



MineSafe

Western Australia



Keep your cool



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In this issue

We started 2007 with a bumper issue of *MineSafe* magazine, and the third and final issue for the year is another 'gold mine of information'. As always, it starts with the regular section by State Mining Engineer Martin Knee, who promotes the concept of 'safe design' in his contribution.

We have articles and pictorial spreads on the 2007 Underground Mine Emergency Response Competition, held in Kambalda, and the 2007 South West Emergency Response Skills Challenge, held in Australind. The 2007 Mines Safety Roadshow is also featured. There are also warnings about some natural hazards – cyclones and lightning strikes – faced in mining and exploration.

The *Mines Safety and Inspection Act 1994* is currently being reviewed by Commissioner Kenner of the Industrial Relations Commission. One of the issues to be considered during this review is the introduction of a safety case regime into the mining industry. We include some different perspectives on what a safety case might involve for the mining industry.

The Australasian Institute of Mining and Metallurgy recently released the second edition of *Orebody modelling and strategic mine planning*, and its contents are overviewed in this issue. There are also invitations to comment on the working hours code of practice released last year and provide feedback on hazardous manual tasks (formerly known as manual handling).

This issue contains Part 4 of the themed section on road safety on mine sites. The contributions by a traffic engineering expert consider heavy vehicle performance and effective road signage on mine sites – the latter a popular topic based on Roadshow feedback.

With the hot weather experienced in most of the State at this time of the year, there is a compilation of resources to help you 'keep your cool', as well as some sun safety measures published by the State of Queensland, but very applicable to our circumstances.

In the safety and health representatives section, we introduce you to Lindsay Robinson from Bemax Cable Sands, who has been a safety and health representative for 14 years. We welcome Peter Green, the new Employee's Inspector of Mines for Kalgoorlie, and invite nominations for an Employee's Inspector of Mines for the Pilbara. There is also a reminder about using the correct form to notify Resources Safety of the election of a safety and health representative. This will ensure details are entered into the mines safety database in a timely fashion – and the representative's package despatched.

We report on several safety and health awards made in the latter part of this year, recognising the innovative work done for the mining industry. There is also an interesting story about how the best laid plans can go awry, as shown by a crusher incident in the North West.

Did you know that Resources Safety is custodian of about 25,000 mine plans dating back to the late 1800s? A project is underway to scan the entire mine plan collection by March 2008. Until recently, mine plans were required to be lodged in hardcopy format only. However, these are cumbersome to store and subject to deterioration over time. Submission requirements have been changed so that most plans may now be lodged as PDF files.

There are three significant incident reports covering specific safety advice related to two drilling incidents and a bucket elevator fire.

Readers are encouraged to regularly check the Resources Safety website at www.docep.wa.gov.au/ResourcesSafety to find out what's new – updates and new information are posted there first. For example, some health management documents have been updated recently.

As 2007 draws to a close, I wish *MineSafe* readers and their families a safe and happy new year, and thank you for your interest and support throughout the year.

Malcolm Russell

Executive Director, Resources Safety

Department of Consumer and Employment Protection

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Thinking it through from the start — concept of 'safe design'

So-called *safe design* is a process that eliminates occupational health and safety (OHS) hazards, or minimises potential OHS risk, by involving decision makers at an early stage and considering the life cycle of the designed product.

A safe design approach will generate a design option that eliminates OHS hazards and minimises the risks to those who make the product, to those who erect or install it, to those who use it and maintain it throughout its useful life and to those who may have to demolish it, dispose of it or recycle it at the end of its productive career.

Why should we consider a safe design approach? Safe design is important to employees; designers (architects, engineers, industrial designers); manufacturers, importers and suppliers; employers; inspectors; and OHS practitioners. It is good management practice. And it helps decision makers understand and implement the OHS risk management approach.

Safe design principles can be applied through the life cycle of the designed product whether in the:

- construction, use, maintenance or demolition of any building or structure;
- manufacture, supply, installation, use, maintenance or disposal of plant or equipment;
- manufacture, supply, use or disposal of chemicals; or
- implementation or use of any system of work or process or any other physical attribute or system associated with either the work place or the interface with people.

The accompanying break-out box lists the five key elements that impact on achieving a safe design.

The opportunities to create safer workplaces are most cost effective when captured in the earliest phases of the lifecycle of designed products

or processes. The most effective risk control measure – *eliminating the hazard* – is often cheaper and more practical to achieve at the design or planning stage, rather than making changes later in the lifecycle when the hazards become real risks to clients, users, employees and businesses.

It is estimated that inherently safe plant and equipment would save between 5 and 10 per cent of their cost through reductions in inventories of hazardous materials, reduced need for protective equipment and the reduced costs of testing and maintaining the equipment. The direct costs associated with unsafe design can be significant (e.g. retrofitting, workers' compensation and insurance levies, environmental clean up and negligence claims). Since these costs impact more on parties downstream in the lifecycle who purchase and use the product, the incentive for these parties to influence and benefit from safe design is also greater.

In the early phases (concept and detailed design process) there is greater scope to design-out hazards and incorporate risk control measures that are compatible with the original design concept and functional requirements of the product. Decisions can be made to eliminate OHS hazards in the systems of work, methods of manufacture or construction, or the use of materials involved in creating the designed product.

This means that a designer must have a good understanding of the lifecycle of the item they are designing, including the needs of users and the environment in which that item may be used.

New risks may emerge as products are modified or the environments in which they are used change. Safety can be further enhanced if each person who has control over actions taken in any of the lifecycle phases takes steps to ensure health and safety is pro-actively addressed, by reviewing the design and checking that the design meets safety standards in each of the lifecycle phases.

Subsequent stages of the product's lifecycle should not proceed until the preceding phase design reviews have been considered and approved by those persons with control.

The accompanying illustration summarises the life-cycle phases associated with a designed product. It also demonstrates the inverse relationship between the ease of implementing decisions to improve safety against the costs of safety implementation against life-cycle for the designed product.

Key elements for a safe design

Principle 1: Persons with control

– persons who make decisions affecting the design of products, facilities or processes are able to promote health and safety at the source.

Principle 2: Product lifecycle – safe design applies to every stage in the lifecycle from conception through to disposal. It involves eliminating hazards or minimising risks as early in the lifecycle as possible.

Principle 3: Systematic risk management – the application of hazard identification, risk assessment and risk control processes to achieve safe design.

Principle 4: Safe design knowledge and capability – should be either demonstrated or acquired by persons with control over design.

Principle 5: Information transfer – effective communication and documentation of design and risk control information between all persons involved in the phases of the lifecycle is essential for the safe design approach.

Continued on page 4...

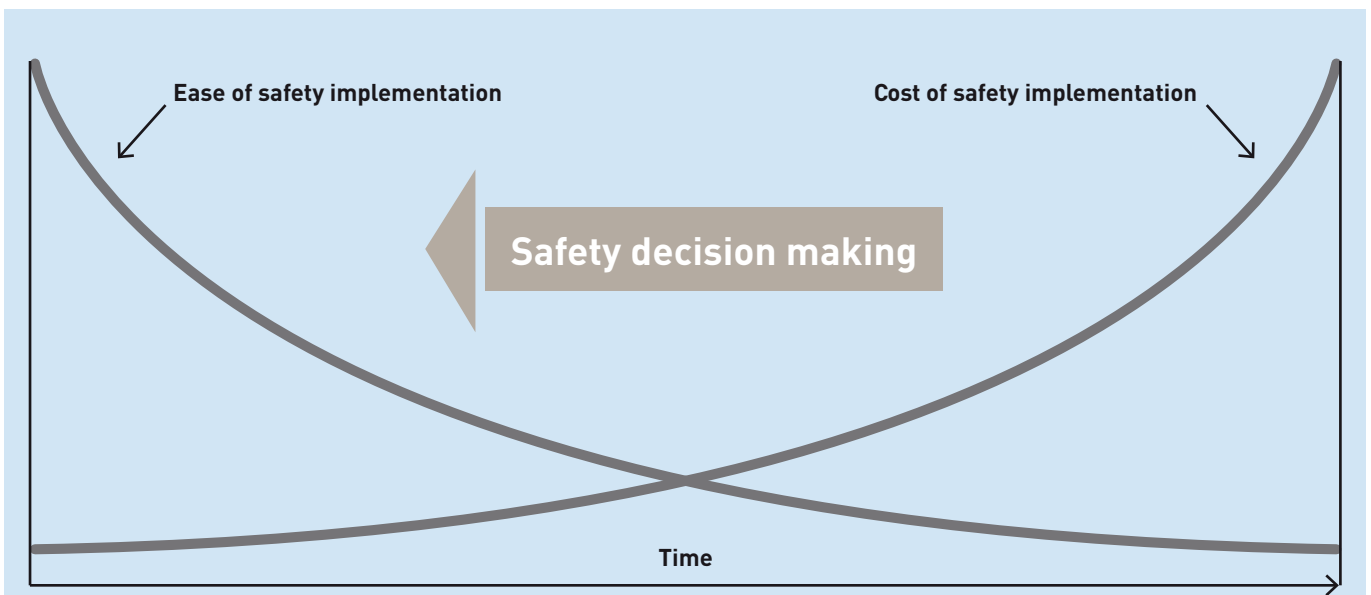
...from page 3

A safe design approach results in many benefits, including:

- simplified risk control;
- prevention of injury and disease;
- improved useability of products, systems and facilities;
- a greater ability to predict and manage production and operational costs across the life cycle of the designed-product;
- a greater ability to predict and minimise costs associated with injury and environmental damage;
- better prediction and management of production and operational costs over the lifecycle of a product;
- a more informed ability to meet legislative responsibilities;
- a reduced need for redesign and retrofitting, and its associated costs; and
- innovation (in that safe design demands new thinking).

In summary, safe design involves understanding, identifying and analysing potential OHS hazards and risks throughout the designed product's lifecycle as part of the design process to improve its safety.

Further safe design information and examples may be obtained from the excellent 2006 publication *Guidance on the principles of safe design for work*, available from the Australian Safety and Compensation Council (ASCC) or www.ascc.gov.au/ascc/HealthSafety/SafeDesign



LIFE CYCLE OF THE DESIGNED PRODUCT

Develop concept/ commission	Design	Construct/ manufacture	Supply/install	Use	Maintain	De-commission	Disposal/recycle
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Moving upstream in the design process. Adapted from WC Christensen and FA Manuele (eds), 1999, Safety Through Design: Best Practices. National Safety Council, Itasca, Illinois.

PPE statistics for mining

Resources Safety was recently asked if there were any statistics showing improvements in safety in the mining industry resulting from personal protective equipment (PPE) use.

Chris Stublely, from the Information Services Section, Health Management Branch, responded that PPE is not specifically referred to on the injury notification forms so they cannot be used to provide the statistics. However, he suggested that an analysis of lost time injuries (LTIs) to eyes may provide a guide.

A quick look over the years that the Resources Safety database has been in operation gives the following information:

1987-88 216 lost time eye injuries out of a total of 2,246 LTIs

2005-06 15 lost time eye injuries out of a total of 462 LTIs

Over almost two decades, not only have the number of LTIs decreased, but the proportion of LTIs due to eye injuries has decreased from 9.6% to 3.2%.

Some of this improvement could be attributed to greater compliance with the requirement to wear eye protection. More functional and comfortable safety glass designs might also have increased acceptance.

As always, PPE should be viewed as the line of last resort in the hierarchy of controls.

Underground Mine Emergency Response Competition

Mid West team takes top award

The Mid West region continues to up the ante in the mining industry with the Oxiana Golden Grove team taking out top honours at the 2007 Underground Mine Emergency Response Competition held 2-4 November at St Ives gold mine near Kambalda.

It was a double for the Mid West team captain and competition stalwart Ben Ingham, who recently competed in Victoria with his team, as he took out the Best Captain Award.

Second place went to Agnew Gold, while the local team from Kalgoorlie Consolidated Gold Mines (KCGM) came in third.

Best New Team went to Jundee, with the team from Kanowna Belle coming in second in this category.

Individual scenario winners were:

- Skills – Plutonic
- Breathing Apparatus Skills – Golden Grove
- Fire – Agnew Gold
- Ropes – Kanowna Belle
- Search and Rescue – Golden Grove
- First Aid – Agnew Gold

- Theory – Golden Grove
- Safety – Golden Grove
- Overall First Aid – Agnew Gold.

The Rescue Coordinators Award went to Cindy Lewis from Newmont Jundee, the Best New Captain to Justin Colwell from Barrick Plutonic, and Individual Theory to Mike Bowron from Oxiana Golden Grove. The Search and Rescue event was recognised with the Best Scenario Award.

Thirteen teams competed in all:

- Agnew Gold
- Barrick Granny Smith
- Barrick Kanowna Mines Rescue
- Cosmos Nickel Project
- KCGM Rats
- Lawlers Gold Mine
- Leinster Emergency Services
- Mincor Operations
- Newmont Jundee Emergency Response
- Norilsk Nickel
- Oxiana Golden Grove
- Plutonic Emergency Response Team.

Thanks to hosts

Competition committee chairman Mark Pannewig gave a special vote of thanks to the host site of this year's Underground Mine Emergency Rescue Competition, the St Ives Gold Mining Company – Leviathan Gold Mine.

'We always need host sites and this year the deadline was running short. Two days before the deadline, St Ives put their hand up and I give a special thanks to the Underground Manager Geoff Newcombe for allowing us access to the mine and his assistance during the event,' he said.

'All the scenarios were realistic and the standards continue to improve. I know all the teams enjoyed the events immensely.'

He said it was rewarding to see lots of new faces this year with new blood coming in, as well as the old (familiar) faces.

'Also many of the adjudicators stepped up into new roles, which was appreciated,' Mr Pannewig said.

Again, senior staff from the Resources Safety Division of the Department of Consumer and Employment Protection assisted in the smooth running of the annual underground competition.

Resources Safety employees assisting included Senior Inspector Peter O'Loughlin as one of the Chief Adjudicators, Senior Inspector Jim Boucaut and Senior Occupational Health Inspector Terry Seifken as adjudicators in the Emergency Controllers Event, and Senior Occupational Health Inspector Gary Hussey as an adjudicator in the Breathing Apparatus Skills Event.

The Breathing Apparatus Skills Event was sponsored by Resources Safety and won by the Oxiana Golden Grove team.

The event, run by the Chamber of Minerals and Energy, is largest of its type in the southern hemisphere.

Real life drama on way to rescue comp

Emergency rescue training kicked into action for two teams on their way to the Underground Mine Emergency Rescue Competition on the Sunday morning.

Members of the Norilsk Nickel Australia's Black Swan – Lake Johnston mines and, shortly after, the Barrick Lawler rescue teams came across the scene of a high speed traffic accident, providing support and first aid to the seriously injured motorist.

On arrival the injured party was found to be blue in the face, not breathing and suffering from head trauma, with the vehicle on fire from the impact of hitting a tree.

At the awards ceremony later that day, competition committee chairman Mark Pannewig said the team's emergency training kicked into action.

'They got the fellow out of the vehicle and got him breathing again. The people from Barrick and Black Swan then formed one

large team, with each team having the same sort of training and things just jelled,' Mark said.

'The fire was put out, and the fellow, who was in a critical condition, was flown to Perth. It was a miracle that he was still alive and it was an amazing effort from two of our teams.'

'We say we train for a day we hope never happens. Our people compete in realistic scenarios, but this time it was for real.'

Due to the traumatic experience, the teams were debriefed on Sunday evening.

Mr Pannewig asked the audience to allow the teams involved to deal with the emotions, which often result when these things happen.

The teams received a standing ovation when they entered the Australian Prospectors and Miners Hall of Fame for the weekend presentations.

Underground Mine Emergency Response Competition

Training for the day

With a rescue team from Kanowna Belle competing only two weeks after a fire resulted in 54 miners being evacuated to refuge chambers at the gold mine, the relevance of intense competition and training was obvious.

While no one was injured during the recent incident, workers were evacuated to refuge chambers following a blaze that started in the engine bay of a 775 Caterpillar truck.

