical source of high-explosive energy in the world today — the ammonium nitrate–fuel mixtures.

After World War I, when it was mixed with trinitrotoluene (TNT) in artillery shells, ammonium nitrate was used extensively as a fertiliser.

In Germany, stockpiles of a fertiliser mixture of ammonium nitrate and ammonium sulphate were routinely blasted with high explosives to break up the hard solid, without mishap and in apparent safety. However, on 21 September 1921, there was a huge explosion in Oppau when a mound of 4,500 tonnes of this nitrate and sulphate mixture detonated. The blast killed 600 people, destroyed the processing plant and 700 homes, and the shockwaves were felt over 200 km away.

The explosion at Oppau drove home the fact, not realised until then, that ammonium nitrate not sensitised by the presence of a fuel could be made

security of SSAN. While the security requirements for these dangerous goods will be enhanced, and only licence holders, including specifically authorised employees, will have access, there will be no change to their classification as Class 5.1 or 9 substances. Their safe manufacture, storage and transport will be controlled by the new Storage and Handling Regulations and Transport Regulations.


### Upgrading security

In the meantime, industry is already upgrading security on ammonium nitrate. As a result, it can not be purchased at retail outlets, and wholesalers supplying farmers now maintain detailed sales records. In addition, the Western Australian mining industry is further increasing its security arrangements for the storage of ammonium nitrate.

To balance security considerations with the needs of miners and farmers, the proposed new licensing regime will ensure SSAN is only accessible to those who have a legitimate need for the product, are not of security concern, and can demonstrate that they will transport, store and handle the product safely and securely.

### Dangerous goods security card

Importantly, all licence holders and people with unsupervised access to explosives and SSAN — including people on mine sites with any access — will require a national probity assessment. The assessment will comprise a check against the National Police Certificate from the Australian Federal Police and an ASIO name check. These checks have long been routine in the airline industry and are now being introduced on the wharves as part of new federal maritime regulations.

People who are not licence holders, but are working under a licence holder, will be issued with a dangerous goods security card as proof of the probity assessment. The security card will be valid for five years, after which the National Police Certificate must be renewed. The security card will allow portability of the probity assessment between employers and between state jurisdictions.

### Security requirements

The proposed new Explosives Regulations will require a licence holder to have and give effect to a

Continued overleaf

to detonate with the initiation of a large high explosive primer.

Twenty-six years later, another explosion demonstrated the lethal force of ammonium nitrate when mixed with fuel. The French freighter Grandcamp was docking in Texas City, Texas on 16 April 1947 when the deck of the ship caught fire. The ship, carrying ammonium nitrate fertiliser, later exploded, killing at least 567 people and creating a tidal wave that enveloped the shore. The particular ammonium nitrate involved contained nearly one per cent of paraffin oil, which sensitised and turned it into an explosive. The manufacture of this type of ammonium nitrate was quickly discontinued after the tragic accident.

Some 48 years later, in 1995, a truck bomb containing ammonium nitrate and fuel oil (ANFO) was detonated outside a Federal building in Oklahoma City, killing 168 people and injuring hundreds more.

These were isolated incidents but, today, the potent properties of ammonium nitrate are even more under the spotlight because it is favoured by terrorists. This is because of all bomb-making materials, ammonium nitrate is the safest to handle, cheap and the most readily available.

Ammonium nitrate does not burn under any circumstances. But, being an oxidising agent, it will strongly support combustion in the presence of fuel, without any external air supply being available. What we understand as an ammonium nitrate explosion is a very rapid oxidisation reaction that generates a violent expansion or shock wave travelling at about 3,000 m/sec, the force and impact of which causes the destruction.

While ANFO can be made from ammonium nitrate and fuel oil in the correct proportions, it still needs a detonator and a commercial booster or primer before it can be made to explode. In Western Australia, these products are usually very difficult to acquire, and not legally available without a licence.

Australia's resources industry is dependent on ammonium nitrate in all types of mining, including iron ore, gold, nickel, diamonds and coal, and a ban on its use for security reasons is not a realistic option. However, new regulations controlling ammonium nitrate under the *Dangerous Goods Safety Act 2004* will be introduced into Western Australia early next year as part of a nationally agreed approach to the threat of terrorism.

from previous page

management plan. Approval of such a plan will be a prerequisite for the manufacture, storage and transport of SSAN.

As an example, the security part of the plan may need to cover precautions taken to ensure the ammonium nitrate is secure for the entire journey, procedures for checking and authorising persons, nomination of a responsible person, security of keys, training, records, audits, and processes for reporting loss or theft.

