

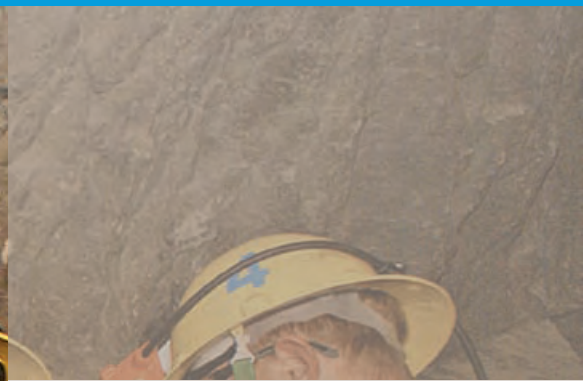


MineSafe

Western Australia



2008 Underground Emergency Response Competition



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Department of **Consumer
and Employment Protection**
Resources Safety Division

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In this issue

In this last issue of *MineSafe* for 2008, the State Mining Engineer, Martin Knee, looks at the origins of our mining legislation. There is also an update on the status of some reviews that may impact on Western Australia.

The Underground Mine Emergency Response Competition was held near Coolgardie in November. We report on the results and focus on some of the people involved making this competition (and its surface counterpart) an important and integral feature of the mining calendar. It is timely to issue a reminder about maintaining refuge chambers.

The importance of access to historical records and present-day expertise is highlighted in a comprehensive article on subsidence assessment in the Collie region. The importance of research to mining safety is also supported by information about some of the projects and researchers sponsored by the Minerals and Energy Research Institute of Western Australia (MERIWA).

We report on the fourth annual Mines Safety Roadshow, which was presented in October in Kalgoorlie and Bunbury, finishing in Karratha and Perth during Safe Work Australia Week.

The relationship between the Royal Flying Doctor Service and resources industry is explored in a feature item.

This issue sees the first of a series of 'Who's who' type articles covering Resources Safety staff, highlighting the skills and expertise they bring to the safety domain.

The code of practice on working hours was released in 2006, and was recently evaluated by the Commission for Occupational Safety and Health (COSH) – the results are summarised here.

Topics covered in the occupational health theme include the ongoing review of hazardous manual tasks and a recently released fact sheet series, a new health surveillance guideline, and a warning about welding fumes.

The impact of fly-in fly-out (FIFO) workplaces was the subject of a recent seminar jointly sponsored by the John Curtin Institute of Public Policy, and Housing and Urban Research Institute of Western Australia. The program is summarised in this issue, and we delve into a research project investigating the experiences of children in FIFO families.

The safety and health representatives section reports on uptake of the new eForm and reminds people about informing Resources Safety if there is a change in a representative's status. There is also news about changes on the Resources Safety front, with the Kalgoorlie office on the move, changes to the website and a new Department in early 2009.

There is an interesting article on a Department of Education and Training publication aimed at assisting new migrants to the State.

Transport safety awards and security risk management of ammonium nitrate are covered under dangerous goods safety news.

To round out this issue of *MineSafe*, there is a feature on the dangers of lightning, a reminder about accident and incident reporting and a significant incident report relating to dangerous goods transport safety.

Enjoy your reading and best wishes for the New Year.

Malcolm Russell
Executive Director, Resources Safety

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Lest we forget

With the recommendations from the Kenner Review of the *Mines Safety and Inspection Act 1994* eagerly awaited, it may be an opportune time to look back down the track at the origins of our mining legislation and see where we have come from, and how steep and rocky the way forward has been at times.

Much Australian mining safety legislation is based on, derived or developed from legislation enacted in the United Kingdom during the 19th century. The driving force behind the British legislation was public opinion mobilised by reformers seeking social change. It is also worth noting that even what seem today eminently reasonable propositions in the legislation had their opponents at the time, and were often the subject of fierce debate, with one proponent of reform describing the House of Lords as having '... few sparks of generosity and no sentiment ...'.