The miners were brought to the surface during the well-coordinated eight-hour rescue operation, which included assistance from rescuers from the nearby KCGM and Black Swan mine rescue teams.

A Barrick Australia Pacific spokeswoman said the evacuation took all day because the miners had rehearsed safety procedures that meant each area of the mine was checked for further hazards before the miners left their refuge stations.

Rescue teams train for the day that things go pear shaped and, with the right training and safety procedures in place, the best outcomes will result.

Following an underground mine tour for the competition, organising committee chairman Mark Pannewig said the organisers put these competitions together for training so if things went wrong, there was a

reasonably good chance of getting people safely out.

His statements were echoed by Chamber of Minerals and Energy Goldfields regional liaison officer Matthew Payne, who said that with rigorous training and the proper procedures in place, the recent fire incident at Kanowna Belle was well managed.

At the time, inspectors from Resources Safety praised the safety procedures in place.

'There were no injuries because the mine's safety system was activated as soon as the fire began,' a Resources Safety spokesman said.

St Ives underground manager Geoff Newcombe invited 'spectators' to view one of the mine's rescue chambers and said they were essential to ensure the safety of workers if there were problems underground.

'These units are actually built in Perth, and this one is designed to keep 12 people safe for 48 hours. The Kanowna incident took about 12 hours, so they weren't really in any danger, they just had to be patient,' Mr Newcombe said.

He said the chamber would have enough oxygen and water for about six people for three days, which could

be extended if the unit still had an external supply of electricity.

Such chambers also contained blankets and food.

'With mains power you would only be limited by your water and food supplies,' he said.

The units are built in Perth by MineArc Systems, who also sponsor the competition, and the one pictured cost around \$100,000 – a small price to pay for such a life saving unit.

It is also a timely reminder to revisit Resources Safety's guideline *Refuge chambers in underground metalliferous mines*.

The Western Australian guideline, believed to be the only one of its kind in the world, was first published in 2005 by the then-Safety and Health Division of the Department of Industry and Resources (now Resources Safety Division in the Department of Consumer and Employment Protection).

It was designed to provide guidance on the safe use of appropriate refuge chambers as part of a response to hazards posed by irrespirable atmospheres underground.

The information was based on a series of risk assessments undertaken between 1977 and 2003



St Ives underground mine manager Geoff Newcombe in a refuge chamber

Underground Mine Emergency Response Competition

at 13 underground mines in Western Australia. These assessments were undertaken by individual mining operations independently of Resources Safety. The guideline also sourced information from fire reports from Western Australian, national and international mining safety authorities.

The guideline says that the most contentious issue associated with the use of refuge chambers appears to be the question of how long refuge chambers can reasonably be expected to support a full complement of occupants while operating in stand-alone mode.

Because there is so much variation, it may be difficult to establish an acceptable duration guide. However, one of the principal recommendations in the Resources Safety guideline is that the supply of oxygen should be available for 36 hours. Previously, the rule of thumb was a supply time of eight hours. It is stated the view

is necessarily conservative and its recommendations are based on a worst-case scenario. It is stated the view is necessarily conservative and the Department's recommendations are based on a worst-case scenario.

The stand-alone time is based on a large rubber-tyred vehicle catching fire while travelling in a main intake airway. The danger of re-ignition, a tyre explosion or both may persist for up to 24 hours, and it is deemed unsafe to approach the vehicle for this period.

While it could be possible to get past the burned-out unit and bring the occupants of the refuge chamber or chambers out on foot, it should not be assumed this would be viable in all incidents.

Eight hours is a reasonable period to allow for clearance of the wreck and restoration of normal services, bringing the total time before a realistic start of rescue operations to 32 hours. In Resources Safety's view,

an additional safety margin of four hours is reasonable.

The technologies exist to support a stand-alone operating time of 36 hours.

Hardcopies of the guideline can be obtained from Resources Safety by emailing ResourcesSafety@docep.wa.gov.au or it can be downloaded in PDF format from www.docep.wa.gov.au/ResourcesSafety



New technology assists rescue efforts

The evolving world of new technologies in making life in underground mine rescue safer.

This year, thermal imaging technology was used by adjudicators to 'see through' smoke and fire at the underground rescue competition fire fighting scenario. Thermal imaging cameras use infrared technology to provide sight when visibility is hindered by fire, smoke or darkness.

St Ives underground mine manager Geoff Newcombe demonstrated the effectiveness of the units during the competition by showing how bodies could be identified in otherwise 'blind' situations.

The increased visibility during a fire emergency allows fire fighters to quickly locate any casualty, a must in underground situations, and greatly reduces the amount of time casualties are exposed to danger.

Another advantage of the units is that the cameras can detect different temperatures, which enables firefighters to identify hot spots so they can be suppressed, reducing fire damage.

The units assist in the RECEO chain of events used to control and evaluate firefighting – Rescue, Exposure, Control/Contain, Extinguish, Overhaul.

Like all electronic components, the prices of the units continue to come down and they are expected to be a normal safety feature to assist rescue in fire situations.

Other features in the latest units include digital temperature measurement up to 1,000°C and up to seven hours operating time image capture, with some models also allowing for video transmission.

With vehicle charging units available and weighing less than 2 kg, the units are versatile and extremely transportable.



Geoff Newcombe demonstrates the effectiveness of the thermal imaging units during the competition.

Underground Mine Emergency Response Competition



REAL LIFE
SCENARIOS



EVENT
HEADQUARTERS



VOLUNTEERS

Underground Mine Emergency Response Competition

HOST SITE

ADJUDICATING

RECOGNITION

Photo's courtesy of Peter W Lewis

Natural hazards

Cyclone reminder



On 2 April 2007, following the tragic events at a rail construction camp near Port Hedland during Cyclone George, WorkSafe and Resources Safety issued a joint safety bulletin on the potential hazards and consequences associated with cyclones.

Mines Safety Bulletin No. 79 *Cyclone – emergency preparation, planning and preparedness* is available from the Resources Safety website at www.docep.wa.gov.au/ResourcesSafety in the mining guidance material and publications section.

On 19 November 2007, following completion of the WorkSafe report on

the deaths of the two workers during Cyclone George, the State Government issued a safety and health alert on emergency preparation for cyclones. The alert is an update of the April safety bulletin, and takes into consideration issues raised during the course of the investigation into the deaths.

WorkSafe WA Commissioner Nina Lyhne said that the report on the investigation had been completed.

'The report has now been passed onto the State Solicitors Office,' Ms Lyhne said. 'They will consider the findings of the investigation and provide legal advice with respect to potential prosecution action.'

'The contents of the WorkSafe report will not be made publicly available because there may be a risk of prejudicing any potential legal proceedings. If this matter does go to court, details will be aired in public in the courts.'

'Once any legal proceedings have been completed, the report will be forwarded to the State Coroner. The Coroner may

then decide to conduct an inquest, in which case the WorkSafe report would form part of that inquest.'

'In the meantime, we have decided to release a further safety bulletin to raise some issues that came to light during the investigation, with a view to preventing similar incidents in the future.'

Safety and Health Alert 17/07 *Tropical cyclones* is available from the WorkSafe website at www.worksafe.wa.gov.au. It recommends that anyone considering construction projects in a cyclone-prone area should check which wind region the site falls into.

Information should be sought on the construction standards that must be observed to ensure that buildings on worksites in cyclone-sensitive regions are adequately secured.

It is also important that emergency procedures and plans are in place in regions that may be affected by cyclones. Workers must be given the appropriate information on safety procedures and be appropriately trained to carry them out.

Lightning strike leads to tyre explosion

A significant incident report made by Anglo Coal's Drayton mine in New South Wales describes an incident on 29 November 2007 where a Cat 789C rear dump truck was struck by lightning. The incident highlights the destructive impact that lightning can have on tyres, and the resultant risk that a tyre explosion presents to anyone in the vicinity.

During an afternoon storm, a Cat 789C truck parked on the go-line was struck by lightning. Some four minutes after the strike, three tyres on the near side exploded.

The resultant air blast and shock wave damaged the truck and broke several windows in surrounding buildings and the windscreen of a water truck parked nearby. Some rim components were found 300

metres from the truck. There were no injuries to personnel.

The company's report made the following recommendations, to be enacted immediately following a lightning strike on trucks:

- area barricaded as a no-go zone;
- incident reported to the mines inspectorate; and
- no-go zone in place for minimum of 24 hours, then reassessed.

Resources Safety has published a guideline on *Tyre safety, fires and explosions*, which is available online in the mining guidance material and publications section at www.docep.wa.gov.au/ResourcesSafety



Safety cases in the mining industry

The *Mines Safety and Inspection Act 1994* is currently undergoing a review by Commissioner Kenner of the Industrial Relations Commission. One of the issues to be considered during this review is the introduction of a safety case regime into the mining industry.

The safety case methodology has been used for many years in complex high risk industries throughout the world and is well documented. The National Offshore Petroleum Safety Authority (NOPSA), for example, has comprehensive guidance material on its website for the safety regulation of the offshore oil and gas industry in Australia. This applies a well founded traditional approach that identifies the key elements of a safety case as:

- facility description;
- safety management system;
- formal safety assessment; and
- validation.

Another recent publication from Engineers Australia entitled *Safety case guideline: an engineer's perspective on the safety imperative* puts forward informative commentary in relation to statutory or common law safety cases, the impact of an adversarial legal system and duty of care (see p. 16).

The key element that can be presented as the argument to demonstrate appropriate safety arrangements is the safety management system (SMS). An SMS cannot be developed without in depth consideration of the activity, process, circumstance and location and a comprehensive safety assessment. It could be argued that a fully integrated SMS that takes into account people, property and the environment, both on and off site, is a safety case.

At present, there is no Australian (or ISO) standard for a generic SMS,

although there are a number of specific SMS standards covering the food industry, water quality, railways and occupational health and safety (OHS).

An integrated SMS could be developed using Australian Standard AS/NZS 9001:2000 (quality management systems) as a basic framework, then applying AS/NZS 4360:2004 (risk management), AS/NZS 4801:2001 (OHS management systems), AS/NZS 14001-2004 (environment management systems) within that framework. The emphasis and focus applied to each standard would depend upon the activity, process, circumstance and location. Obviously, there may be other technical standards and codes of practice to be given consideration and included in the framework.

Each of these well established standards has a number of common elements and the Australian Standard guideline HB139-2003 provides comprehensive guidance on integration. This type of approach can be equally expanded into other aspects of an operation such as financial management, business continuity and disaster recovery as required.

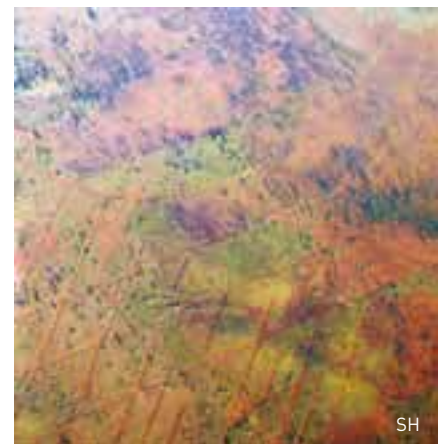
Using such an approach also provides the flexibility of a mix that allows easy adaptation over a large range of operations in differing locations.

It is recognised that the current mines safety legislation is primarily focussed on occupational safety and health, therefore consideration of an environment management system in the SMS may be questionable. However, current environmental protection legislation also applies to mining operations and integration into the overall safety case may be a practical solution to reduce duplication of effort or documentation.

A number of industry players, particularly the larger companies, will already have such systems well established, and will be able to satisfy any new legislative requirement – whatever form it finally takes – without much impact on the way they are doing things now. Others may need to do a fair amount of work to develop and implement such arrangements.

While the introduction of a safety case regime into the mining industry is still some time away, Resources Safety recommends that all industry participants start thinking about how they will address the future – there's a lot of research and reading to be done to find the solution that's right for each operation.

A recent paper by Alf Standen from Corporate Incident Management Associates may be of interest as it covers some of the key elements of an SMS in more detail (see p. 12).



Safety case approach to safety management

The following paper was presented by Alf Standen at a LexisNexis Professional Development conference on Mining and Resource Law WA, held on 24-25 October 2007 for lawyers working in the mining and resources sector. It is reproduced here with his permission.

Alf is Director and Consulting Partner at Corporate Incident Management Associates Pty Ltd. He is recognised for his work over 30 years in training and

skills development, and contributed to the development of competency standards for high risk industries, providing advice to the public and private sectors. Alf has experience in building competence demonstration systems relating to incident response and emergency management within the safety case regime, currently being considered for the mining sector in Western Australia.

Implementing the safety case regime – some key issues

Introduction

The safety case regime is not uncommon in Australia as anyone associated with either the hydrocarbons industry or within a major hazard facility (MHF) will know. Safety case regimes have a far longer history overseas, particularly in the United Kingdom where they have been employed since the late 1960s. In many respects safety cases as we know them have grown out of adversity, and probably the most easily recognised of these was the Piper Alpha offshore platform disaster in the North Sea in 1988, which cost the lives of 167 men.

In his excellent paper, *Safety cases: success or failure* of May 2002, Peter Wilkinson concluded by commenting that safety cases '... are not a panacea and they will not prevent all major accidents, nor less serious ones but they do seem to help us reduce the probability of a major event occurring and to mitigate the consequences of those that do occur.'

It is against this backdrop that this paper is presented and it is appropriate to comment at this early stage that safety cases exist for a single reason – not the preservation of plant or equipment; nor the safety of facilities, though they are desirable consequences – it is the ability for people to return home in no lesser condition than when they went to work.

If we look at the sorts of industries that require safety cases, it's quite apparent that aspects of their

operation are inherently hazardous or dangerous and may affect people both on and off-site. That the sites are hazardous is not important in itself – it is how we react to and manage the hazards and risks those hazards pose. Hazardous industries inevitably find themselves the subject of or are subject to the obligations of legislation and regulation. This in itself should send a message that says 'this is different and you need to think in different terms about your workplace'.

Relationships between the safety case regime and legislation

In the hydrocarbons industry an example of this obligation can be found in the Management of Safety on Offshore Facilities (MoSOF) Regulations under the Petroleum (*Submerged Lands*) Act 1967. Part 3 relates specifically to safety cases and, in this section, the rules are laid down of what must happen within an off-shore situation. Other legislation, land based, includes elements of the attributes to be found in safety cases, such as that related to the protection and safety of persons at work – reducing, eliminating and controlling hazards through the mechanisms of the various occupational health and safety acts throughout the Commonwealth.

Legislation and regulation of course imply 'rules' and 'penalties'; it's what we have to remind us of our obligations in those moments

when we 'forget' or when we're contemplating actions that might be outside the norm. We're also forced to take these seriously when we're contemplating the fallout from a particular incident or event that could have had catastrophic consequences. Existing legislation such as the *Mines Safety and Inspection Act 1994* focuses on creating circumstances under which mines can operate safely and production occurs in an environment that doesn't place employees at risk – the people on whom that production depends.

What does a safety case regime add by way of protection and is it worth the effort? At least one response is the considerable benefit deriving from the way the safety case process causes organisations to consider the 'what if?' factor in more detail. According to the 2004 WorkSafe Victoria publication *Preventing major chemical incidents*:

'The Safety Case is developed by the operator for their facility's unique operations and situation. It sets out how the facility will be operated safely. It can only be prepared after a full examination of the site's activities and with the involvement of employees from the different workgroups and functional areas of the site. Operators must then ensure major incident prevention and control measures identified in the safety case are implemented and fully functional. An effective safety management system ensures they remain functional.'

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In this sense, the safety case gives life to the expectations of legislation and empowers organisations to take responsibility for their activities and actions. From a regulatory perspective, it also means that regulators are able to focus on those aspects of an operation that are clearly critical controls.

Critical aspects of the safety case

Safety case regimes generally tighten the approaches that organisations employ in addressing the safety of persons on or near a site. In a number of respects, the activities undertaken as part of mining operations can impact on persons in areas surrounding a site, and the interests of those persons are of equal importance. The general rule is that if you create the hazard then you must control the hazard, including the environmental hazards.

In essence, the safety case regime brings together the essential components of an otherwise fragmented process, and provides a structure through which all the people associated with a site can have an impact on safety. Some of these aspects are described below.