It is proposed that any site used for loading or temporarily storing ammonium nitrate will require, as a minimum, security perimeter fencing, lockable gates and access controls.

Locking and sealing procedures will need to be well defined, and checks put in place to monitor their effectiveness. The plan will identify who has access to keys and where they are securely kept. It will be a confidential document restricted to those responsible for security and the employees involved.

In addition, the management plan will have to include a system to monitor the location of the consignment at all times, and instruct workers in emergency procedures.

### Transport requirements

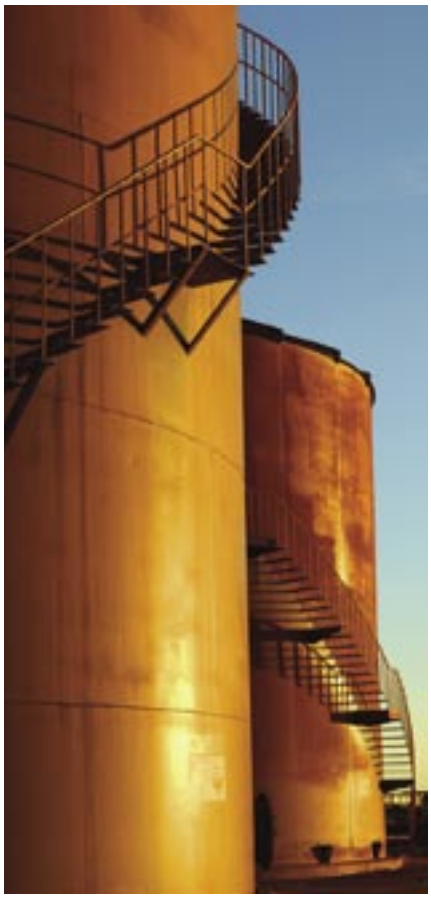
As a Class 5.1 oxidising agent, ammonium nitrate will continue to be transported on placarded vehicles and comply with all safety controls and licences under the nationally uniform transport of dangerous goods regulations and the *Australian Dangerous Goods Code*. However, a licence to transport SSAN will apply, requiring a security plan and security measures. Drivers will require a security card.

### Public consultation

Future editions of *MineSafe* will provide more information on the proposed new regulations, and what companies and individuals in the Western Australian mining industry will need to do to comply with them.

There will also be an opportunity to comment on the draft legislation and associated codes of practice and guidelines during a public consultation period. The dates will be advertised in various media, including the Government Gazette (www.slp.wa.gov.au/gazette/gg.nsf).

# Managing chemicals **on mine sites**



Western Australia's resources industry is a world-class producer of minerals and other commodities. Many operators require large quantities of hazardous chemicals.

Good management and regulation of hazardous substances and dangerous goods are critical for the safety of people employed in industry, and the mining industry is no exception. This is also an increasingly important issue for surrounding communities and the environment. For example, the state's mining industry uses about 85,000 tonnes of cyanide annually. Cyanide is a highly toxic chemical and a potential environmental pollutant.

Mike Rowe, Director of Resources Safety's Occupational Health Branch, said that the management of chemicals has improved significantly within the Western Australian resources sector over the last two decades. The introduction of the Dangerous Goods Regulations 1992 and Mines Safety and Inspection Regulations 1995 (MSIR) has contributed positively to the industry.

'The MSIR requires risk assessments be undertaken aimed at reducing exposure to hazardous substances, while dangerous goods storage licence requirements apply. In addition, operating licences under the *Environmental Protection Act 1986* are increasingly directed at management of environmental emissions,' Mr Rowe said. Consequently, risk management systems are now designed into new facilities, which is far more effective and less expensive than retrofitting controls.

The Western Australian resources industry is at the forefront in employing new control and treatment technology. Modern refineries have to manage numerous emissions, with a particular emphasis on spill prevention.

Some of the earlier problems addressed include incorrect and poor quality labelling, substandard container design and construction,

lack of standardisation and provision of protective gear, and poor storage of chemicals, leading to chronic and acute exposures. Continuous improvement programs, through education, enforcement and systematic risk assessment, have raised industry standards.

The current resources boom is challenging industry to maintain supplies of chemicals. One of the major changes in chemical management has been the adoption of bulk storage instead of handling numerous drums. Apart from the economy of scale, it minimises direct worker contact with the chemicals. Larger chemical stockpiles require robust site management systems, while increased transport needs have led to smarter alternatives, such as transporting solid cyanide in sparge tanks, instead of cyanide solution.