The *Mines Act 1842* was the result of public outcry following the publication of the first report of a Parliamentary Commission on child labour in factories and trades outside the textile industry. The Act did not deal with health and safety matters, but it prohibited the employment of women and girls underground (though not on the surface), and set a minimum age limit of ten years for the employment of boys underground. Importantly, the Act also provided for an inspectorate to check on compliance, enforce the law and report to a central authority.

At the time of the 1842 Act, there was a belief that miners would object to safety inspections as a reflection on their skill at their craft, but the movement in favour of state intervention in this field came from the workers themselves. They were opposed by some coal owners, among them the influential Lord Londonderry, head of the coal owners association, who described the proposal as 'infernal'. Despite this opposition, and partly as a result of a series of colliery disasters with large

loss of life that aroused public opinion, the *Coal Mines Inspection Act 1850* was passed without serious difficulty (though Benjamin Disraeli, later to become the British Prime Minister, described the bill as '...a piece of hasty and ill-considered legislation...').

The 1850 Act provided, for the first time, for inspectors to check on health and safety standards in mines. The need for inspectors with academic qualifications led to the foundation in 1851 of the Royal School of Mines. The work of the school, coupled with the reports of the inspectorate and the lessons learned as a result of mining accidents, resulted in improved conditions over the next twenty years. The prosecution of a mine manager and two of his staff in 1856, following an explosion, demonstrated that the government was serious about regulating the industry.

Various detailed and prescriptive modifications to the legislative framework followed the Act of 1850. In 1860, boys under eighteen years of age were prohibited from acting as engine drivers, and in 1862, parliament required (following yet another accident) that every mine should have at least two means of egress. Later, the *Coal Mines Act 1872* and the *Metalliferous Mines Inspection Act 1872* introduced new, more stringent and detailed regulations reflecting technological advances in ventilation, winding systems and other fields, and required that mine managers hold certificates of competency. Changes and improvements continued, both in the UK and in what were then British Colonies across the world, including Australia.

One example of the way things were before the start of the changes described above may suffice to give some idea of what was going on at the time. It happened at the Huskar Pit in the parish of Silkstone, near Barnsley in Yorkshire on 4 July 1838, only just over a year after the young Queen Victoria came to the throne.

The day was hot and sunny but a violent thunderstorm raged from about 2 pm to 4 pm. Hailstones and about two and a half inches of rain fell. The mine had a shaft that was used for pulling coal up to the surface by means of a steam engine. In a nearby wood there was a drift or decline into the underground workings, which was used for ventilation. The rain put out the boiler fire and the engine could not be used to take the men to the surface. A message was sent down the pit for all the miners to make their way to the shaft bottom.

The children – boys and girls, some very young – who worked in the mine decided not to wait until the engine was working again. They had already spent around nine hours underground. Forty of them decided to go out of the pit by way of the ventilation drift in the adjacent Nabbs Wood. At the bottom of the drift, there was an air door and the children went through this. As they made their way up the drift, a stream, which had been swollen into a rushing torrent by the downpour, overflowed down the drift.

The children were washed off their feet and down to the door through which they had just passed. It had closed behind them, they were trapped against it as the drift filled with water and twenty six children were drowned, although some of the older ones managed to escape along another route that led to the adjacent Moorend Colliery.

This was one of the events that led to the setting up of the Royal Commission and the full tragedy of the event and the horrendously young ages of some of those who died, along with the devastating effects on some families who lost more than one of their children, can be judged by the memorial erected to mark the graves of the children in the Silkstone parish churchyard.

We have come a long way since those dark days, but we need to seek further progress and we must not forget those who paid the price of getting us here.

Continued on page 4...

From the State Mining Engineer

...from page 3

If you want to read the full story of the Huskar Pit disaster, try *Children of the Dark: Life and Death Underground in Victoria's England* written by Alan Gallop and originally published in 2003 by Sutton Publishing (now known as The History Press). The book is currently out of print but The History Press (www.thehistorypress.co.uk) is hoping to produce a revised paperback edition to coincide with the 170th anniversary of the disaster.