The facility **description** can be considered to be a description of the design and operating envelope of the site and all related activities. The design envelope for a site, equipment item or activity is the set of combinations of conditions that describe the boundary between safe and unsafe operation.

The facility description should contain an accurate description of the:

- site, its purpose, layout and operation;
- activities (current and planned) that are covered by the safety case;
- interaction between the operation and its surroundings, including the natural environment and other facilities, industries or activities that are (or may be) present;

- design and operating philosophies and operating envelopes; and
- safety design features to manage major accident events.

The operating envelope is the set of combinations of conditions that describe normal operations. In addition, there is often also a safety margin between the design envelope and actual failure of the system.

Structurally, the **safety management system (SMS)** is the all-embracing 'glue' that binds the safety case together. Through the SMS, all systems and procedures are brought together to facilitate a process identifying:

- continual and systematic identification of hazards to safety and health;
- continual and systematic assessment of risk of injury or illness;
- the reduction of risks to persons to as low as reasonably practicable;
- the inspection, maintenance and testing of control measures for those risks;
- adequate communications with relevant facilities and installations; and
- any other matters that are reasonably necessary.

The SMS must also specify the performance standards that apply.

Conducting **formal safety assessments** is an ongoing process through which the site can identify the hazards related to major events on the site. The objective is to provide a detailed assessment of the risks associated with those hazards and identify the control measures that will be used to reduce the risk as low as reasonably practicable. This process needs experienced people and should involve those with a practical understanding of the site and its processes as well as those experienced in the use of analytical tools.

Safety cases set out to prevent major incidents through better management of safety systems and emergency planning and as part of that planning they also provide the recipe for what will be done when things go wrong. This necessitates a detailed relationship between on-site and off-site emergency response capabilities. Since mine sites are commonly located in isolated areas it is easy to forget that it may be necessary to establish good working relationships with State or Commonwealth agencies that have vital roles to play in the emergency services and environmental areas. Building relationships between these and other agencies in advance can considerably reduce response times and increase effectiveness when external interactions are necessary.

Recent tragic events in the mining industry as a consequence of cyclone activity demonstrate clearly the necessity to have appropriate **emergency management and evacuation plans** in place. It is imperative that personnel can leave sites safely in an emergency situation, assuming that it is appropriate to do so and, equally, personnel responding to an emergency can gain access to affected areas. There also needs to be back-up measures in case the planned response or escape cannot be put into place due to damage, loss of communications or other co-related event. These circumstances clearly show the extent to which sites must embark on emergency management plan development and practice their responses on site to develop the required levels of competence.

Safety cases can require exercises be conducted within prescribed periods and these may include escape and fire or other emergency drills. On mine sites this might include preparation for events such as conveyor fires, fires on large earthmoving equipment, catastrophic

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failures of grinding or crushing plant, and vehicle accidents and incidents during maintenance of equipment. **Drills and exercises** are a necessary adjunct to training and, once training has been successfully delivered, may be used to maintain the competence edge that allows individuals to respond competently and safely.

All organisations should have a process for investigating incidents relating to the workplace. In the area of safety cases, however, this needs to be a documented detailed process that is capable of investigating everything from minor to major incidents. Although different legislation and regulation impose differing obligations on operators for **incident investigation**, all such legislation and regulation make it an imperative to investigate and report such instances to regulatory authorities, usually within a prescribed time frame. For example, the National Occupational Health and Safety Commission's publication on *Control of major hazard facilities – National Standard [NOHSC:1014(2002)]*, *National Code of Practice [NOHSC:2016(1996)]* encourages operators to complete all investigations within a period of 6 months (see Investigation and reporting of major accidents on page 77 of the code).

Accurate and comprehensive reporting and **record keeping** are required for an effective safety management system. In some cases, there are requirements for records to be kept for various periods of time; for example, five years for safety cases falling under the jurisdiction of the National Offshore Petroleum Safety Authority [NOPSA; Petroleum (Submerged Lands) (Management of Safety on Offshore Facilities) Regulations 1996, regulation 27]. More important, however, are the regular and routine analysis of those reports and the gathering of data that can

demonstrate trends or track types of incidents, injuries, or near-misses for follow-up and evaluation and action.

Safety cases are living documents reflecting a constant updating as circumstances (processes, equipment, systems) change. The **auditing** process is necessary to confirm to the organisation (and regulator) that the safety case is functional in terms of meeting agreed elements of the operator's systems and equipment, and the control measures relating to known hazards. Input through employees, contractors, safety and health representatives, supervisors and management all contribute to the process of maintaining the validity of the safety case.

These are some of the issues and elements that make up the overall safety case process, and they are critical to ensuring that safety cases are able to stand scrutiny and achieve the purpose for which they were established.

Implications for personnel both contributing to and working under a safety case

An earlier section of this paper referred to the essential link between safety cases and people. If the mining industry adopts similar practices to other industries involved with safety cases, it is probable that the people part of the equation will be given a similar focus and priority. The key to other safety case regimes is the way in which individuals are involved in the process and, indeed, a key feature of all safety case regimes is the need for effective consultation. Safety cases are developed by people – others work under the auspices of safety cases and facilities are managed under their auspices. So from beginning to end, the process depends on people doing the things they do in ways that can stand scrutiny by a regulator.

This has ramifications for mining companies since the experience of the hydrocarbons industry shows

us that it is not just what people do but how well they can do it that is important. As an example, Victorian Workcover Authority's guidance note MHD GN-3 relating to MHFs refers to '... the mechanism of a safety case prepared and implemented by facility operators outlining the means for safe operation of their facility'. This implies people are actively involved in actions with which they are familiar and competent to undertake.

Safety cases have to be developed, implemented, maintained and audited by **competent people**. The component parts such as SMS, formal safety assessments, and hazard identification and mitigation all need to be addressed by people who are able to, in the paraphrased words of the Commonwealth definition of competence, 'apply knowledge and skill to the standard of performance required in the workplace'.

For example, the NOPSA Safety Case Guidelines of September 2004 state:

'Principle SMS – 06: Appropriate and *competent* people must have participated in development and implementation of the Safety Management Systems and in development and implementation of changes to the system.' Note also that in the hydrocarbons industry the permit to work system is directly connected to the safety case through the SMS and, in the words of the regulations, must '... identify the persons having responsibility under it, and ensure that the involved persons are competent'; and

'Principle FSA – 03: Appropriate and *competent* people must have participated in development of the Formal Safety Assessment.'

Also, in the words of the Victorian *Major Hazard Facilities Regulations Guidance Note* [Safety case outline, MHD GN-4, page 5, January 2006], 'Once the work-scope has been determined, the required resources can be defined. The resources required would mostly be personnel, and the number, skills

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and *competencies* of these personnel should be defined at an early stage, and linked to each task in which they would be involved.'

The implication of these principles is that individuals can be held accountable for their actions and, in the preparation of personnel within organisations, a failure to recognise the competence implications can leave organisations and individuals exposed to later criticism and potential prosecution by regulators and litigation in the courts.

To this end, it is important for the industry to be willing to invest in the resources necessary to enable its own people to play the primary role in developing the safety case. A variety of people need to be involved – the input of people such as operators with hands-on operational or engineering knowledge of the area under consideration and health and safety representatives throughout the process is vital. According to the Plastics and Chemical Industry Association (PACIA), these people are invaluable to involve in workshops on hazard identification, safety assessment and on the adequacy of control measures (M Donnan, September 2003, *PACIA guidance note on industry lessons from developing and implementing the safety case in Victoria*).

PACIA also recommended that consultants be used with care. Initially, of course, consultants and industry were both learning about the process and how it would work in Australia. However, there is now a wider knowledge base and a greater depth of experience available and, as PACIA pointed out, consultants should be used to inform the process not own it – that's the organisation's job.

Nationally, there are **competency standards** that relate to various aspects of the safety case process and these can be found in the national training packages for the mining; and chemical, hydrocarbons and oil refining industries. More will certainly be developed as

industry experience with safety cases grows. The standards are written by industry personnel with the intention of providing some nationally consistent benchmarks for personnel across industry. They describe the attributes of knowledge and skill that should be demonstrated against specific performance criteria and in the context of different organisations.

The standards are not universal nor do they represent all aspects of involvement in the safety case process – but they are industry based and represent a clear intention by the industries that developed them to contribute to the ability of personnel working within the safety case regime to do so competently. Competency standards are not generally compulsory for use by organisations, though they can be imposed through legislation or regulation – they are, however, compulsory for registered training organisations (RTOs) that seek to acquire public funding for the delivery of associated courses.

In conclusion

Whichever way the mining industry chooses to go with the safety case process, it should be borne in mind that people – and competent people at that – are the key. It should also be remembered that the time and effort invested in the safety case regime offer many benefits to organisations. Again in the words of Peter Wilkinson, '...the benefits of Safety Cases come in a number of areas.

These include:

- an improved understanding of the hazards and risks;
- an enhanced knowledge of the technical and managerial controls required to manage them; and
- better oversight by the regulator.

Taken together, these should lead to the principal goal of a reduction in the number and consequences of major accidents'.

What Peter's paper pointed out was that these benefits are achieved through the process of organisations preparing the safety case and the improvements in the hardware and managerial arrangements identified as necessary. Also, that preparing and reviewing safety cases provides both the driving force and framework by which areas of improvement can be identified and assessed, and programs of action prepared. Finally, the paper pointed out that safety cases make it possible for the regulator's interventions to be more efficient and effective.

To realise any of these benefits, however, rests on the necessity for a detailed consultation with employees and with all stakeholders to the process. Without that input, it is inevitable that key aspects will be overlooked thus potentially sowing the seeds of disaster.

Finishing with a quote from PACIA's advice:

- **'Planning is essential** – you must prepare a detailed project plan – the preparation of a safety case is a complex project to be undertaken. Define the scope early – core scope, linked facilities and isolated facilities etc. The scope is important to help focus your efforts and anticipate the desired endpoints.
- **It is important to know what you are trying to achieve** – what the end will look like, before you can plan how to achieve it. Many companies had a very good plan of the steps, but didn't clearly know the outcome they were seeking to achieve. Avoid getting bogged down in the detail – think about the bigger picture. Remember, you are building a case for safety that explains why you are doing things'.

From an industry and organisational perspective, the safety case poses challenges but offers considerable benefits in terms of the improved safety of operations and subsequent effects on people. And that's what this is all about.

Safety case approach to safety management

Safety case guideline: an engineer's perspective on the safety imperative

The second edition of *Safety case guideline: an engineer's perspective on the safety imperative* was released recently by the Victorian Chapter of the Risk Engineering Society (RES), a technical society of Engineers Australia.

Safety management is moving from the isolated application of strictly technical tools to a more robust safety case approach that applies multiple assessment methodologies to demonstrate that both technical and organisational risks are managed effectively.

With the growing emphasis of performance-based legislation, the safety case is not only a mechanism for achieving safety goals but has also become an important liability management tool.

To act effectively as both a technical and liability management tool, safety cases need to have an initial argument for the approaches selected to demonstrate effective safety management. Three types of risk are defined, and seven paradigms for assessing downside risk and three enquiry methods of 'risk sign off' are described in the guideline.

The second edition was prepared in response to significant changes made to Australian Standard AS/NZS 4360:2004 on risk management and the Victorian Occupational Health and Safety Regulations 2007. As a result, four major changes have been made.

Statutory and common law safety cases

The current version of the guideline focuses on statutory safety cases, that is, ensuring all statutory and regulatory safety requirements are met. With safety cases increasingly being seen as liability management tools as well as safety management tools, a common law 'duty of care' approach is now being taken. This approach takes into account not only statutory and regulatory safety

requirements, but also common law requirements, which focus on ensuring all reasonably practicable precautions are in place.

'Acceptable' to 'not intolerable' risk

In order to meet the common law duty of care, it appears that risk management is moving away from the concept of 'acceptable' risk to 'not intolerable' risk. This is supported by the cessation of use of the term 'acceptable risk' in the 2004 revision of Australian Standard AS/NZS 4360. For risks not identified as 'intolerable', the common law principle applies, that is, the balance of the significance of the risk versus the effort required to reduce it. This implies that there is no lower limit to risk levels.

'Good practice' versus 'best practice'

All references to 'best practice' in the guideline now read 'good practice'. This distinction notes that while 'best practice' is something an organisation aspires to, 'good practice' is something it must legally achieve.

Focus on controls rather than risk assessment

This change is supported by amendments to the Victorian Occupational Health and Safety Regulations (effective 1 July 2007), which state that if, for a particular risk, accepted risk controls exist, then conducting a risk assessment would only delay the implementation of such controls.

The Victorian Chapter of RES prepared this guideline in accordance with Victorian legislation. However, professionals in other states should find this a useful guide to preparing a safety case.

The guideline is available for purchase via the Engineers Australia website at www.engaust.com.au/bookshop/epub.html#safetycase

Orebody modelling and strategic mine planning

Orebody modelling and strategic mine planning are arguably the backbone of the mining industry and represent an intricate, complex and critically important part of mining ventures. They have a profound effect on the value of a mine, as well as determining the technical plan to be followed from mine development to mine closure.

The Australasian Institute of Mining and Metallurgy recently released the second edition of *Orebody modelling and strategic mine planning*, volume 14 in its Spectrum Series on specialised topics.

Topics covered in this publication include:

- Why strategic risk management?
- New practical conditional simulation methods and applications
- Advances in conventional mining optimisation and applications
- Integrated large-scale applications
- Geological uncertainty and mineral resources/ore reserves
- Geotechnical risk and mine design
- Case studies and blending optimisation
- New concepts, technologies and directions.

The paper entitled *Mine design in Western Australia — a regulator's perspective* was written by Ian Misich, Senior Geotechnical Engineer with Resources Safety, and Patrick Burke, formerly of Resources Safety, and has been updated by Ian to reflect current departmental nomenclature and website links.

This second edition also contains three additional papers highlighting new developments, including integrated mine evaluation and mine management under uncertainty; optimising ore extraction and in-pit dumping; and stochastic simulation of orebody geology or wireframes with multi-point spatial statistics.

Visit www.shop.ausimm.com.au, email publications@ausimm.com.au or telephone 03 9662 3166 to order this publication.



Review of Mines Safety and Inspection Act

Commissioner Stephen Kenner of the Western Australian Industrial Relations Commission was appointed in October this year to conduct a review of the *Mines Safety and Inspection Act 1994*.

Employment Protection Minister Michelle Roberts said Commissioner Kenner would bring considerable experience to the statutory review process, which will look into the operation and effectiveness of the Act.

Commissioner Kenner has had a great deal of experience in the Western Australian mining industry with his extensive consideration of mining and related legislation including the *Mining Act 1978*, *Mines Safety and Inspection Act 1994*, *Occupational Safety and Health Act 1994* (OSH Act) and related regulations.

He is also chairman of the Western Australian Coal Industry Tribunal, dealing with all industrial matters in the coal mining industry in Western Australia.

'Under the Act, certain reviews are to be carried out and I have decided to

bring forward the 2009 review so that a number of other important studies and reviews can also be taken into consideration,' Mrs Roberts said.

'For instance, we have recently held public consultations into the National Mines Safety Framework, which I launched in Perth and Kalgoorlie, and it is prudent to consider the national goals and strategies and its draft legislation when we are reviewing our own Act.'

'Commissioner Kenner will also be looking at areas that could be improved, including alignment with the OSH Act,' Mrs Roberts said.

'We want to look at what amendments to the Act would be required to introduce the concept of a "safety case" regime, similar to that already in place for the oil and gas sector, where the legislation defines broad safety objectives and the operator develops the most appropriate methods of managing risk.'

The deadline for submissions has been extended to 5.00 pm WST, Thursday, 31 January 2008.

Comments sought on working hours code of practice

The then-recently released Code of practice: working hours was considered in the afternoon session at the 2006 Mines Safety Roadshow. At the time, participants were advised that feedback would be sought the following year.

The code was published by the Commission for Occupational Safety and Health (COSH) and endorsed by the Mining Industry Advisory Committee for use in the mining industry. Copies were sent to mine and exploration managers on the Resources Safety database, and made available on the Resources Safety website.