'Today, direct handling of chemicals can be substantially eliminated through tanker delivery, transfer to bulk storage units, automatic distribution within the plant, and the use of remote level sensing and telemetry to notify the supplier when stocks are low,' Mr Rowe indicated.

Economic imperatives have also seen the industry's overall management of chemicals improve. Mr Rowe noted that chemicals can be expensive, so better control of addition rates and efficient recovery of reagents such as cyanide improves a company's bottom line.

A decade or so ago, leaks from storage tanks were often inadequately contained, increasing the risk of a spill affecting employees or damaging the environment. Today, concrete bunding is common throughout the industry, and most underground storage tanks have been removed from mine sites.

Improved engineering and administrative controls on chemicals have also led to changes in management of Resources Safety's atmospheric contaminant database CONTAM. Less dust sampling is required as employees become better protected, and risk assessments have focussed on other areas of potential exposure, such as welding fumes, solvents and noise.

The *National Standard for the Control of Major Hazard Facilities [NOHSC:1014(2002)]* (MHF Standard) will apply to many processing plants that store large quantities of toxic or flammable materials, such as cyanide, liquefied petroleum gas (LPG), ammonia or chlorine. The MHF Standard requires a risk assessment, development of a safety case and audits. Many processing plants will already meet the level of safety assurance required.

In addition to regulating the use of chemicals at mining operations, the importation, temporary storage and transport of chemicals are also subject to regulatory oversight by Resources Safety. In particular, the mining industry is the biggest user of explosives, including security sensitive ammonium nitrate (SSAN). The port interface is an important component in the transport chain for many dangerous goods — and ports are defined as mining operations if used for the stacking, loading and handling of ore or other mining products.

'The sheer quantity and widespread use of manufactured explosives and chemicals such as SSAN, means that security is now an added element that the mining industry must be aware of,' Mr Rowe said.

Companies will require updated security plans, which include risk assessment, need for security clearance, restricted access to the site and more secure premises. These important topics are the subject of a more detailed article on page 10 of this issue of *MineSafe*.

## From MOSHAB to MIAC

The last meeting of the Mines Occupational Safety and Health Advisory Board (MOSHAB) was held in March this year, prior to the introduction of the amended *Mines Safety and Inspection Act* and associated regulations. It was chaired by Jim Limerick of the Department of Industry and Resources (DOIR), and the Executive Officer was Russell Park from DOIR's Safety and Health Division (SHD, now Resources Safety).

At the final meeting, the Chairman thanked all members for their participation on MOSHAB and the way in which they sought consensus to improve safety and health for workers in the minerals industry, without political intervention or compromise. He also encouraged the same commitment, approach and passion on the Mining Industry Advisory Committee (MIAC), when it formed, as had been displayed over the past decade on MOSHAB.

MIAC was established in April 2005 under the *Occupational Safety and Health Act 1984* as an advisory body on matters pertaining to occupational safety and health in the mining industry. The next issue of *MineSafe* will outline the Committee's functions and structure, and introduce its members.

*MOSHAB final meeting — Clockwise from top left: Gary Wood, CFMEU; Henry Rozmianiec, AWU (WA); Bob Leggerini, SHD (Employee's Inspector); Martin Knee, SHD (State Mining Engineer); Jim Limerick, DOIR; Nicole Roocke, CMEWA (observer); Gail McGowan, WorkSafe; Brian Sherwood, SHD (Employee's Inspector); Russell Park, SHD; Hans Umlauff, CMEWA*

*Absent members: Reg Howard-Smith, CMEWA; Jim Walker, CMEWA*

# Recent releases

Resources Safety publishes a range of material including:

- codes of practice and guidelines
- reports, such as industry performance statistics and significant incident reports
- newsletters, such as *MineSafe*
- legislation and policy documents
- licence and permit applications
- online databases.

Recent publications include a series of nine brochures providing an overview of changes to the *Mines Safety Inspection Act 1994*, and a series of 18 brochures on 'mine safety matters'.

The mine safety matters series examines potential workplace hazards and safe work practices in a range of mining industry environments. The topics covered are:

- drill rig operation
- electricity
- hazardous substances
- managing occupational noise in the workplace
- openpit mining over old mine workings
- railway crossings
- remote bogging
- rockfalls underground


# Coming soon

Keep an eye out for the following updated guidelines, to be published by Resources Safety later this year:

- Safety and health representatives and committees
- Incident reporting and health surveillance
- General duty of care in Western Australian mines
- Noise control in mines.