The internet also has a wealth of historical information, including:

www.cmhrc.co.uk/site/home – The Coal Mining History Resource Centre, a comprehensive website covering the history of coal mining in the United Kingdom.

www.mylearning.org/jpage.asp?pageid=2077&journeyid=297 – My Learning, comprises free learning resources from museums, libraries and archives in Yorkshire, including the section on coal mining and the Victorians, covering the dangers of working underground.

Images and information on the memorials to the children are also available from various sites, including:

www.dmm-pitwork.org.uk/html/daz.htm – Details of Silkstone memorial

www.findagrave.com/cgi-bin/fg.cgi?page=gr&GRid=17951922 and www.heritageexplorer.org.uk/HeritageExplorer/

TeachingActivities/Victorian+Life++Children+at+Work.htm – Close-ups of Silkstone memorial

www.hrionline.ac.uk/matshef/deggen/MSdeggen.htm#heavy – Nabbs Wood memorial

Details from the Silkstone memorial

The mortal remains of the Females are deposited in the Graves at the feet of the Males as undernamed,

1st Grave beginning (sic) at the South end,

Catharine Garnett Aged 11 Years.

Hannah Webiter Aged 13 Years.

Elizabeth Carr Aged 13 Years.

Ann Moss Aged 9 Years.

2nd Grave,

Elizabeth Hollings Aged 15 Years.

Ellen Parker Aged 15 Years.

Hannah Taylor Aged 17 Years.

3rd Grave,

Mary Sellors Aged 10 Years.

Elizabeth Clarkson Aged 11 Years,
She lies at the feet of her Brother James Clarkson.

Sarah Newton Aged 8 Years.

Sarah Jukes Aged 10 Years.

The mortal remains are deposited in the Graves as undernamed,

1st Grave beginning (sic) at the North end,

George Birkinthaw Aged 10 Years }
Joseph Birkinthaw Aged 7 years } Brothers

Isaac Wright Aged 12 Years }
Abraham Wright Aged 8 years } Brothers

2nd Grave,

James Clarkson Aged 16 Years.

Francis Hoyland Aged 13 Years.

William Atick Aged 12 Years.

Samuel Horne Aged 10 Years.

3rd Grave,

Eli Hutchinson Aged 9 Years.

George Garnett Aged 9 Years.

John Simpson Aged 9 Years.

4th Grave,

George Lamb Aged 8 Years.

William Womerfley Aged 8 Years.

James Turton Aged 10 Years.

John Gothard Aged 8 Years.

Reviewing OSH

As reported in the last issue of *MineSafe*, a number of reviews have been conducted relating to occupational health and safety that affect the mining industry.

Kenner Review

The statutory review of the *Mines Safety and Inspection Act 1994* was conducted by Commissioner Stephen Kenner. This review was reported in the December 2007 issue of *MineSafe* (volume 16, number 3). Submissions from a variety of interested persons and representative organisations were received. A report on the review will be sent to the Minister for Mines and Petroleum.

National Mine Safety Framework

The National Mine Safety Framework (NMSF) is an initiative of the Ministerial Council on Mineral and Petroleum Resources and aims to deliver greater consistency in mine safety and health regulation across Australia.

The Ministerial Council's tripartite NMSF Steering Group has presented it with a comprehensive report and recommendations, with a final submission to the Council of Australian Governments (COAG) in November 2008.

For further information, visit www.ret.gov.au/minesafety or contact the NMSF Secretariat:

Telephone: 02 6213 7244

Email: NMSF.Secretariat@ret.gov.au

National Review into Model Occupational Health and Safety Laws

The panel conducting the National Review into Model Occupational Health and Safety Laws completed its first report on 31 October 2008.