The code outlines employers' duty of care in relation to occupational safety and health risks that may arise from working hours arrangements, and provides guidance on conducting a risk management process. It has now been available for more than a year so it is timely to review its usage and effectiveness, and COSH is seeking your comments.

A survey form is available at www.worksafe.wa.gov.au and should be returned by Friday 1 February 2008.

The comments provided will be used to evaluate the code and consider whether improvements should be made.

Responses will remain anonymous and confidential, and will only be used to evaluate the code.

The code can be downloaded from the WorkSafe website or www.docep.wa.gov.au/ResourcesSafety in the mining section under 'Guidance material and publications', or purchased from WorkSafe by ringing 1300 307 877.



Statutory review of the *Mines Safety and Inspection Act 1994* **Call for submissions - time extended**

A review of the operation and effectiveness of the *Mines Safety and Inspection Act 1994 (the Act)* is being conducted by Commissioner S J Kenner of the Western Australian Industrial Relations Commission.

The review is also required to take into account the:

- areas of the legislation that could be improved, such as the application to rail safety, mine sites during construction and interaction with other occupational safety and health legislation;
- goals and strategies of the National Mine Safety Framework;
- recent Hicks Feasibility Study of Resources Safety in Western Australia that recommended the introduction of a safety case regime into the mining industry;
- recommendations outstanding from the Laing Report in relation to the review of Parts 3 and 4 of the Act; and the
- recent review of the *Occupational Safety and Health Act 1984* by Mr Richard Hooker.

Written submissions addressing the terms of reference for the review are invited from interested individuals and organisations.

Further information, including the terms of reference, and how to make a submission, can be obtained at www.docep.wa.gov.au/ResourcesSafety or by contacting Ms Julie Steven on 08 9358 8079.

Specific legal queries may be directed to:
Ms Melina Newnan, Review Executive Officer, on 08 9358 8155.

Written submissions can be lodged by:

- email to ResourcesSafety@docep.wa.gov.au or
- sending to GPO Box 2275, PERTH WA 6000.

All submissions will be treated as public documents unless confidentiality is specifically requested.

Submissions close 5pm Western Standard Time, Thursday 31 January 2008

Report

In October 2007, Resources Safety took the third annual Mines Safety Roadshow to Bunbury, Kalgoorlie, Port Hedland, Tom Price and Perth.

The roadshow presented information on occupational safety and health issues that affect the minerals industry, and the program was based on issues raised by the mines inspectorate that industry needed to be aware of, and topics suggested at last year's roadshow.

There were over 425 participants representing a range of industry perspectives, including safety and health representatives, occupational health and safety (OHS) professionals, supervisors and managers. About a third were safety and health representatives.

Resources Safety staff, including Martin Knee (State Mining Engineer) and inspectors, were joined by Damir Vagaja (ARRB Group) for the regional events. Damir presented information on road safety on mine sites.

In Perth, Bert Boquet (Embry-Riddle Aeronautical University, Florida) and Greg Rowan (CSIRO, Queensland) combined with Martin Knee to present an expanded safety culture session in lieu of the road safety session. Together with Allan Jackson (RTIO, Chair of The AusIMM OHS Taskforce) and Gary Wood (CFMEU), they convened a panel discussion on safety culture that ranged widely and was well received.

In early November, the PowerPoint presentations were made available on Resources Safety's website as toolbox presentations, adding to those from previous years.

Participants who responded on the survey forms suggested numerous topics for future mines safety roadshows, *MineSafe* articles and other Resources Safety publications and resources.

Based on feedback from this year's roadshow, four venues are planned for the 2008 Mines Safety Roadshow, covering Kalgoorlie, Bunbury, Karratha and Perth. It is proposed that the regional events run over two weeks in mid-late October 2008. The Perth event is booked for Friday 24 October, in Safe Work Australia Week.

Safety culture

Safety culture was a prominent theme at the 2007 Mines Safety Roadshow, and many participants were keen to obtain more information on this and related topics, as covered by the speakers.

The following list of resources found by 'googling' the internet is by no means exhaustive, but does provide a good starting point.

Safety culture

- Fleming, M, and Lardner, R, 1999, Safety culture: the way forward. *The Chemical Engineer*, 11 March 1999, p. 16-18. www.keilcentre.co.uk/downloads/Culture.pdf
- Hopkins A, 2002, Safety culture, mindfulness and safe behaviour: converging ideas? *National Research Centre for OHS Regulation, Working Paper 7*, The Australian National University, Canberra. www.ohs.anu.edu.au/publications/pdf/wp%207%20-%20Hopkins.pdf
- Johnsen, SO, Vatn, J, Rosness, R, and Herrera, IA, 2006, Cross border railway operations: improving safety at cultural interfaces. *Cognition, Technology & Work*, Vol. 8 No. 1, p. 76-88. Springer, London. www.springerlink.com/content/p31162u2524t17n7/
- The following paper has an extensive reference list, including those authored by KH Rogers on high reliability organisations. Pizzi, LT, Goldfarb, NI, and Nash, DB, 2001, Chapter 40: promoting a culture of safety. *In Evidence Report/Technology Assessment No. 43, Making Health Care Safer: A Critical Analysis of Patient Safety Practices*, AHRQ Publication No. 01-E058, Agency for Healthcare Research and Quality, Rockville, USA. www.ahrq.gov/Clinic/ptsafety/chap40.htm
- Roughton, JE, and Mercurio, JJ, 2002, *Developing an effective safety culture: a leadership approach*. Butterworth-Heinemann, Boston, 384 pp.

'Swiss cheese' model

- Reason, J, 1990, *Human error*.

Cambridge University Press, Cambridge, 318 pp.

- Reason, J, 1997, *Managing the risks of organisational accidents*. Ashgate, Aldershot, UK, 266 pp.

Human factors

- Diederik, PJ, Thierry, H, and Wolff, CJ, 1998, *A handbook of work and organizational psychology (2nd edition). Volume 2: work psychology*. Psychology Press, Hove, UK, 320 pp.
- Shappell, SA, Detwiler, CA, Holcomb, KA, Hackworth, CA, Boquet, AJ, and Wiegmann, DA, 2006, *Human error and commercial aviation accidents: a comprehensive fine-grained analysis using HFACS*. DOT/FAA/AM-06/18, Office of Aerospace Medicine, Washington. www.faa.gov/library/reports/medical/oamtechreports/2000s/media/200618.pdf
- Wiegmann, D, and Shappell, S., 2001, Human error analysis of commercial aviation accidents: application of the Human Factors Analysis and Classification System (HFACS). *Aviation, Space, and Environmental Medicine*, vol. 72, p. 1006-1016.

Organisational culture

- The following paper also covers risk management. Else, D, and Terrey, G, 2004, Sustainable by design: an opportunity for Australia to navigate a path to globally 'fit for purpose equipment'. In *SD04 Sustainable Development Conference*, Minerals Council of Australia, Kingston, ACT. www.minerals.org.au/__data/assets/pdf_file/0013/6016/5B-2ElseDennis.pdf
- Weick, KE, 2001, *Making sense of the organisation*. Blackwell Business, Oxford, 483 pp.

The toolbox presentations based on the safety culture presentations at the roadshow are available from www.docep.wa.gov.au/ResourcesSafety in the mining section under 'Guidance material and publications'.

Mine Safety Roadshow



PERTH



TOM PRICE



PORT HEDLAND



KALGOORLIE



BUNBURY

Road safety on mine sites Part 4

As part of our series on road safety within the mining industry, traffic engineering expert Damir Vagaja looks at two topics in this issue of MineSafe – heavy vehicle performance and signage on mine sites, with the latter being a popular topic at the recent Mines Safety Roadshow regional events.

Damir holds a BSc (Civil) degree, and is Mining and Resources Manager at ARRB Group (www.arrb.com.au;

formerly ARRB Transport Research), a public company whose members are federal, state and local government authorities in Australia and New Zealand. He is a member of Engineers Australia and the Australian Institute of Traffic Planning and Management, and worked in the Western Australian mining industry before moving into traffic engineering and safety.

Assessing heavy vehicle performance

Considering the unique remoteness of the Australian landscape, it is not surprising that the Australian transport industry demands many innovative and unique solutions to cope with this.

A key tool in the development of mine operations is vehicle performance assessment. This may include onsite vehicle testing and computer simulation.

Testing the dynamic performance of typically large, innovative heavy vehicles in the mining industry is an important step in improving the safety and efficiency of mining operations. A dynamic test can reveal safety issues related to the applicability of a vehicle type to a task.

The identification and understanding of these issues can assist mining managers in deciding on the safest type of vehicle operation suitable for meeting their freight requirements.

Computer simulations can be used to test a vehicle in a similar manner. Virtual copies of existing combinations can be created and tested, where they can be pushed to and beyond their limits without a safety risk to equipment or personnel.

Also, innovative combinations can be designed, optimised and created virtually, with the performance of a

new vehicle determined before a single nut and bolt are assembled.

The simulations can also be used to investigate the affects of variations in loading conditions, engine and driveline configuration, braking on cycle time and fuel consumption on various grades and bends. This can be used to investigate the impact of different traffic management models (including give-way rules) on the productivity of a given operation.

Crashes, whether vehicle rollover, or collisions between vehicles or a vehicle and pedestrian, can all result from a poor performing vehicle. The costs associated with a crash are high and varied, with vehicle damage and repairs, payload loss, possible driver injuries, rehabilitation and downtime.

The ramifications of a crash may cost operators hundreds of thousands of dollars and, if the vehicle is at fault and due diligence can't be proven, leaves the operator open to a lawsuit.

Vehicle rollover is a dire consequence of a poor performing vehicle. When a rollover occurs, it is often attributed to driver error, typically excessive speed. While this may be true in many cases, it is a mistake to only consider speed or driver error as the sole contributor to a crash.

In fact, the speed required to cause a vehicle to roll over is intimately related to its rollover stability and to the road geometry, so any conclusions of this type must also consider vehicle stability and the road. Making assumptions as to the cause of an accident can hide the true contributors, thereby allowing similar accidents to reoccur.

While speed is an important factor in many crashes, monitoring speed alone does not provide enough information to assess the safety of a vehicle in operation. Vehicle rollover will result from excessive lateral acceleration, caused by a combination of speed and the profile of the corner.

Monitoring the lateral acceleration on a vehicle's route shows how close to its limits a vehicle is being taken, indicating what is a safe speed for the assessed vehicle to operate on that road.

A methodical and scientifically based approach to heavy vehicle design and assessment can offer considerable safety benefits in a range of operational conditions. Typically, such an approach also identifies various opportunities to also improve the productivity and efficiency of an operation.

Safety and health conference

The Chamber of Minerals and Energy WA is presenting the Driving a Safer Future - 2008 Safety and Health Conference on 10-11 March 2008. The conference is aimed at developing effective risk communication and risk awareness programs. **Further information is available online at www.cmewa.com.au**

Effective road signage

Signage is an important part of the road network as it advises drivers of all kinds of regulations or potential hazards. Intersection and speed signs are most commonly used.

However, signage at mine sites is commonly not addressed centrally and consistently. The use of roads within the mine site can change and the signing is often not updated to reflect the current road conditions. There is rarely a signing maintenance program or central point for ordering signs to ensure that they conform to the basic standards of:

- size;
- reflectivity;
- fit for purpose;
- easy to read and understand; and
- where possible, conforming with the Australian Standards.

Standard signage

Where possible, all traffic signs on mine sites should be installed in accordance with Australian Standard AS 1742.2:1994 *Traffic control devices for general use*.

Road users usually best respond to traffic controls that they encounter in normal circumstances. It is important, therefore, that the use of non-standard signs is restricted to those applications where the required message cannot be adequately conveyed with a standard sign.

All signage identified that is non-standard or in poor condition should be replaced with standard equivalents where available. A list of standard signage is provided in Australian Standard AS 1742.1:2003 *General introduction and index of signs*.

All damaged and faded signs should be replaced with new retroreflective signage with reflectivity to Australian Standard AS/NZS 1906.1:2007 *Retroreflective materials and devices for road traffic control purposes – retroreflective sheeting* as a minimum so their colours and shapes are highly

visible at night and during other low-light situations.

Roadside signs should be installed at a minimum height of 1.5 metres for light vehicle roads where there are no pedestrians and no parked vehicles expected. If there are pedestrians or parked cars in the vicinity of signs, then the signs should be two metres high. However, some signs on medians may need to be installed at heights less than 1.5 metres. For haulage roads, the minimum installation height of signs should be 1.8 metres.

The required size for a sign depends on the legibility distance of the legend and the time taken by a driver to read the information on the sign. Australian Standards use a letter coding for sign sizes, where A is the smallest. Size B will be suitable for most mine site applications. However, the large size C (used on freeways in public road situations) may be desirable in some circumstances to improve the conspicuousness of the sign, such as at intersections used by haul trucks.

Stop, give way, no entry and advanced pedestrians and zebra crossing warning signs are usually provided on the left side of the roadway. Where additional emphasis is required or where there is risk for signs to be obstructed (e.g. vegetation, sun light, passing vehicles), it is recommended that the signs are duplicated on the right side of the road.

Intersections

Intersections are an important area where signs are required to regulate the safe movement of traffic and provide the priority to drivers.

All intersections should be posted with give-way signage as described in Australian Standard AS 1742 (Set) *Manual of uniform traffic control devices*.

Stop signs should only be used when there is inadequate sight distance for drivers to see approaching vehicles

on the through road. The warrants for the installation of stop signs are outlined in AS 1742.

Reflective bidirectional hazard markers should be installed in accordance with AS 1742 behind the terminating leg of T-junctions in order to minimise the risk of vehicles overrunning the intersection.

Speed limits

Signage for speed limits should be installed on mine access roads in the same manner that they would be installed on public roads. Drivers within the mine site should expect to see the same standard of signage on the mine roads as on the public road network and should drive accordingly.

Consistency of signage is important to convey the correct message to the driver. Recommendations for speed signage include:

- using multiples of 10 km/h;
- installation on the left side of the road – and ideally on both sides of the road; and
- on long stretches of road, repeater signs installed at spacings of 500 metres.

In terms of speed management overall, factors to be considered include:

- appropriate speed limits taking into account
 - consistency
 - practicality
 - relevancy
- limit the number of speed limits to three or four (e.g. 10, 20, 40, 60 km/h)
- prepare speed zone maps
- monitoring and enforcement
- consideration for changing environment
 - unsealed roads (e.g. dust, rain, wind)
 - always drive to conditions.

Continued on page 22...

Road safety on mine sites Part 4

...from page 21

Non-standard signs used on mine sites

Custom (non-standard) signs should only be used when the desired message cannot be conveyed by a standard sign. When designing custom signs, it should be noted that a message is best conveyed through a graphical representation.

Should a descriptive sign be required, the Australian Standards should be followed. As a general guide, have a maximum of five words per line up to a maximum of five lines of text and use a text size that is legible at the required speed limit.

The minimum reflectivity of custom signs should conform to AS/NZS 1906. High reflectivity materials should be used for signs that are more important and located in areas where dust is a problem.

Sign clutter

Extraneous signage or sign clutter reduce the effectiveness of the message conveyed by each individual sign. If signs are perceived as no longer relevant, the risk of an overall reduction in compliance with traffic signs site-wide is increased, even with the important warning signs.

Only relevant signage should be displayed that clearly conveys the desired message, with the aim of increasing compliance with the road rules.

Maintenance and inspections

In order to maintain the road network in a safe condition, signs should be regularly maintained and inspected as part of an overall road and footpath asset management system. The system should record the condition of signs, noting any works that are required, including:

- replacement of sub-standard signage and delineation;
- requirement for washing of signs and delineation; and
- trimming of vegetation adjacent to roads and footpaths that may be obscuring signs.

The system should record the requirement and subsequent removal of temporary signage provided in emergencies, and include a reporting system for recording and actioning details of damage that occur between inspections.