- safety case management of large structures
- travelling in remote locations
- truck driving
- underground mobile equipment fires
- vehicle and equipment access
- welding
- working at height
- working in a confined space
- working in hot processes
- working near large mobile equipment.

Electronic copies of Resources Safety material are available on our website at www.docep.wa.gov.au/Resources Safety. Hardcopies can be obtained by calling +61 8 9222 3229 or emailing SafetyResources@docep.wa.gov.au

# Material safety **data sheets**

Material safety data sheets (MSDSs) provide information on hazardous substances so they can be used or produced safely in the workplace.

MSDSs are used by:

- employees, who may be exposed to a hazard at work
- employers, who need to know the proper methods for dealing with hazardous substances used or produced in the workplace so these can be incorporated into the site's safe working practices
- emergency personnel, such as fire fighters, clean-up crews and medical staff.

It is a requirement under the Mines Safety and Inspection Regulations 1995 that, as far as practicable, an MSDS is available for each hazardous substance on a minesite and the MSDS is readily accessible to all employees potentially at risk from that hazardous substance.

The format of MSDSs varies, depending on who is providing them, but the type of information covered is basically the same and an MSDS may include:

- identity, such as product information, what category of hazardous substance it is and its uses
- physical appearance, physical (such as boiling point) and chemical (such as reactivity) properties, and a description of the mixture or formulation if applicable
- health hazards, both chronic (long term) and acute effects depending on exposure mechanism and duration, and first aid information
- precautions for use, including exposure standards, correct application, ventilation requirements, flammability and personal protection requirements
- safe handling, which covers the storage and transport of the substance, dealing with spills or leaks and disposal, and any fire or explosion hazard.

A guideline on MSDSs is available at www.safetyline.wa.gov.au

Remember to read all labels carefully before using any product. Speak to your supervisor or safety and health representative if you have any queries or concerns about exposure to hazardous substances at your workplace and the safest methods of use and handling.

# Safe Work Australia **Week**

### DOCEP events

Timing of the annual Perth Work Safe Forum has been changed from May to October to coincide with the inaugural national Safe Work Australia Week to be held from 23 to 29 October 2005. Resources Safety's Mines Safety Roadshow has also been scheduled for this week, to complement the forum, one of WorkSafe's premier events. The roadshow is the day after the forum and it is hoped that people will take the opportunity to attend both events, which focus on different safety and health issues.

Occupational safety and health jurisdictions in all other states have organised a range of activities for the week. The Commonwealth Department of Employment and Workplace Relations is promoting these activities on a calendar of events on its website. WorkSafe and Resources Safety encourage workplaces to have additional focus on safety and health during this week. Suggested workplace activities can be found at www.worksafe.wa.gov.au

### Perth Work Safe 2005 Forum

Register now for the Perth 2005 Work Safe Forum to be held on 26 October at the Perth Convention Exhibition Centre. The forum partners are WorkSafe, the newly created Resources Safety Division of the Department of Consumer and Employment Protection, the Commission for Occupational Safety and Health, and WorkCover Western Australia.

The primary target audience for the forums is again elected safety and health representatives. Employers, safety officers and employees are also welcome.

The program includes a mixture of plenary presentations; the perspectives of employer, worker and government representatives; question times and a choice of two of eight concurrent sessions. Plenary topics include 'Taking safety seriously' and 'Extended working hours'. Popular science commentator Dr Karl Kruszelnicki will present 'Great moments in work safety'.

Find out more by phoning WorkSafe on 9327 8777 or go to www.worksafe.wa.gov.au to download a copy of the registration brochure. At only $88.00, you can't afford to miss out.

# Mines Safety Roadshow

Get the latest news about safety and health and broaden your networks

As mentioned in the last issue of *MineSafe*, Resources Safety is holding a roadshow in October, to provide people in the minerals industry with some dedicated information sessions on safety and health. The program should particularly interest safety and health representatives, supervisors, managers and employers from mining and exploration companies, and occupational safety and health professionals. However, anyone with an interest in mines safety is encouraged to attend.

Some of the topics to be covered are recent legislative changes; the roles of safety and health representatives, employers and managers in improving mines safety and health; and incident and injury reporting. Presenters include inspectors and other staff from Resources Safety and WorkSafe, as well as industry and union representatives.