At the Workplace Relations Ministers' Council meeting on 5 November 2008, the Ministers noted the first report of the review. The second and final report is due to be completed by 30 January 2009.

Any queries on this review should be directed to the National OHS Review Secretariat on 1300 131 798 or visit www.nationalohsreview.gov.au for the latest news.

2008 Underground Emergency Response Competition

Focus on **mine emergency** response

AngloGold Ashanti's Sunrise Dam dominated the Chamber of Minerals and Energy Western Australia's 2008 Underground Mine Emergency Response Competition held in November.

Sunrise Dam won Best Team and Best New Team as well as five individual competition categories. Captain Michael Nugus took home the trophy for Best Captain.

It caps off a successful year for Sunrise Dam, which was overall winner of the 2008 Surface Mine Emergency Response Competition in May, with Michael Nugus again receiving the Best Captain award.

On accepting the awards, Mr Nugus told a gathering at the Australian Prospectors and Miners Hall of Fame that the team's win was a tribute not only to the dedication of his fellow team members, but to the support provided by the company, managers and team trainers.

He praised his fellow team members, saying that the majority of team members had not previously competed in competitions. Only he and another team member had experience at competitions.

Thirteen teams from across Western Australia competed in this year's challenge held at Focus Minerals Ltd's Coolgardie Gold Project.

The majority of teams comprised members who had not previously competed in competitions, with 10 out of the 13 teams classified as 'new'.

The six-member teams were required to pit their skills in seven events including fire fighting, first aid and breathing apparatus.

About 400 volunteers were involved in the competition weekend, including team members, adjudicators and casualties.

The competition, which is six months in the planning, is organised by the Chamber's Eastern Regional Council Mines Rescue Committee (ERC/MRC) and is the largest held in the southern hemisphere.

Committee chairman Anthony Finlayson said the competition aimed to provide realistic scenarios for teams to evaluate their knowledge and skills in a set time frame and within a competition environment.

For each event, teams are assessed and provided feedback by a team of adjudicators across critical areas such as team safety and first aid.

A key focus of the competition is to encourage new people to compete in the challenge so they can gain valuable experience.

Mr Finlayson said the hardest part of organising a competition was finding a host prepared to invest the time, money and resources needed.

This year, Focus Minerals stepped up to the challenge despite only recently joining the Chamber.

Focus Minerals' general manager Darren Gibcus said the company had to shut down half the mine for the weekend, which was a direct cost to the company and its contractor Barmenco.

'Although it was a fairly big undertaking, it was an opportunity to support the Chamber and to demonstrate our commitment to mine safety and emergency response,' he said. 'It was also an opportunity to raise our profile in the industry because a lot of people didn't quite realise what we are doing here.'

Mr Gibcus said Focus started mine development at the Coolgardie Gold Project in February 2008, with maiden gold production in April. It is a relatively small scale operation at present, producing up to 20,000 tonnes of ore a month.

'We are looking at increasing that to 40,000 tonnes or more in the next six months, and looking at producing 50,000 ounces of gold this year,' he said.

'Smaller mines should step up (to volunteer to host the competition) and not just leave it to the majors,' he said. 'It's certainly a commitment and it does

have an impact but you have to look at the wider implications, particularly mines around Coolgardie and the importance of backing each other up.'

Mr Gibcus said the mine site, which is 320 metres at its deepest, was ideal for the competition because it had a number of old workings where individual events could be staged.

Chamber Chief Executive Reg Howard-Smith said Focus Minerals deserved the praise of the whole sector.

He said the Emergency Response Challenge continued to play a vital role in ensuring the emergency response capability of the Western Australian resources sector remained exemplary.

'Despite the impact of recent events on global financial markets, the WA resources sector will not compromise on safety as its number one priority,' he said.



ERC/MRC Chairman Anthony Finlayson



General Manager of Focus Minerals, Darren Gibcus

Team skills and other challenges

It didn't have the special effects of the fire fighting event or the blood and gore of the first aid scenario.