Keep left
R2-3(L)



No entry
R2-4



Stop
R1-1(L)



Give way
R1-2



Pedestrian crossing ahead
W6-2



Pedestrians
W6-1



Public example of sign clutter

NM

Help sought on hazardous manual tasks

The Health Management Branch at Resources Safety wants to hear about hazardous manual tasks you have identified in your workplace and any innovative solutions you have implemented that have made manual tasks less hazardous.

Overexertion or strenuous movements have consistently been the most common type of accident in the Western Australian mining industry, representing almost one third of all accidents. These types of accidents predominately occur from employees undertaking hazardous manual tasks. Most of the injuries resulting from these accidents are musculoskeletal disorders of the trunk or back, arms and legs.

The Australian Safety and Compensation Council (ASCC) reported that, between July 1997 and June 2003, workplace injuries related to

manual tasks resulted in 437,852 compensation claims in Australia. This figure represents 41.6 % of all compensation claims for that period. The direct cost, not counting indirect impacts (including long-term impacts on the quality of life of the injured worker) was \$11.965 billion.

In collaboration, Resources Safety and the New South Wales and Queensland occupational health and safety regulatory agencies are currently undertaking separate projects aimed at reducing musculoskeletal disorders from performing manual tasks within the mining industry. The first stage of this project is to identify hazardous manual tasks that result in injury to mining industry employees. Once hazardous manual tasks are identified, the aim is to identify and publicise solutions to reduce the risk of musculoskeletal disorders.

As part of the identification process, an analysis of the accident and injury data is currently underway. Consultation with mining industry stakeholders will add to the findings of the statistical review. Hence, we want to hear from you.

Have you identified hazardous manual handling tasks in your workplace or been involved in the design, construction, commissioning or maintenance of any equipment, plant, work surfaces, work practices or systems that have made manual tasks less hazardous? Please contact Lindy Nield by email (lnield@docep.wa.gov.au) or phone (9358 8088).

Please share your knowledge and innovation with us. Your contribution will help to reduce the incidence and severity of disabling and lost time injuries.

What are hazardous manual tasks?

Manual task is a label given to any activities that require a person to use their physical body (musculoskeletal system) to perform work. This includes work that involves the use of force for lifting, lowering, pushing, pulling, carrying, moving, holding or restraining anything. It also includes work that involves repetitive actions, sustained postures and involves concurrent exposure to vibration. This replaces the previously used term *manual handling*.

Almost every activity involves some form of a 'manual task'. To distinguish between those that are potentially a problem and those that are not, the term *hazardous manual task* is used. *Hazardous manual tasks* refer to any manual task that involves certain characteristics that increases the risk of injury. These characteristics include:

- repetitive or sustained application of force;
- repetitive or sustained awkward postures;

- repetitive or sustained movements;
- application of high force;
- exposure to sustained vibration;
- involve handling of a person or animal; or
- involve handling of unstable or unbalanced loads that are difficult to grasp or hold.

What are musculoskeletal disorders?

Hazardous manual tasks can lead to a variety of injuries and conditions collectively referred to as *musculoskeletal disorders* (MSD) including:

- sprains and strains of muscles, ligaments and tendons;
- back injuries, including damage to the muscles, tendons, ligaments, spinal discs, nerves, joints and bones;
- joint injuries or degeneration, including injuries to the shoulder, elbow, wrist, hip, knee, ankle, hands and feet;
- bone injuries;

- nerve injuries;
- muscular and vascular disorders as a result of hand-arm vibration; and
- soft tissue hernias.

Hazardous manual tasks are a main cause of work-related musculoskeletal disorders or, to look at it another way, musculoskeletal disorders are a major type of injury resulting from hazardous manual tasks.

More information?

In August 2007, the Australian Safety and Compensation Council (ASCC) declared the National Standard for Manual Tasks (2007) and the *National Code of Practice for the Prevention of Musculoskeletal Disorders from Performing Manual Tasks at Work* (2007).

The code of practice provides practical guidance on how to manage risk arising from performing manual tasks at work.

The standard and code of practice can be downloaded from the ASCC website at www.ascc.gov.au

Occupational health news

Keep your cool

Resources Safety is regularly contacted, particularly over the summer months, regarding posters and other resource material on sun safety, heat-related illnesses and urine charts for monitoring hydration levels.

Although we do not have such material ourselves, the internet has a wealth of publicly available material that may be helpful for companies to either use directly or modify for their own purposes. Some of these are listed below.

Note that some of the sites are North American and therefore care should be taken with some units, such as temperature, and emergency phone numbers. Also be aware that some material is copyright and there may be restrictions on how it may be used or distributed.

Heat-related illnesses

The American National Red Cross

www.redcross.org/services/hss/tips/heat.html

Normally, the body keeps itself cool by letting heat escape through the skin or by evaporating sweat (perspiration). When these mechanisms are faulty or insufficient, the person may suffer a heat-related illness, which can become serious or even deadly if unattended. This webpage has information on:

- preventing heat-related illness;
- know what heat-related terms mean;
- stages of heat-related illness; and
- general care for heat emergencies.

Heat cramps

eMedicine Health – Heat cramps

www.emedicinehealth.com/heat_cramps/article_em.htm

To quote this webpage, heat cramps are painful, brief muscle cramps that occur during exercise or work in a hot environment. Muscles may spasm or jerk involuntarily. Cramping may also be delayed and occur a few hours later.

Heat cramps usually involve the muscles fatigued by heavy work such as calves, thighs, abdomen, and shoulders.

You are most at risk doing work or activities in a hot environment—usually during the first few days of an activity you're not used to. You are also at risk if you sweat a great deal during exercise and don't drink enough or drink large amounts of fluids that lack salt.

This webpage covers:

- heat cramps causes;
- heat cramps symptoms;
- when to seek medical care;

- heat cramps treatment;
- self-care at home;
- next steps;
- prevention; and
- outlook.

Heat stress

Construction Safety Association of Ontario
www.csao.org/t.tools/t6.news/heat_stress.cfm

Members of the Occupational Health and Safety Council of Ontario have developed a Heat stress awareness guide, Heat stress awareness tool and Heat stress poster to provide information and advice on managing and controlling heat stress in the workplace.

The Heat stress awareness guide helps employers and workers learn how to prevent heat stress. The guide:

- summarises the causes, symptoms, and treatment of heat-related illness;
- demonstrates how to use the Humidex to assess heat stress hazards; and
- outlines specific actions for managing and controlling heat stress.

It includes a self-audit checklist, a sample heat stress policy and an outline of the essential elements of a heat stress program.

The Heat stress awareness tool can be used to assess the risk of heat stress at your workplace. Measure the temperature and humidity, then refer to the Heat stress action

Health management **online updates**

MineHealth

The health assessment form, which was previously provided to health clinics in pads, is now available online from the Resources Safety website at www.docep.wa.gov.au/Resources_Safety in the mining section under 'Health surveillance system (MineHealth)'.
The *Guide to health surveillance system for mining employees* was recently updated and the latest version can be downloaded from the same section.

CONTAM

The *CONTAM system procedures* were also recently updated and are available online. The publication is the mining section under 'Contaminant monitoring (CONTAM)'.
Queries
Feedback on the information contained in the updated documents is welcome, and should be directed to the CONTAM Manager, Resources Safety:

Telephone: 9358 8108
Facsimile: 9358 8094
Email: contammanager@docep.wa.gov.au



Occupational health news

chart to determine the appropriate course of action to protect yourself.

There is also a useful frequently asked questions (FAQs) section.

Heat illness

US National Association of Letter Carriers (NALC)

www.nalc.org/depart/safety/heatwave.html

This webpage lists the symptoms and actions to take for heat exhaustion and heat stroke, and has a downloadable poster with the same information.

Heat index response plan

North Carolina Department of Labor (NCDOL)

www.nclabor.com/pubs.htm#Posters

This website has a number of heat-related publications, including posters. The Heat kills poster has recommendations for employers to control and prevent heat illness.

Sun safety measures

Queensland Government, Department of Employment and Industrial Relations – Workplace health and safety

www.deir.qld.gov.au/workplace/subjects/sunsafety/measures/index.htm

This webpage has useful information on sun safety measures that can be taken,

including:

- controlling exposure;
- protective clothing;
- sunscreen;
- hydration; and
- training.

Beat the heat

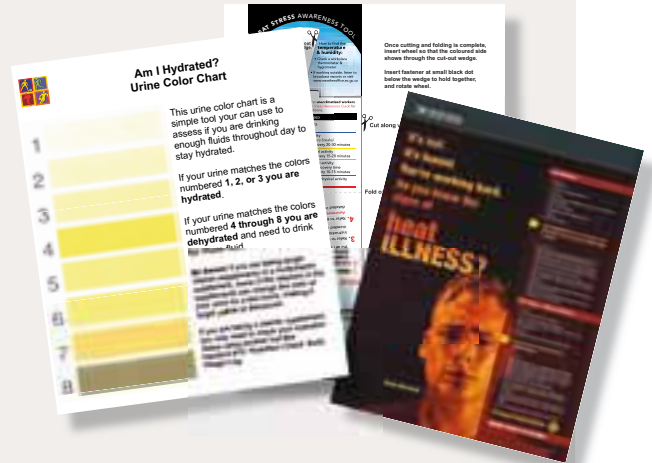
The Australian Army Cadets, Australian Defence Force Cadets

www.aac.adfc.gov.au/uploads/Administrator/ArmySafe%20Postersv3.0.pdf

The Australian Army Cadets has made available an online poster as part of its heat injury management policy. The poster has tips on preventing heat illness and how to spot symptoms, and includes a urine chart and chart for hot weather casualties and injuries that covers heat exhaustion and heat stroke.

It includes a notation to remember the acronym H-E-A-T when training in hot weather:

- H – heat category;
- E – exertion level;
- A – acclimatisation; and
- T – time of heat exposure and recovery time.



Urine colour chart

Rice University - Am I hydrated?

www.owl.net.rice.edu/~heal103/docs/Am%20Hydrated%20Urine%20Color%20Chart.pdf

Rice University's Department of Kinesiology has the syllabus material for a 2006 course called Heal 103 on its website. One of the topics is hydration, and the supplemental reading and information provided includes a page entitled Am I hydrated? Urine colour chart.

Similar charts are provided in toilet facilities on many Western Australian mine sites to be used as a 'hydration ready reckoner'.

Back issues of MineSafe

Resources Safety has back issues of MineSafe magazine covering the past two years or so and is happy to send them to anyone who can use them.

If you would like to avail yourself of this offer, just send an email to ResourcesSafety@docep.wa.gov.au indicating which issue or issues you would like and how many copies. Remember to include your postal details.



Sun safety measures

The following information was originally published by the State of Queensland, Department of Employment and Industrial Relations in 2005. It is reproduced with permission.

Controlling exposure

At any time when your shadow is smaller than you, there is a risk of UV radiation exposure. Every workplace should carry out its own assessment of sun exposure, identify tasks that place workers at risk and control the degree of exposure.

- Wear personal protection (sunscreen, sunglasses and suitable clothing), take precautions and set limits during summer's highest risk time – between 10 am and 2 pm (or between 10 am and 3 pm in western Queensland). *[Advice from The Cancer Council Western Australia: Most of the day's UV occurs between 10 am and 3 pm so this remains an important time to minimise sun exposure, with or without daylight saving.]*
- Reorganise work schedules so that outdoor tasks are done early in the morning or late in the day.
- Rotate or job-share tasks that involve direct sun exposure.
- Implement easy 'sun smart' policies (such as a directive that workers drive with their vehicle windows up between 10 am and 2 pm).
- Plan the work around the movement of the sun. For instance, do outdoor work on the western and northern side of a building in the morning, and work on the eastern and southern sides in the afternoon.
- Where possible, do not work in an environment heated by several sources (such as burning off under a mid-summer sun).
- Use trees, buildings and temporary shelters (such as awnings or tarps) to shade the work area and/or rest area.
- Insulate plant and equipment to reduce radiant heat emissions.
- Where possible, fit a shade to equipment and machinery (such as tractors and small earthmovers). Do not remove shielding that is provided on plant or equipment.
- Provide laminated windscreens and tinted side windows to trucks or vehicles.
- Where possible, mechanise physically demanding tasks.
- Take rest or meal breaks in shady areas.
- Drink plenty of cool water.
- Gradually adjust your workload when starting or returning to work in hot conditions. Generally, the process takes about a week.
- In extreme conditions, wear specialised liquid or air cooled clothing.
- Screen workers for heat tolerance.
- Follow a doctor's advice before working in hot conditions if you are on medications such as sedatives, tranquillisers, antidepressants, amphetamines, antispasmodics, diuretics or medication affecting blood pressure.
- Have a plan in place for treating heat affected workers.

Protective clothing

- When working in the sun, always wear protective clothing. Protective clothing includes:
 - a hat with a broad brim (7.5 to 8 cm) or a flap at the back to shade both the face and back of the neck;
 - a hardhat with a brim added;
 - a loose-fitting, long-sleeved, collared shirt;
 - a shirt made from a dark, close weave fabric (a dark colour gives better protection than a light colour or white);
 - woven, rather than knitted, fabrics;
 - loose trousers;
 - sunglasses with side protection (look for the Australian Standard AS 1067 *Sunglasses and fashion spectacles*);
 - safety glasses designed to minimise UV radiation exposure to the eye;
 - garments with a UV protection factor (look for this label).

- Ensure that personal protection equipment does not create a hazard in itself. For instance, disposable overalls with plastic lining do not allow sweat to evaporate, thereby increasing heat stress in a hot climate.

Sunscreen

- About 15 minutes before you go out under the sun, apply a sunscreen with a very high sun protection factor (at least a 15+ broadspectrum sunscreen, but 30+ is preferable). The skin should be dry.
- Apply extra sunscreen or zinc cream to vulnerable places such as the nose, lips, ears, bald head, neck and back of the hands.
- Reapply sunscreen at least every two hours if you perspire or get wet.
- Select a gel- or alcohol-based sunscreen if you are handling tools. These sunscreens will not make hands as greasy as a cream-based sunscreen.
- Generally, you need to apply about 35 ml of sunscreen to ensure there is an adequate barrier between the skin and the sun.
- Provide an adequate supply of sunscreen and zinc cream at the workplace at all times.
- Carry a clear lip balm that contains sunscreen, and apply it regularly.

Hydration

- Our body can sweat about one litre an hour performing heavy work, however we often drink less fluid than we need because our thirst response lags behind the actual level of dehydration. Most heat-related illnesses are caused by dehydration.
- Drink 150 to 200 ml of cool fluids every 15 to 20 minutes, rather than consume a 1 litre drink every now and again.
 - Choose water or a sports drink rather than tea, coffee or milk.
 - Increase your intake of fluids if your urine is dark (the normal colour should be pale yellow).

Safety and health representatives section

- Add a little extra salt to food if you are acclimatising to hot working conditions, however do not take salt tablets.
- If you suffer dehydration, do not recommence work until you are fully rehydrated.

Training

Workers exposed to the sun as part of their work should be educated about the dangers of UV radiation exposure and how to identify early signs of skin cancer.

- Know how to self-screen for skin cancers.
- Be trained in the correct use of personal protective equipment.
- Implement a 'buddy system' where workers and supervisors in hot environments look out for early signs of heat illness in their workmates.
- Implement an acclimatisation program that gradually adjusts workloads for new workers and those returning from holidays.
- Include sun safety information in induction training.



KH

Which form?

As required in the *Mines Safety and Inspection Act 1994*, a person conducting an election for safety and health representatives must:

- give notice of the result to —
 - a person elected as a safety and health representative; and
 - the employer concerned; and
- give notice of the result to the State mining engineer in the prescribed form and provide such further particulars as are prescribed in that form.

The prescribed form is that available from the Resources Safety website at www.docep.wa.gov.au/ResourcesSafety in the mining forms section, listed as *Notification of election of safety and health representative(s)*.

It is the responsibility of the person who conducted the election to complete and send the form to Resources Safety. Even if no ballot is required (i.e. same number of nominations as positions available), the form must still be completed and sent in.

Despite a low-key campaign over several years to encourage compliance, Resources Safety continues to receive a large number of non-standard notification forms that:

- were downloaded from the WorkSafe website (including 'election' and 'registration' forms);
- are derived from other sources (e.g. produced in-house); or
- have been superseded (e.g. Department of Minerals and Energy, Department of Industry and Resources).