The registration fee of $55.00 per person (including GST) includes morning tea, lunch and a resources pack. If you would like to attend, you can download the registration form from www.docep.wa.gov.au/ResourcesSafety. Further information can also be obtained by telephoning 08 9222 3229 or emailing ResourcesSafety@docep.wa.gov.au

The Roadshow provides an excellent opportunity to improve your knowledge of safety and health and broaden your networks, so we hope to see you there.

**The roadshow will visit:**

- Karratha — 11 October
- Kalgoorlie — 17 October
- Port Hedland — 12 October
- Bunbury — 21 October
- Newman — 14 October
- Perth — 27 October

## Program

| | |
|---|---|
| **9.00 am** | **Welcome and introduction** |
| 9.15 am | Legislative changes |
| 9.40 am | Mines safety — roles, responsibilities and consequences |
| 10.10 am | Issue of PINs |
| **10.30 am** | **Morning tea** |
| 10.50 am | Issue of PINs — continued |
| 11.30 am | Communication strategies |
| 12.10 pm | Electing safety and health representatives and establishing committees |
| **12.30 pm** | **Lunch** |
| 1.30 pm | Reporting incidents and injuries in mining and exploration |
| 1.55 pm | Technical topic: electrical safety |
| 2.25 pm | Access to Resources Safety information |
| 2.40 pm | Feedback session |
| **3.00 pm** | **Close** |

# Safety and health representatives section

## Ask an inspector

Peter Capon is a District Inspector of Mines who is currently based in the Collie Inspectorate. He joined Resources Safety's predecessor in March 1992 and spent nearly 13 years in the Kalgoorlie Inspectorate before transferring to the Collie office. Peter had previously worked as a coal mining engineer for British Coal for 14 years. He comes from a systems-based training background.

Peter's current focus is the lack of attention to detail with respect to poor conditions and substandard practices. If left unchecked, unidentified hazards can lead to accidents or incidents. Peter is promoting a positive safety culture for mine sites whereby all mine employees, including the registered manager, supervisory staff, safety representatives and operators, become more aware and rectify poor conditions and substandard practices without the intervention of inspectors. Generally, mine employees will be much more effective 'mine inspectors' by virtue of being on site daily, in comparison to inspectors who can visit only occasionally. It is also in everyone's best interests to address hazards sooner rather than later.

But how is it that an inspector can enter a largely unfamiliar mine and identify any number of issues that are not being dealt with by the personnel or safety systems present at the mine?

Peter indicated that it is important for people to have a questioning — not an accepting — mind if they are to succeed in finding the unmanaged issues or hazards at a mining operation. He also revealed the type of thought process he goes through when inspecting. This involves scrutinising each item and practice at the mine in an endeavour to rectify issues before they can cause an untoward event. Peter believes his list of questions is a useful tool that everyone can use to some degree to nurture the right conditions and safety culture at their mine. In other words, make your luck rather than rely on luck!

### Peter's golden rules

- Be cautious (assume the worst and manage or act accordingly)
- Be risk focussed — not task driven
- Be hands off — not hands on (keep well away from hazards)
- Make your luck — don't rely on luck (take proactive steps to ensure safety)
- For every action there should be an equal and opposite reaction (the 'size' of the control put in place should match the 'size' of the hazard)

### Mine smart — think 'AIR'

**A** Avoid injury
**I** Identify dangers
**R** Rectify hazards before carrying out each work step

### Positive safety culture — develop a questioning mind

1. Is it as it should be?
2. Are standards of safety consistent?
3. Is there a storage place for all items?
4. Is it an accident or incident waiting to happen?
5. Have procedures, safe work practices (SWPs) or job safety analyses (JSAs) been developed for the task?
6. Have the personnel been trained and assessed as competent for the task being performed?
7. Is the system of work being followed by personnel?
8. Is there adequate supervision on the job?
9. Are auditing, task observation and hazard reporting undertaken?
10. Have the necessary permits been completed for the task being undertaken?
11. Have the preferred control measures of elimination, substitution and engineering controls been considered first, followed by procedural or administrative controls and personal protection equipment (PPE)?
12. Is the risk as low as it can be, or could it be reduced further by slight modification?
13. Does it comply with the applicable Acts and regulations, standards, codes of practices, guidelines, company rules, etc.?
14. Are there any applicable significant incident reports (SIRs) or safety bulletins (SBs) relevant to the task?

### Keep us informed

To keep our safety and health representative contact list up-to-date, please advise Julie Steven in Resources Safety (ph. 9222 3438, fax 9325 2280, email jsteven@docep.wa.gov.au) if you are no longer a safety and health representative, but also let her know if you would like to remain on our mailing list to receive the *MineSafe*.

# Safety bulletins and

## significant incident reports

**All bulletins and reports are available online at www.docep.wa.gov.au/ResourcesSafety in the Mining Safety and Health section**

Safety Bulletin No. 73
Released 31 August 2005

## Loss of control of on-highway type vehicles

### The hazard

In September 1997, the driver of a water cart was fatally injured when the vehicle lost control while watering down the main ramp of an open pit mine, tipped onto its side and collided with the pit wall. The water cart was an on-highway type truck and was not fitted with a rollover protective structure (ROPS). *Significant Incident Report No. 84*, written as a result of the incident, recommended:

- fitting ROPSs on highway type trucks used as water carts
- regular and effective examination and maintenance of braking systems
- consideration of suitable retarding barriers
- provision of adequate training for operators, including emergency procedures
- a review, using a risk assessment approach, of the suitability of equipment used in quarrying operations.

*Safety Bulletin No. 52* was issued in May 2000 in response to numerous incidents involving the loss of control of on-highway type road-watering trucks. The bulletin highlighted two main causal factors for these incidents:

- inadequate braking systems for the trucks
- less-than-adequate training of operators.

The bulletin also discussed the general duty of care to ensure all equipment is fit for purpose and concluded that all mine operators should adopt a risk management approach to determine the suitability of vehicles used as water trucks and for other ancillary tasks. It also concluded that the use of on-highway type trucks for water cart duties in deep open pits was less than adequate.

Over the last two years there has been a concerning increase in incidents involving loss of control of on-highway type vehicles on mines. It appears that some of the lessons from historical incidents have been forgotten. This mines safety bulletin highlights several recent incidents that involved various on-highway type vehicles being used at both surface and underground mine sites in Western Australia. Fortunately, no serious injuries resulted from these incidents but, in most cases, the potential consequences were extreme — that is, serious injury or fatality. The aim of this bulletin is to raise industry awareness of the issues involved in this type of incident, including associated legislative requirements. Industry is urged to proactively review the work processes and systems associated with this type of equipment, and implement appropriate measures to minimise the likelihood of similar incidents in the future.

A summary of selected incidents is listed below:

#### February 2003

The operator of a service truck descending a pit ramp experienced braking difficulties and drove into a windrow to stop the truck. One of the service brake diaphragms had failed, resulting in the loss of air pressure. Roadway conditions were wet and muddy. Although the truck's primary brakes were in a generally serviceable condition, there was no secondary or emergency braking system.

#### July 2003

A loaded bulk explosives mixing vehicle lost all braking systems when travelling down a pit ramp. The vehicle rolled onto its side when negotiating a bend on the ramp. 'Spongy' brakes had been identified two days previously but not reported. The investigation revealed that the brakes were adjusted incorrectly. Deficiencies with maintenance practices, service schedules and training programs were identified.

#### September 2004

A 50 t mobile crane lost control travelling down a pit ramp. The crane reached speeds of 80 km/h before negotiating a temporary access ramp and coming to rest on a bench. The runaway initiated after a gear change and incorrect operation of a retro-fitted gearbox. The brakes were ineffectual and

did not stop the crane due to their incorrect assembly.

### October 2004

A Franna crane lost control while tramming down a decline with a suspended load. The brakes failed to stop the crane so the load was lowered to the ground to halt the vehicle.

### November 2004

An on-highway type water cart collided with a dump truck after losing brakes when travelling down a pit ramp. The incident began with the selection of the wrong gear (ie human error) but the braking system failed to stop the truck when it gathered speed. Investigation indicated the brakes were inefficient due to the presence of mud inside the brake booster chamber and slack brake adjusters. Servicing and inspection procedures were inadequate.

### April 2005

A loaded concrete agitator truck lost control while travelling down a decline due to failure of the service brake system. The operator steered the truck into the wall to slow the truck and did not activate the emergency braking system. The design of the emergency switch did not facilitate ease of use. The truck rolled onto its side and was extensively damaged. Issues identified during the investigation included shortcomings in operator training and maintenance programs. Following the incident an independent consultant was commissioned to test the braking systems of the concrete trucks on site and assess their effectiveness for work performed by the units.

### June 2005

The brakes of an on-highway type water truck failed when it was travelling down a pit ramp. The operator drove the truck into the wall to stop the vehicle then continued to use the truck after discharging some of the water. The operator had noticed problems with the brakes at a previous stop or call-up point but elected to continue down the ramp. The truck was not designed nor intended for use in the open pit at this mine site. However, this restriction was not clearly communicated to the workforce. Inappropriate channels of communication and poor operational planning allowed the truck to be used in an unsuitable application.