In addition to these forms not being prescribed, they commonly do not contain all the particulars required to complete the newly elected representative's entry in the mines safety database.

From 1 January 2008, the submission of non-standard forms will delay processing of the election information while the prescribed form is sent to the person conducting the election for resubmission.

For further information or to submit the correct completed form, contact Tse Yin Chang, Publications and Promotions Administrative Officer at:

Resources Safety, DOCEP
Locked Bag 14
CLOISTERS SQUARE WA 6850

Phone: (08) 9358 8178
Fax: (08) 9358 8188
Email: ResourcesSafety@dcep.wa.gov.au

Safety and health representatives section

Lindsay Robinson attended the 2007 Mines Safety Roadshow held in Bunbury and commented that he has been a safety and health representative for Bemax (formerly Cable Sands Pty Ltd) for many years. He kindly accepted an invitation to write about his experiences for MineSafe.

Lindsay clocks up 14 years as SHRep

Bemax Resources Limited (incorporating Cable Sands Group) is a mineral sands company operating in the South West of Western Australia, with a dry plant situated in Bunbury and outlying operating mine sites. A mine site was recently commissioned at Ginkgo in New South Wales with a non-magnetic fraction portion of the concentrate trucked to Broken Hill for upgrading, before transporting to Bunbury for final separation into products such as rutile, leucoxene and zircon.

I am a metallurgical technician in the Technical Services Department with over 14 years' experience in exploration and technical services, including three years in Support Services. I have been a safety and health representative for 14 years.

The company has supported me in many ways, through attendance at safety functions and training courses including the introductory safety and health representatives course, the updated provisional improvement notices (PINS) course and an internal audit training course. Safety and emergency training is ongoing at Cable Sands for all employees. These sessions cover topics such as first aid, radiation, safety management systems, high voltage isolation, fire fighting including hazardous chemical fires, environmental, job safety analysis (JSA), chemical approval, emergency

procedures and evacuation, alcohol and other drugs, harassment and discrimination, and various employee assistance programmes.

Other body injury preventative courses I have attended include ergonomics, safe behaviour safety and risk taking, advanced resuscitation, skin and sun safety, and hand, eyes, hearing and handling and back safety awareness including manual handling and respiratory training.

Over nearly 20 years in the mining industry, I have experienced a huge shift in safety towards seeking out any potential hazards that may arise.

Apart from the monthly safety inspections conducted in various areas, 'Fresh Eye' inspections are completed on a regular basis at the mine sites. Quarterly occupational safety and health meetings are attended to discuss any new or potential hazards that may arise.

In 2006, both Technical Services and Support Services for the South West operations reached their ten-year lost time injury (LTI) free milestones. The company acknowledged these achievements by hosting a celebration dinner for section employees and their partners.

Early in 2007, the company entered the Chamber of Minerals and Energy's 2007 CME Safety and Health Innovation Awards with a simply designed

and cheap pallet trolley that can manoeuvre heavy wooden pallets to reduce the potential lifting and dragging injury hazard. This innovation was recognised with a participation certificate.

Other simple designs to eliminate or minimise potential hazards in the work place have been implemented in Technical Services. An example is a plastic bucket lid opener, which has reduced the risk of repetitive hand injury or strains. A flux fume exhaust system has been installed to reduce eye and skin irritation.

In summary, I guess that I must have safety in my veins, as I have not only been a safety and health representative for 14 years in the mining industry, but was also an active participant in the Royal Australian Surf Life Saving for nine years.

In the sixties, a small group of us amateur boaties was sipping a few beers one Sunday after a fishing trip and decided to start up a boating club that fosters safe boat handling and comradeship. This club is very active today, with a large membership, clubrooms, radio communications and social functions. It has an excellent record in the safe keeping of skippers and crews who venture into the unknown seas.



Bemax Resources - Cable Sands, Technical Services Department. Ten years LTI free on 1 April 2006

Back row (left to right): Michael Hodgens, Lindsay Robinson, Corina Hall, Ian McNeill (Operations Manager), Anita Comisso, Matt Giacci, Peter Holtzman.

Front Row: Mini Camons, Dianne Needham, Heather Hutcheson, Cherry Lucas, Michelle Molloy



Lindsay moving a wooden pallet



Closer view of the pallet trolley

Safety and health representatives section

Peter is the new Kalgoorlie Employee's Inspector of Mines

Kalgoorlie resident Peter Green has recently been elected as the new Employee's Inspector of Mines for the Goldfields region.

He has been involved in the mining industry most of his working life and holds an impressive array of qualifications, including an Underground Shift Supervisor's ticket, a Restricted Quarry Manager's ticket and a Certificate IV in Workplace Training and Assessment. He has also studied for a diploma in occupational health and safety.

'Having worked in Western Australia and offshore in three different countries, I fully respect the existing mines safety legislation in Western Australia. I feel I have both the people skills to communicate with employees

and employers alike and have the experience in all aspects of mining to fulfil my obligations to this position,' Peter said.

Following his successful election, Peter has pledged to uphold the existing standard of inspections and to be accessible to every employee in the Kalgoorlie Inspectorate.

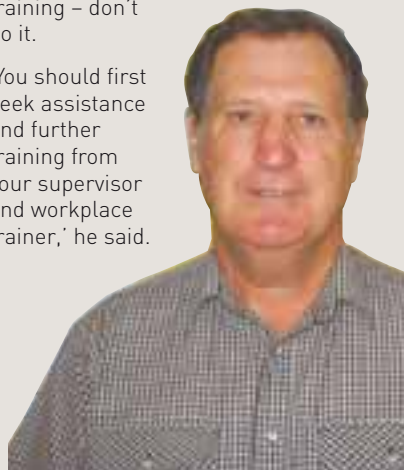
Peter's role as an Employee's Inspector of Mines will mainly involve inspecting mines for compliance with the Western Australian mines safety legislation.

He will also liaise with safety and health representatives, employees and management of mine sites.

He remains focused that all employees should continue to work in a safe and healthy environment.

Peter believes that in today's mining industry training is paramount and that 'ignorance equals risk'. Therefore, if you as an employee are not sure of your job or have had inadequate training – don't do it.

'You should first seek assistance and further training from your supervisor and workplace trainer,' he said.



Nominations sought for Pilbara position

Early in 2008, the Electoral Commission will call for nominations for a new Employee's Inspector of Mines for the Karratha Inspectorate, which includes both coastal and inland Pilbara regions.

Employee's Inspectors are elected by people employed at mines in their region. They are then appointed by the State Mining Engineer, with new elections held after four years.

They must have a certificate of competency as an underground supervisor and at least five years' experience in underground mining.

The position offers a range of employment benefits, including occupational allowances, housing subsidies, living expenses and additional leave.

Many people who have worked in the mining industry get great satisfaction from putting something back as a safety expert, and improving safety within

the industry, using the experience and technical knowledge they have gained through the earlier part of their career.

Alternatively, working in the regulatory area can be a great stepping stone for experienced people looking to eventually move back into industry at a senior management level.

Another advantage is the family-friendly hours of work and flexibility allowing for better lifestyle choices.

Resources Safety, a division of the Department of Consumer and Employment Protection, is responsible for the safety and health regulation of mining, minerals processing, dangerous goods (explosives and other chemicals) and major hazard facilities, with the division promoting best practice in the areas of safety and health with companies and their employers.

The department has some 1,000 staff in total, and has offices in key economic

centres around the State. Resources Safety has offices in Collie, Kalgoorlie, Karratha and Perth.

So if you are suitably qualified, want a change in lifestyle and have a desire to put something back into the workplace, please consider a role as an Employee's Inspector of Mines.

Further information, expressions of interest and nomination procedures can be found by calling Mary at Resources Safety's Collie office on 9734 1222 or Electoral Commission Returning Officer Cathy King on 13 63 06.



Safety and health awards

Technology for safer mining wins inventor award

A Western Australian invention is set to add millions of dollars in extra revenue to the global resources sector.

Premier and Science and Innovation Minister Alan Carpenter recently announced Scanalyse as the winner of the WA Inventor of the Year 2007 for its revolutionary device, the MillMapper.

The MillMapper is an innovative technology that maps the inner workings of a grinding mill on a mine site, helping to increase safety and saving time and money for the global resources industry.

Liners have a relatively short life span and there is currently no way of monitoring

their deterioration without shutting a mill down for extended periods.

Scanalyse's MillMapper uses a specially calibrated 3D laser scanner to collect superior data on grinding mill liners.

The innovative technology will allow the capture of real-time data, which will help increase throughput levels and improve the knowledge of wear liner shapes.

'The unique technology that Scanalyse has developed will save hundreds of thousands of dollars per year in reduced maintenance costs and increase mill throughput resulting in millions of dollars of extra revenue for a mine site,' Mr Carpenter said.

'The State is experiencing unprecedented growth in the resources industry and the role that technology plays cannot be underestimated – it underpins everything we do.'

The Premier said the calibre of entrants in this year's Inventor of the Year Award was outstanding.

He said this year's award was particularly good news for the State's resources industry, with four innovative technologies that were designed to help the industry winning an award.



Scanner in a mill

'This year's award has recognised four innovative technologies – MillMapper, the CryoCell® Technology, T-Line Safety System and the Core Level Indicator System,' he said.

'These inventions are set to benefit the onshore and offshore resources industry and further cement WA's position in the global resource services sector.'

The Premier said the Inventor of the Year Award was part of the State Government's commitment to Western Australia's vital science and innovation sector.

The program aims to co-ordinate activities that promote the development of innovation across the public, private and education sectors.

For more information on this year's winners and runners up, visit www.doir.wa.gov.au/inventor



Peter Clarke, Scanalyse CEO, showing the software

WA alumina company recognised as OSH leader

Worsley Alumina Pty Ltd has won the minerals industry's highest accolade – the 2007 MINEX Award – the National Minerals Industry Safety and Health Excellence Award.

Worsley Alumina is a joint venture company operated by BHP Billiton, with three sites located in southwestern Western Australia. The sites are separated by hundreds of kilometres, with the bauxite mine at Boddington, the alumina refinery at Collie and the port facilities at the Port of Bunbury.

At the 15th Annual Awards dinner, Mr Charlie Lenegan, Chairman of

the Minerals Council of Australia, said, 'The MINEX Awards are designed to demonstrate this industry's commitment to its number one value of zero harm in the workplace and the communities in which we operate.'

'We consider there is no greater stewardship responsibility than the safety and health of our people.'

According to the Mineral Council of Australia's November media release, Worsley Alumina impressed the evaluators and judges with its leadership and safety culture applied through its consistent use of systems and procedures

across three complex and discrete sites.

'Worsley exhibits a well structured, well resourced commitment to safety and health with a high degree of employee participation,' Mr Lenegan said.

'The level of management commitment is outstanding, with health and safety fully integrated into all operations with a high degree of participation by all.'

'The company has clear measures of competency and continuous improvement goals with management committed to long term objectives. The

Safety and health awards

2007 Work Safety Awards winners

The four winners of the prestigious 2007 Work Safety Awards Western Australia were announced in late October.

Pilbara Constructions Pty Ltd, Port of Broome, Monear Pty Ltd and Sundowner Technologies, and Bill Towie from the Forest Products Commission were the winners of four award categories and are automatically entered into the national Safe Work Australia Awards.

WorkSafe WA Commissioner Nina Lyhne said that the four winners were terrific examples of the many excellent workplace innovations and occupational safety and health systems being developed in Western Australia.

'These awards provide the opportunity for innovative Western Australians to gain national recognition for their achievements,' Ms Lyhne said.

'They recognise outstanding occupational safety and health management, solutions and innovation in WA workplaces that reduce the risk of work-related injury and disease.

'Awards such as these are all about encouraging best practice in safety and health, and the winners are leading the way by making a significant contribution to reducing the injury toll in workplaces.'

The award for best workplace safety and health management system was won by

Pilbara Constructions Pty Ltd.

Pilbara Constructions works continuously to improve safety practices and has an excellent record in workplace safety.

When the company's safety and health management systems were assessed under the WorkSafe Plan assessment system late last year, Pilbara Constructions scored the perfect 100 per cent in each of the five key elements of assessment process.

The award for best public sector leadership for injury prevention and management was won by the Port of Broome.

The Port's proactive approach to safety and health management attests to its strong commitment to providing a safe work environment for all employees.

The award for best solution to an identified workplace safety and health issue was won by Monear Pty Ltd and Sundowner Technologies.

Monear provides cleaning services for commercial kitchen and bakery utensils and equipment, much of which is extremely heavy.

In order to lessen manual handling injuries from lifting heavy equipment, Monear worked with Sundowner

Technologies to design an automatic device to lift heavy equipment out of the cleaning tank.

The award for best individual contribution to safety and health was won by Mr Bill Towie from the Forest Products Commission. Mr Towie – the Commission's safety and training consultant – has worked continuously to increase awareness of workplace safety and health by introducing many initiatives designed to reduce the risk of injury.

Winners of the national Safe Work Australia Awards will be announced early in 2008.

'Each of the category winners of the 2007 Work Safety WA Awards is a very worthy winner, and each now has the opportunity for their achievements to be recognised across Australia,' Ms Lyhne said.

'WA has already established somewhat of a proud tradition at the national level, with two of the three WA entrants in the Safe Work Australia Awards winning their national categories last year.

'I heartily congratulate the winners, along with everyone else who nominated for the awards, and encourage businesses of all sizes to nominate for the 2008 Work Safety Awards Western Australia.'

business integrated approach with active and continuous improvement represents industry leading practice.'

Health and safety systems are embedded in Worsley Alumina's overall business planning cycle whereby strategic considerations are applied to risk profiling, interventions and initiatives, appropriate resourcing and a commitment to both capital and operational funding.

The judges also gave a 'Highly Commended' award to Mt Whaleback iron ore mine located in the Pilbara and operated by BHP Billiton.

Mt Whaleback has considerable strengths in safety and health management, made more remarkable by the enormous scale of the operation and the large number of employees.

The judges were extremely impressed with the strong leadership, commitment and the substantial amount of resources made available across the site to achieve continuous safety and health improvement.

Mt Whaleback's risk management systems are strongly embedded in the company's operation and the focus on employee health and wellbeing

is exemplary – translating to both families of employees and the wider community through significant complementary programs.

Loy Yang Power's coal mine in Victoria's Latrobe Valley received an 'Encouragement' award. The MINEX judges considered that if the site follows through on the significant commitments it has made on the road to continuous improvement, it will reach a level of maturity in its safety and health management that next year and the following years is likely to be outstanding.

Safety and health awards

Dangerous Goods Safe Driver of the Year

The Parmelia Hilton was the venue for the 2007 WA Road Transport Industry Awards evening held on 27 October. Hosted by the WA Transport Forum, the gala event was attended by over 400 people from various sectors of the transport industry.

Resources Safety sponsors the 'Dangerous Goods Safe Driver of the Year' category of the WA Transport Forum's awards. This award recognises the knowledge, safe practices and diligence of dangerous goods drivers working within the dangerous goods transport industry. The judging panel comprised Stephen Lane (Resources Safety), John Rossiter (Main Roads) and Tony Watson (WA Police).

The winner of the 2007 award was Jason Clifton, owner-operator of Clifton Transport. Jason has been driving

professionally for four and a half years, accumulating about one million kilometres during that time. Initially employed as a dangerous goods driver for Coogee Chemicals, he is accredited for all dangerous goods classes other than explosives.

In his four years of dangerous goods transport with Coogee, Jason transported bulk corrosive chemicals to the northeastern Goldfields and was incident free. The safety knowledge and bulk transport skills he obtained through mentoring by senior drivers in the company have stood Jason in good stead.

The runner up for the award was Quentin Salt of Boral Resources. Quentin has been involved in transport for 32 years, during which he has



Philip Hine (right), Director of Resources Safety's Dangerous Goods Safety Branch, with Jason Clifton, 2007 Dangerous Goods Safe Driver

enjoyed several stints of dangerous goods driving with Boral Resources and its predecessors. Currently, he is involved in driver training and mentoring, where he brings an extensive knowledge of procedures and driving skills to his work.