## Contributory factors

The types of vehicles and circumstances involved in these incidents are many and varied. Causal factors for these incidents include:

- vehicle's braking systems not being adequate for the application and operating conditions
- defects in braking systems
- inadequate vehicle inspection, maintenance and servicing regimes
- no or inadequate operating procedures, such as speed limits and gear specification
- inadequate operator training in operating the vehicle and emergency procedures
- operation of defective equipment
- insufficient risk assessment prior to use of the equipment
- equipment modifications made without proper change management processes.

It is obvious that these factors are similar to those raised in previous safety information provided by the Mines Inspectorate and from other sources.

Legislation relevant to these incidents includes the general duty of care provisions of the *Mines Safety and Inspection Act 1994*, and specific requirements under the Mines Safety and Inspection Regulations 1995.

Section 9 of the Act requires employers to provide and maintain safe workplaces, plant and systems of work. In the context of this bulletin, this would include fit-for-purpose equipment, risk assessment processes, maintenance and service programs, safe operating procedures and operator training.

Section 10 requires employees to take reasonable steps to ensure the safety and health of themselves and others. This would include reporting defects and not using defective equipment. Section 11 specifically requires the reporting of potentially hazardous situations.

Some specific regulations that are directly applicable to this discussion include, but are not limited to:

- Regulation 4.13: Training and induction of employees
- Regulation 6.2: Plant to be maintained and operated in safe manner
- Regulation 6.17: Employer to identify hazards associated with plant and assess risks
- Regulation 10.38: Trackless units — braking systems
- Regulation 13.2: Motor vehicle brakes.

## Recommendations

Principal employers, employers and managers needs to proactively assess all aspects of the work process associated with the use of on-highway type equipment at mines, including the selection and condition of equipment, competency of personnel, systems of work and operating environment. A risk assessment approach should be adopted to identify hazards, assess the risks and identify appropriate measures to manage the risk based on the hierarchy of controls. The goals are to reduce the risks to personnel to acceptable levels and ensure compliance with relevant legislation.




Importantly, this risk assessment approach should not be a one-off exercise. It should be an integrated part of the safety management system to assess and manage risks associated with the application of mobile equipment on an ongoing basis.

Significant Incident Report No. 134
Released 18 August 2005

# Detonator found inside ANFO loader

### Incident

During charge-up operations at an underground mine, the operator noticed a restricted flow of ANFO coming from the delivery hose. Upon examination, a non-electric detonator and a small rock were found in the actuator valve located at the base of the 'kettle'. Charge-up operations were immediately ceased and the blockage cleared. The supervisor was notified and an investigation commenced.

Had the detonator exploded the consequences for the charge-up crew could have been catastrophic.

### Causes

The investigation revealed that, prior to the incident, detonators were being stored on the lip of the kettle by the charge-up crew. It appears that at some stage a detonator fell undetected from the lip into the kettle.

There was no wire-mesh screen present on the funnel to prevent lumps of ANFO and other items, including detonators, from entering the kettle.

### Recommendations

Managers of underground mines should review their charge-up practices to ensure that such an incident cannot occur at their operations.

The following actions must be considered:

- mesh screening devices to be installed on all ANFO loading kettles to prevent foreign material, including detonators, from entering the kettle
- detonators, primers and explosives not to be stored on an ANFO loading kettle at any time
- checks to be made before filling a kettle with ANFO to ensure that no foreign material is present inside the kettle
- systems to be introduced to account for all detonators used during charge-up operations.

There was a similar incident recently at a mine in Queensland prompting *Explosives Safety Alert No. 11* to be issued by the Queensland Government — Natural Resources and Mines. This may be downloaded from www.nrm.qld.gov.au/mines/explosives/index.html

Significant Incident Report No. 135
Released 23 August 2005

# Aluminium drill rod failure

### Incident

A reverse circulation (RC) drill rig was drilling at a depth of about 94 m when the head drill rod failed. The failure was a long split that rapidly formed from between the pin end tool joint, about 0.5 m from the end of the drill rod, to about 2 m from the same end of the drill rod.

The failed section was located within the drill hole casing a short distance down the hole below the slips table of the drill rig. The slips table was located at the drill deck in immediate proximity to the drill crew work area.