Mine plans in a digital era

The Department of Consumer and Employment Protection, through Resources Safety, is custodian of about 25,000 mine plans dating back to the late 1800s. The plans have been submitted on a variety of media including paper, blueprint and transparency.

Under the Mines Safety and Inspection Regulations (1995), companies must provide the State Mining Engineer with plans at certain phases of the mine's life cycle. Submitted plans are catalogued in Resources Safety's mine plan database.

The plans must be produced to the standards and at the intervals specified in the regulations and the *Mines Survey Code of Practice*. An authorised mine surveyor must certify the plans.

A mine plan generally comprises several sheets and may include:

- overall site plans;
- cross sections;
- level plans; and
- pit plans.

Tenement holders may request access to the plans submitted for their mine site. The plans may be useful as a record of historical mining activity in an area – particularly where ground changes hands – and to assist in locating old workings for both safety purposes and in order to re-enter the workings.

Copies of plans that may be provided simply reflect what was submitted at the time so the Department strongly recommends extreme care in any use that may be made of them. In other words, the Department and mines inspectorate are unable to guarantee the accuracy of the plans, either at the time that they were originally made or as an accurate reflection of the current state of workings – and copies of plans are provided on this basis.

Until recently, mine plans were required to be lodged in hardcopy format only. However, these are cumbersome to store and subject to deterioration over time. Resources Safety recently embarked on two projects to improve management of the plans and customer service.

Scanning of the mine plan collection

The first of the projects is to scan the existing mine plan collection. Scanning commenced in August 2007 and is expected to be complete in March 2008. Scanning of the collection will provide numerous benefits to Resources Safety and its customers, including:

- less damage to hardcopy plans from continuous handling;
- reduced manual processes for Resources Safety;
- backup copy in case of loss or degradation;
- improved response time for plan requests; and
- easier access to or provision of the plans to customers.

Digital submission of mine plans

The second project is to allow submission of mine plans as digital portable document format (PDF) files.

The State Mining Engineer has issued a general exemption to allow PDF submission of mine plans. The general exemption specifies the standards

When the best laid plans go awry

The following article was submitted by Patrick Burke, Group Safety Manager Compliance with Macmahon, to share a commentary on how something unexpected can affect a job, despite everyone's best intentions and an intense focus on planning before proceeding.

Day 1

At about seven thirty on an August evening in 2006, the gyratory crusher on an iron ore mining operation in Western Australia's Pilbara region unexpectedly ceased working. It was presumed that a piece of steel or similar object had become jammed between the crusher mantle (cone) and concaves (shell). Earlier in the day, the crushing crew had noticed various pieces of steel being detected and removed by the tramp steel system located at the outlet from the crusher.

A feature of modern gyratory crushers is the ability of the operator to alter the 'gap' between the mantle and the concaves by raising or lowering the mantle using an hydraulic power system. The crushing crew initially attempted to release the blockage by doing this but were unsuccessful.

required to be complied with when submitting PDF plans.

Resources Safety now requests that all mine plans be submitted as PDF files, together with a hard copy when required under the regulations.

Further information

The general exemption is available on the Resources Safety website at www.docep.wa.gov.au/ResourcesSafety in the mining legislation and policy section under 'General exemptions'.

The *Mines Survey Code of Practice* is also available online from the Resources Safety website in the mining guidance material and publications section or in hardcopy format by telephoning 9358 8154 or emailing ResourcesSafety@docep.wa.gov.au

Enquiries about mine plans should be directed to Resources Safety's Geographic Information Systems Analyst, Louise Fogarty (phone 9358 8115, email LFogarty@docep.wa.gov.au).

Days 2-3

The following day, the crusher power system was isolated and a safe work procedure developed to enable the removal of rock material from the vicinity of the mantle. A major component of the safe work procedure was a job hazard analysis (JHA) to ensure work could proceed safely.

Initially, the rock was removed by an excavator operating from outside the crusher but it soon became necessary for personnel to enter the bin so a confined space permit was raised. A small excavator was lowered into the crusher to continue ore removal, a task which was finally completed by manual effort and water jetting. During this process, a safe act observation (SAO) was carried out by management with no significant issue being identified. The whole operation of clearing the obstruction was characterised throughout by a conservative and careful approach to matters of safety and health.

Day 4

On the morning of the fourth day of the clearance operation, an excavator bucket 'digger' tooth and its adaptor, which had attached the tooth to the bucket, were found jammed firmly between the mantle and concaves. The term applied to this type of equipment is ground engaging tool (GET).

The crew concluded that the obstructing steel would have to be cut using a thermic lance. It was acknowledged at this time that a temporary platform would have to be provided for the lance operator to work from. Platform construction commenced immediately and lancing equipment was procured from off-site.

A thermic lance is basically a steel tube containing a cluster of metal rods through which a stream of pure oxygen is passed. It is lit by heating the end of the tube with an oxy-acetylene torch before introducing the oxygen. When the oxygen is turned on, the tube and the rods ignite, creating a temperature in the vicinity

of 4000°C. Lances are manufactured in varying lengths, enabling an operator to cut material at a safe distance. The very high temperature and possible ejection of hot material from the work piece mean that appropriate personal protective equipment (PPE) must be worn.

By about 1.30 pm, the platform was ready and lancing equipment was on site. The Process Manager called a meeting of all involved to discuss the job, conduct a risk assessment, complete a JHA and raise a hot work permit. There was a significant body of knowledge and experience within the group, which engendered considerable confidence in the risk assessment they carried out and the arrangements that were made.

The gyratory crusher was a relatively new installation and was experiencing some teething troubles, one of which was the failure of the mantle position indicator to work properly. This led to uncertainty as to whether or not the mantle was fully resting on the hydraulic system or if indeed it was being 'held up' by the GET. Consequently, it was decided to attach the work platform to the concaves only in case the mantle, when freed, dropped.

The operators

Neither the boilermaker who was to operate the lance nor the leading hand fitter who was to assist him had experience in the task. However, both were experienced boilermakers and had participated in developing the safe work procedure to remove the GET.

The JHA recognised the possibility of rocks falling into the work area from the bin floor so a temporary fence was attached to the top of the concaves above the platform.

Both operators were provided with full welding leathers and the lance operator wore a welding hood and 'bump' cap. The JHA had identified the possibility of the lance operator being affected by fumes from the burning material and,

Continued on page 34...

...from page 33

consequently, he was wearing a half-face respirator fitted with P2/P3 cartridges.

The tooth was lanced first as it was smaller than the adaptor and offered an opportunity for the operator to gain some experience with the lance. This was successful and the tooth fell away.

The incident

Lancing of the adaptor then commenced. The intention was to lance a channel in the exposed metal surface to allow the adaptor body to 'close', thereby relieving the pressure being exerted on it and, hopefully, allowing it to loosen. It was decided to approach the lancing from the 'closed side setting' to ensure that if the GET was ejected, it would be projected away from the operator. This part of the process was completed successfully and, believing the work to be finished, the operator turned the oxygen supply off and stood up. He lifted his welding helmet and made a comment to his colleague. As he did this, a loud bang was heard and a shower of sparks emerged from the vicinity of the GET.

Those witnessing the event observed a large glowing object among the sparks that appeared to strike the operator on the head before continuing over the west wall of the crusher housing. The lance operator was knocked unconscious to the ground. His colleague was unaffected and immediately went to his assistance. The operator's injury was later found to be a spider web fracture to the left side of his skull. The flying object damaged his welding helmet and left burn marks on his bump cap.

An additional event not initially identified was that, at some point subsequent to the spark incident, the adaptor was ejected violently from where it had been trapped, rebounding on the crusher spider structure and ultimately landing on the lance operators working platform. There is a clearly discernible dent on the structure where the adaptor struck.

Contributory factors

The precise cause of the incident could not be ascertained but it has been postulated that as the 'channel' was cut in the adaptor, the molten slag may have initially 'crusted' over. As the assembly cooled, the confined slag burst through the crust, showering the surroundings

with molten metal. Analysis of a piece of the material later recovered from the base of the crusher – believed to be the missile that struck the lance operator and weighing about 0.48 kg – indicates that it was molten when it struck him.

The eventual ejection of the adaptor body is believed to have occurred when the metal cooled sufficiently for it to loosen. The pressure it was under due to being wedged between the cone and the concaves forced it out with great violence. This seems to be confirmed by the hydraulic pressure increase in the mantle support system after the event; in other words, the mantle dropped.

In an effort to establish the cause of the ejection, the adaptor was sent to a laboratory for analysis and assessment. It was determined that the adaptor did not have any gas inclusions or casting faults that might have initiated sudden failure. The possibility that water or mud may have been present causing the event was also eliminated.

Previous experience with removing trapped metal from gyratory crushers using thermic lancing did not suggest that an ejection event of this nature could occur.

Lessons learnt

Although preventing the ingress of such material into the crusher is clearly the best solution, it was accepted that this may not always be possible. Consequently, a means whereby lancing could be undertaken safely had to be found.

Various types of ad hoc working platforms are in use but it is questionable whether they would be robust enough to withstand the impact of an object such as the adaptor body. The crusher maintenance team at the mine designed a platform that they consider would afford adequate protection from this kind of event – the man injured in this event contributed to the process. A structural engineering consultancy refined the design and a unit has been manufactured. The design has been recommended by the crusher manufacturer and the platform is being deployed at other Australian sites.

The most concerning issue to emerge from this incident is probably the failure of an informed and arguably exhaustive risk management process to identify the possibility of matters unfolding

as they did. An event of this nature was apparently outside the understanding of some very knowledgeable and experienced people. From a statistical perspective, the fact that it has now happened indicates that it can, and probably will, occur again.

Based on the lessons and experience gained to date, the crusher operating crew at the mine has evolved a detailed procedure for the use of the platform. This procedure, like the platform design, is freely available to anyone who wishes to use it (contact Patrick at PBurke@macmahon.com.au).



The incident was captured on video



Metal fragments believed to have struck lance operator



Yellow arrow indicates where the adaptor was trapped in the crusher. Red arrow points to where the adaptor eventually landed



Lancing platform developed after crusher incident

Photo's courtesy of Macmahon

2007 South West Emergency Response Skills Challenge

Sandstormers perform well at SWERSC

The great value derived from a locally run, realistic, relevant and practical emergency response event, led the Chamber of Minerals and Energy of Western Australia (CME) to run the South West Emergency Response Skills Challenge (SWERSC) for its second year on 20-21 October 2007.

The 2007 event was envisaged as an opportunity to consolidate the achievements of the inaugural 2006 SWERSC.

This year's event, again held at the Australind Senior High School, involved seven teams (up from six last year) of emergency response personnel from mainly local resource operations:

- Iluka Resources
- Tiwest
- Worsley Alumina – Boddington Bauxite Mine
- Worsley Alumina Refinery
- Wesfarmers Premier Coal

- Verve Energy
- Talison Minerals – Greenbushes Operations.

The teams participated in seven scenarios, with functional fitness being a new feature of the Challenge. The event was spread over two days, allowing time for social networking on the first evening through a fun mixed-teams event.

The principles underpinning SWERSC were unchanged from last year, with the key aim of creating the right environment to lift the skill levels of all emergency response personnel involved. As always, healthy competition is a great motivator, but adding to the trophy collection is not the prime consideration.

The team judged to have performed best overall was Iluka Resources' 'Sandstormers' team, with the overall runner-up being the Talison Minerals – Greenbushes Operations team.

For the individual scenarios, the results were:

Fire Fighting

Worsley Alumina - Boddington Bauxite Mine

HazChem/BA

Iluka Sandstormers

First Aid

Wesfarmers Premier Coal

Team Skills

Iluka Sandstormers

Rope Rescue

Talison Greenbushes

Functional Fitness

Talison Greenbushes and Iluka Sandstormers (equal first)

Theory

Wesfarmers Premier Coal

For further information, contact Matt Granger, South West Regional Liaison Officer with the CME (telephone 9791 6707, email: m.granger@cmewa.com)



Photo's courtesy of CME



Significant incident reports

All significant incident reports and bulletins are available online at www.docep.wa.gov.au/ResourcesSafety

Mines Safety

Significant Incident Report No. 145
Released 20 November 2007

Driller's offsider struck by dust deflector box or "wear bend"

Incident

A driller's offsider was fatally injured when he was struck by a "wear bend" that became detached from the cyclone at an exploration drilling site. The wear bend is a steel attachment built for connecting the sample hose to the cyclone. It is reinforced with thick metal blocks to withstand the abrasive nature of the drill cuttings on the return side of the reverse circulation (RC) drilling process. The wear bend weighed about 40 kg.

The wear bend assembly broke away from the welded flange on the cyclone as the driller was attempting to clear a blockage in the sample hose by using high pressure compressed air. The driller's offsider was standing next to the sample hose. He was struck by the wear bend and sample hose, and suffered fatal head and other injuries.

Causes and contributing factors

- High pressure compressed air was used in an attempt to clear the blockage.
- Employees were not standing clear of the sample hose while the driller was attempting to unblock the sample hose.
- The wear bend became detached from the cyclone as an insufficient number of bolts and nuts was installed.
- The bolts and nuts used to attach the wear bend to the cyclone were too small for the intended application and were pulled through the bolt holes on the cyclone.

- There were no safe working procedures for unblocking a sample hose and for installing a wear bend.
- The safety devices for securing the wear bend to the cyclone in case of a failure of the bolts and nuts were not connected at the time of the accident.
- There was no proper engineering design for the wear bend if subjected to high pressure compressed air during the drilling process.

Recommendations

- A properly engineered design process must be undertaken for all components subjected to high pressures and forces during the RC drilling and sampling process. Approved fabrication drawings should be provided to the persons carrying out the fabrication work and the work should be checked to ensure it complies with the design.
- Safe work procedures must be developed for activities associated with the drilling operation. The use of inspection reports and incident reports, backed up by a detailed maintenance system, are valuable tools to identify hazards in component design and operation.
- Equipment inspections using checklists must be carried out at least daily and signed off by an appointed supervisor. Defects identified must be acted upon in a timely fashion. Follow up checks should also be made to ensure that the work is carried out without exposing employees to hazards.
- In developing safe work procedures, particular attention should be paid to actions recommended in the following Mines Safety Significant Incident Reports:
 - No. 3 *Compressed air hose connection – fatal accident*, issued 29 September 1989;
 - No. 92 *R C drill rig 3" sample hose connection – serious accident*, issued 23 February 1998;
 - No. 109 *Fitting of tile boxes on drilling rigs*, issued on 9 October, 2001; and
 - No. 119 *Driller's offsider blasted with sample dust under pressure*, issued on 4 November 2002.

Mines Safety

Significant Incident Report No. 146
Released 12 December 2007

Hazard posed by cyclone draw in RC drilling

Incident

A reverse circulation (RC) drill rig was drilling a grid of 40 to 50 metre deep holes at an exploration site in Western Australia. The holes penetrated the groundwater table.

In dry ground, the sample splitter beneath the cyclone was used to collect a representative sample fraction. During this process, the large plastic sample bag had been sucked up inside the base of the splitter by the dust suppression fans on a number of occasions. When this occurred, the offsider instinctively reached up inside the splitter and pulled the sample bag out.

When wet ground was encountered, or when water was injected into the drill string, the sample cuttings tended to block the splitter. This led to the splitter being removed from the base of the cyclone and the large plastic sample bag being held over the mouth of a short adaptor cone beneath the cyclone draw.

The cyclone draw is a sliding steel plate that controls the discharge of the sample cuttings from the cyclone.

While drilling was in progress, with the splitter off, the plastic sample bag was again sucked up, this time inside the cone and into the draw. The offsider did what he had done before — reached up, this time inside the cone, to pull the sample bag out.

At the same moment, the driller, while looking at the controls, closed the draw.



The sliding steel plate of the draw trapped three fingers of the offside's right hand. On opening the draw, it was found that the three fingers had been amputated.

Cause

The sliding draw, beneath the cyclone, is a potential pinch point. With the sample splitter in place, this potential pinch point cannot be accessed.

With the splitter off, the length of the cone beneath the cyclone was such that it was possible for a person to reach up inside the cone and place their hand in a potential pinch point — the path traversed by the sliding steel plate of the draw.

Thus, when the splitter was not in use it was possible to access this potential pinch point.

Comments and preventative action

Exploration companies and drilling companies must review their RC drilling procedures to ensure that employees engaged in RC drilling operations are not exposed to the particular hazard posed by a sliding draw beneath the sample cyclone.

The two main reasons for error are that as creatures of habit we do what worked last time and we skip steps when we are in a hurry (Flight Safety Australia, Nov-Dec 2003, p. 38-41).

This needs to be recognised by employers and employees alike. Where there are slight changes in work procedures — in this situation, with and without the splitter installed — the exposure of employees to hazards can change dramatically. What may have been a safe system of work with the splitter installed was not when the splitter was removed.

With the splitter removed, the offside did what worked last time, when the sample bag got sucked up, the offside instinctively reached up this time inside the cone to retrieve the bag, with disastrous results.

The control measure adopted was to engineer out the hazard by:

- making it much more difficult to access the potential pinch point; and



- adding hydraulic interlocks to prevent operation of the draw under certain conditions

The original adaptor cone is shown in photograph 1.

A new cone was fabricated that is much longer than the original cone, as shown in photograph 2.

In addition, two hydraulic interlocks were installed to prevent inadvertent operation of the draw.



Photo 1: Sample bag attached to original cone



Photo 2: New cone, which is much longer than the original cone

**Dangerous Goods Safety
Significant Incident Report No. 01-07
Released 26 September 2007**

Ammonium nitrate storage facility bucket elevator fire

Incident

On 22 November 2006, ammonium nitrate was being transferred into a silo storage facility at a mine site by means of a belt-driven bucket elevator.



During the transfer operation, a ram solenoid valve failed to fully reposition a diverter gate used to direct ammonium nitrate between silos. This led to ammonium nitrate backing up, then falling down the elevator shaft and bogging the bucket elevator.

The drive pulley of the belt-driven bucket elevator continued to rotate even though the elevator was bogged, resulting in slippage and the generation of sufficient heat to cause the belt to catch fire.

The facility was promptly shut down, the fire extinguished and the area cooled with water.

Causes

- A ram solenoid valve on the diverter gate was defective and failed to fully reposition the diverter gate.
- The under-speed detector on the belt was linked only to an alarm and not to a system designed to automatically shut down the facility.
- Due to nuisance tripping, the facility was being operated in 'manual mode', intended to be used only during testing and commissioning activities. In this 'manual mode', all alarms are overridden.

Recommendations

- Facility inspection and maintenance programmes must ensure the reliable operation of all items that either directly or indirectly play a role in maintaining safe operations (e.g. solenoids, level gauges).
- A shut down system should be in place and operate in the event of belt under-speed.
- There should be controls to prevent safety features, such as alarms, being improperly overridden.
- When operating a facility in 'manual mode', the operation should be attended at all times.
- Training provided to facility operators should cover safe facility operation, and require an appropriate understanding of its safety features.
- Operating procedures should require the clearing of ammonium nitrate bucket elevators, augers and other transfer equipment immediately after use.

FAQs about bullying

The following frequently asked questions are available on the Resources Safety website at www.docep.wa.gov.au/ResourcesSafety in the mining FAQs section

Resources Safety also has two publications on this topic – a code of practice on Prevention and management of violence, aggression and bullying at work and a guideline on Dealing with bullying at work.

What is workplace bullying?

Workplace bullying can be defined as repeated, unreasonable or inappropriate behaviour directed towards a worker, or a group of workers, that creates a risk to health and safety.

A workplace situation can be identified as bullying if a worker or workers are:

- Harmed
- Intimidated
- Threatened
- Victimised
- Undermined
- Offended
- Degraded
- Humiliated

whether alone or in front of co-workers, visitors or customers.

While some workplace bullying may involve verbal abuse and physical violence, bullying can also be subtle intimidation with inappropriate comments about personal appearance, constant criticisms, isolation of workers from others and unrealistic, embarrassing or degrading work demands. Workplace bullying can also be carried out via letters, email and telephone text messages.

What are possible effects of workplace bullying?

Health effects

The reactions of individual workers will vary. It is possible that workers who are bullied will experience some of the following health effects:

- Stress, anxiety or sleep disturbance
- Ill health or fatigue
- Panic attacks or impaired ability to make decisions
- Incapacity to work, concentration problems, loss of self-confidence and self-esteem or reduced output and performance
- Depression or a sense of isolation

- Physical injury
- Reduced quality of home and family life
- Hypersensitivity
- Post traumatic stress syndrome
- In extreme cases, risk of suicide

Other effects

Other effects of bullying can be considerable direct and indirect cost for organisations. There may be a high turnover or low morale in areas where bullying occurs.

In addition to the direct cost of recruiting and training new staff or remediation to resolve the problem, there can be:

- Lost productivity that occurs when people are absent from work or not working to full capacity
- Cost associated with counselling, mediation, compensation claims and possible legal action
- Other effects could be a reputation for poor management of workplace bullying, difficulties with recruiting staff and the business may be affected by a poor image

What can you do about workplace bullying at the workplace?

Every situation is different, however bullying can be stopped. How you handle bullying will depend on your particular work environment and the nature of the bullying. If you are bullied you can take action informally or follow a more formal approach.

The following **informal** steps are recommended as a first approach in dealing with most bullying cases:

- Check for policies and procedures that deal with the prevention of workplace bullying. This could be a specific workplace anti-bullying policy or procedure, a grievance procedure or an issue resolution procedure
- Seek advice, for instance from the contact officer or grievance officer, safety and health representative, safety and health officer, human resources officer or union official
- Keep a detailed record of what happened, including place, date, time, persons and what was said or done. Ensure that records are accurate
- Consider approaching the bully and make it clear to the bully that you found the behaviour offensive,

intimidating or harassing and that you would like it to stop

- Sometimes people are not aware of how their behaviour towards others can be perceived. The person may not realise their behaviour offends you, so it is important to approach the person and let them know how you feel. You could also ask someone else (eg. the grievance officer or human resources officer) to approach the bully on your behalf or to mediate or facilitate a face-to-face discussion and find a solution that is acceptable for anyone involved
- Use a counselling service if available through your workplace. This may help you to develop ways of dealing with a bully or the effects of bullying

More **formal** procedures may be required if the informal procedures are not successful or in situations where the allegations are more serious and there has been less favourable treatment or actual physical or psychological harm. This should be confirmed by preliminary enquiries before a formal investigation is undertaken.

If the employer concludes that a formal investigation is warranted, a person who is not involved in that particular incident should undertake the investigation. Natural justice must be observed in all dealings with persons accused of workplace bullying.

What is natural justice?

Natural justice must be observed in all dealings with persons accused of workplace bullying for two reasons.

Firstly, it is essential that people be protected against false and malicious accusations. Persons may be falsely accused of workplace bullying because of a desire on the part of the other persons to harm them or an over-reaction to a trivial or isolated incident. Indeed false accusations can be part of the bullying process in itself and people could be accused of bullying as a means of covering up bullying by someone else.

Secondly, if a person accused of bullying is denied natural justice, then any action taken against him or her may be overturned should he or she appeal against it. Therefore he or she escapes punishment even if the original accusation was correct.

Natural justice is generally considered to include the following rights to:

- Be fully informed of the complaint against the person accused,

including being told the name of the person making the complaint

- Reply in full to the complaint
- Be considered innocent until proven to be guilty
- representation by a person of his or her choice
- Have information about the complaint restricted to those who are directly involved be given the benefit of any reasonable doubt
- Have all mention of the matter removed from his or her personal records if the case against him or her is not proven
- Be informed of any rights of appeal that may exist against any decision made on the matter

What isn't workplace bullying?

An isolated incident of inappropriate or unreasonable behaviour may be an affront to dignity at work but as a one-off incident it is not considered to be bullying. However, since an employer has a general duty to provide workers with a safe workplace and systems of work, single incidents of this type should not be ignored.

It is important to differentiate between a person's legitimate authority at work and bullying. All employers have a legal right to direct and control how work is done, and managers have a responsibility to monitor workflow and give feedback on performance.

If a worker has obvious performance problems, these should be identified and dealt with in a constructive way that does not involve personal insults or derogatory remarks. In situations where a worker is dissatisfied with management practices, the problem should also be raised in a manner that does not involve personal abuse.

Why does bullying go unreported?

Workers are less likely to report bullying and cooperate in inquiries if they:

- Don't recognise bullying behaviour
- Have a lack of knowledge about bullying behaviours and their effects
- Are unsure about the correct procedure
- Don't know where to seek help
- Fear retribution from the bully or bullies
- Feel intimidated or embarrassed
- Believe that bullying is part of the

workplace culture

- Feel that nothing will change
- Feel that their opportunities for promotion in the organisation or the industry will be affected

Some workers may not be aware that the organisation they work for has established bullying prevention and management procedures and that their reports will be dealt with in a proper manner.

Even if a person does not complain about workplace bullying, there may still be offended or affected by the behaviour and the behaviour may still be unacceptable.

What are the duties of the employer under the Act in relation to bullying?

The *Mines Safety and Inspection Act 1994* requires employers to ensure so far as is practicable a working environment in which employees are not exposed to hazards.

Workplace bullying should be treated as any other hazard at the workplace. If unreasonable or inappropriate behaviour, or the potential for such behaviour is identified, there is a high risk of psychological and/or physical harm. Therefore steps should be taken to stop the behaviour.

It is the duty of the employer to so far as is practicable ensure that adequate systems are in place to prevent or stop the bullying behaviour. To address workplace bullying, or the potential for bullying, employers should:

- Consult with employees and safety and health representatives
- Implement adequate policies and procedures, which could include grievance procedures, a bullying prevention policy or procedures for reporting and investigating workplace bullying issues
- Appoint a contact person, grievance officer or mediator as a first contact point for enquiries, concerns and complaints
- Provide information and training on the relevant policies and procedures
- Monitor indicators or workplace bullying, including absence from work (sick leave, workers compensation leave, long service leave, unpaid work), turnover of staff and results of formal exit interviews

If a bullying concern is reported to the employer, the employer must within reasonable time investigate the matter that has been reported, determine action,

if any, and notify the employee(s) of the outcome. To be able to investigate raised concerns and resolve issues at the workplace the employer has the right to ask for more detailed information.

Employers are also required to attempt to resolve safety and health issues raised in the workplace in accordance with relevant procedures. This includes reported workplace bullying issues.

What are duties of employees under the Act in relation to bullying?

Employees should take reasonable care for their own safety and health at work. They should also avoid adversely affecting the safety or health of any person in the workplace through any act or omission. Every employee must be made aware of their duty not to place the safety and health of others at risk by engaging in bullying or, where they are in a position of authority, to take steps to stop bullying if and when it happens.

Employees should follow the employer's safety instructions, cooperate with their employer on work-related safety and health matters, use personal protective equipment provided and report to their employer any work-related injuries or anything that they consider to be a hazard in their workplace (which could include bullying).

If an internal workplace bullying complaint has been lodged within a workplace the complainant is protected by qualified privilege, provided the complaint is not malicious, the facts presented in the complaint are true, the complaint is made in accordance with workplace procedures and it is not discussed with people who are not directly involved in the resolution of the complaint.

Qualified privilege is a concept that comes from common law. It protects an individual from a possible defamation charge under certain circumstances; that is, where a person makes a statement or receives information from another as part of carrying out public or private duties.

Who can lodge a workplace bullying OSH enquiry with Resources Safety?

OSH enquiries

Before lodging an OSH enquiry the employee should first try to resolve the workplace bullying within the workplace through the informal or formal

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process. The employer should first get an opportunity to investigate hazards at the workplace. If the workplace bullying matter remains unresolved or the complainant feels that he or she could not report the workplace bullying to anyone in the workplace an OSH enquiry may be lodged with Resources Safety.

Any person may lodge an OSH enquiry with Resources Safety in relation to bullying. To be able to conduct an investigation into workplace bullying contact details of the person(s) who is/are allegedly bullied should be provided to Resources Safety.

The investigating inspector should be able to:

- Contact the person who is allegedly bullied
- Obtain further details about the alleged unreasonable and inappropriate behaviour at the workplace and any other relevant information
- Discuss the most appropriate approach

It is Resource Safety's role to ensure that the employer and the employee meet their obligations under the Act. It is not the role of an inspector to become involved in the specifics of workplace bullying or to mediate between the target and the perpetrator.

Issue resolution

Employers are required to attempt to resolve safety and health issues raised within the workplace in accordance with relevant procedures. If an issue remains unresolved and there is a risk of serious and imminent injury or harm, either the employer, the employee or safety and health representative may ask an inspector to visit the workplace. An inspector will then attend the workplace and take whatever action under the Act he or she considers appropriate.

Can Resources Safety investigate an anonymous workplace bullying OSH enquiry?

The Resources Safety inspector should be able to obtain further details from the person who is allegedly bullied at the workplace. This is necessary to gain a better understanding of the inappropriate and unreasonable behaviour at the workplace and the actions already undertaken.

As part of the investigation the inspector will discuss the most appropriate approach with the person who is allegedly bullied at the workplace. If the Inspector and complainant agree to further investigate the concerns, the inspector will ask the bullied person to give consent to discuss the concerns of alleged bullying at the workplace.

The inspector cannot disclose that a (bullying) complaint has been made, unless the complainant has agreed otherwise. Therefore, it becomes difficult to investigate an alleged workplace bullying complaint when no contact details are provided to Resources Safety.

What is the role of a Resources Safety inspector when investigating a workplace bullying OSH enquiry?

The inspector will first contact the person who has lodged the OSH enquiry and obtain further details about the alleged bullying behaviour from the bullied person(s). The inspector may ask for a brief written overview of bullying incidents, including place, date, time, persons and what was said or done. The inspector will discuss the most appropriate approach.

If both inspector and complainant agree, the inspector will contact the employer and discuss the raised bullying concerns at the workplace. If applicable the inspector can also arrange meetings with the alleged perpetrator, witnesses and other relevant persons.

It is the inspector's role to establish if the employer and the employee meet their obligations under the Act. It is not the role of an inspector to become involved in the specifics of workplace bullying or to mediate between the bullied person and the alleged perpetrator.

Depending on the outcome of the investigation and the circumstances the Inspector can take one or more of the following actions:

- Take no action
- Provide information on workplace bullying
- Issue improvement notice(s). For instance, under certain circumstances the employer could be directed to ensure that adequate systems are in place to prevent or stop bullying, or to investigate the hazards reported by an employee. The perpetrator could be directed to stop the inappropriate

or unreasonable behaviour that adversely affects the safety and health of other persons at the workplace

We have a bullying culture at work. Is that acceptable?

Workplace bullying behaviour is not acceptable at any workplace. Even if a person does not complain about workplace bullying, they may still be offended and affected by the behaviour and the behaviour may still be unacceptable.

Some individuals may initially be more tolerant of bullying than others. This does not mean the potential for harm is diminished. Bullying should not be regarded as normal workplace behaviour. Bullying can be stopped, and it should not be tolerated in any form.

What other legislation may be applicable to a workplace bullying?

Dealing with workplace bullying may involve laws other than the *Mines Safety and Inspection Act 1994*. Some of these laws are listed below:

- When bullying involves direct or indirect discrimination on the grounds of race, sex, marital status, pregnancy, impairment, religious or political conviction, age, gender history, sexual orientation, family responsibility or family status, sexual or racial harassment, or spent conviction in accordance with the *Equal Opportunity Act 1984*, the employee may lodge a complaint with the Commissioner for Equal Opportunity
- Should an employee consider he or she has been dismissed as a result of making a complaint in relation to bullying, or is forced to resign due to the effects of bullying the employee may be entitled to lodge a claim under the unfair dismissal provisions in the *Industrial Relations Act 1979*
- The *Public Sector Management Act 1994* governs the behaviour of public sector employees and bullying can be a breach of the Western Australian Public Sector Code of Ethics
- Any physical assault and sexual assault are criminal matters and should be referred to the Western Australia Police