The compressed air system for the drill rig was supplying high-pressure compressed air to the down-hole hammer. It was running at a pressure of about 3860 kPa (560 psi) and flow rate of about 39.6 $m^3$/min (1400 cfm). When the rod failed there was a sudden and uncontrolled release of high-pressure compressed air from the split, which flowed up the inside of the drill collar with enough force to dislodge the steel drill rod slips at the surface.

Fortunately, the drill crew working in the area was not injured and there was no other damage. If the failure had occurred above, at or nearer to the surface then there would almost certainly have been injuries.

Since the occurrence, the mining company (principal employer) and drill rig owner (employer) have removed all aluminium drill rods from service.

### Use of aluminium drill rods

The use of aluminum drill rods is not common in Australia, although their use is more prevalent in other countries such as the United States. The primary circumstance associated with the use of aluminum drill rods at the drilling operation where this incident occurred was that a hovercraft drill rig was used on lake bed surfaces. Consequently, minimising weight was seen to be important in the effective operation of the drill rig.

The lighter weight of the aluminum drill rods meant that more drill rods could be carried, allowing deeper holes to be drilled using high-pressure compressed air. The weight saved by using aluminum drill rods was estimated at 62 kg per rod compared with steel rods. The use of the hovercraft drill rig and its capability to drill deeper holes




were also seen as important aspects of the principal employer's drilling operations.

At the time of the incident, it was estimated that this batch of drill rods had completed 17,000 m of drilling, which is not considered to be excessive.

### Previous occurrence of damage to aluminium drill rods

From inquiries made, it was discovered that there had been a previous occurrence of an aluminium drill rod failing and sustaining damage near the tool end joint.

The tool end joint of an aluminium drill rod is typically a round steel section where a spanner or Stilson-type wrench makes contact with the rod to allow for the joint to be screwed or unscrewed, using the drill head to rotate one drill rod while another is held fast.

A feature of the tool end joint is a machine-turned steel insert with two flat machine-milled sections, which is screwed into the end of the drill rod itself using machine-turned threads and a locking compound, such as Loctite, to prevent the tool end separating from the drill rod.

*Significant Incident Report No. 135 — a side view of the split in the aluminium drill rod*

### Cause of failure

Based on available evidence, the likely cause was a fault induced by the manufacturing process and associated with contamination of the raw aluminium billet material as it was extruded through dies to form raw aluminium pipe. A lubricant is required in the process and, in some instances, there can be contamination towards one end of the raw pipe. This can produce a flaw that may result in a seam, possibly not visible to the naked eye.

### Hazards

The hazards associated with the sudden release of high-pressure compressed air in drilling operations, particularly in the immediate vicinity of the drill crew work area, are well known and documented. It was fortunate that, in this occurrence, the failure was some distance down the hole. If it had been at or near the surface then people near the drill collar would almost certainly have been injured.

All drill rods, whether made from steel or aluminium, sustain wear and damage from the drilling process. Aluminium is typically softer than steel and has differing mechanical properties, which must be assessed for the application so that personnel are not exposed to hazards or risks. It is important to verify the suitability of all plant, including aluminium drill rods, before its introduction into drilling operations.

It was evident from the recorded measurements taken of the failed aluminium drill rod that there were variations of up to 2 mm on the outside diameter.

It was also apparent from viewing the batch of used aluminium drill rods —including the failed rod — that the drilling process has a much more aggressive effect on the outside surface of the aluminium drill rods than on comparable steel rods. Hence the monitoring of wear and damage to aluminium drill rods is very important.

The drilling process also places tremendous forces on drill rods, such as compression forces when under feed during drilling, tensile forces when being pulled back up the hole and torque while being rotated, in combination with high internal pressures from high-pressure compressed air. There are also other factors to be considered, such as heat, flexure and shock loading, during the down-hole hammer drilling process.

Another risk factor is concerned with the method of joining the tool end joint to the aluminium drill rod. In this incident, the split failure appeared to begin at the end of the internal threaded section of the aluminium drill rod where the steel insert was screwed into it.

From inquiries and a review of the available evidence, it appears that an adequate hazard or risk assessment had not been completed before or after the introduction of aluminium drill rods at the drilling operations, nor following the first failure of an aluminium drill rod.

### Recommendations

An appropriate hazard or risk assessment must be undertaken and completed by all parties concerned, including the manufacturer of the drill rods. Principal employers and employers must ensure that they are satisfied that manufacturers can demonstrate compliance with the relevant regulations, and that appropriate procedures and systems of instruction, training, competency assessment and supervision are established and maintained to ensure safe selection, use, inspection, maintenance and discard criteria for all drill rods, not only the aluminium rods that failed in this instance.