But when it came to the most challenging event, competitors and chief adjudicators voted *Team Skills* as the *Best Scenario* at this year's competition.

The scenario was simple — a rock fall has trapped two people, one of whom is lapsing in and out of consciousness and has sustained leg injuries.

The team's tasks are to make verbal contact with the conscious casualty, elicit information about the second more seriously injured miner, extricate the casualties by tunnelling and shoring through 1.2 metres of muck pile and then, using simple rope work, pull them out.

The objectives of the 45-minute exercise were to test the team's communications skills and problem-solving capability, and raise awareness within industry of the need to consider heavy rescue capabilities at their sites.



Chief Adjudicator and Senior Inspector of Mines Peter O'Loughlin



Adjudicators for the Team Skills scenario

Peter O'Loughlin, chief adjudicator and a Resources Safety Senior Inspector of Mines, said more mining deaths were attributed to rock falls than any other event, including fire.

He said it had been some time since teams were tested on their ability to shore up ground.

For the first time, the teams also used a fibre-optic scope to assess the second casualty's injuries and provide advice via a two-way radio to the lucid casualty on how to treat the injured man.

This is the first time most of the teams would have used this technology.

Garry Hussy, adjudicator and a Senior Occupational Health Inspector with Resources Safety, said a fibre-optic camera was used in the Snowy Mountains disaster, and similar excavation and shoring techniques have been used to extricate casualties over the years.

As an indication of how difficult the challenge was, not one team was able to extricate the casualties within the allocated time frame.

Team captains told *MineSafe* that the event was challenging because they were directing team members on two fronts.

At each competition, event managers throw in curve balls to keep teams on their toes and this year was no different.

During the *Fire Fighting* event, teams rolled out the 45 metre hose, only to discover the hose had split, and water gushed out everywhere.

Teams were required to extinguish the fire, which had engulfed a fuel truck, and treat a casualty suffering from minor burns and smoke inhalation.

As always, safety is paramount. The fire was controlled by manipulating the mix of LPG, diesel and nitrogen and was tested half a dozen times in the lead-up to the competition. The scenario was situated near a ventilation return to ensure that the smoke dissipated quickly and would not put others at risk.

In the *Search and Rescue* scenario, the teams had to locate four missing people on two mine levels. One casualty was required to slip past teams in a smoke-filled area to make their search more difficult. Teams were allocated nearly two hours for this event, which was one of the most physically demanding of the challenges.

With the *Breathing Apparatus Skills* challenge, sponsored by Resources Safety, teams were split into three, with one group required to rescue a miner while the other two were tested on their knowledge of the equipment. This included one team dismantling, reassembling and testing their unit. No communication was permitted between the team members, except during the rescue mission.

For the *Rope Rescue* scenario, the teams were required to rescue and provide first aid to two workers, one of whom had a broken tibia and fibula. The only access to the miners was via a 3 metre ladderway, at a severe angle of 45 degrees. The only resource available was a rescue strop and evacuation stretcher.

The *Emergency Response Coordinators* challenge revolved around an evacuation of the mine following a seismic event. Teams were required to find three people and avoid an electrified vehicle. The coordinator had to coordinate the search and rescue from a separate location. Resources Safety's Senior Inspector of Mines Jim Boucaut and Senior Occupational Health Inspector Terry Siefken were adjudicators.

Teams were faced with two scenarios in the *First Aid* challenge. A seismic event resulted in a rock fall, completely severing a geologist's leg. Her assistant was so shocked she had a severe asthma attack. Around the corner, an electrician suffered electrical burns on his hands and feet when he was electrocuted while working on a jumbo box. As he was blown clear of the box, he pushed his assistant into the wall, causing injuries to his assistant's upper arm.

2008 Underground Emergency Response Competition

Meet a team manager

Newcrest Telfer team manager John McIntosh admits he pushes his team members.

Team members must have the mental and physical stamina to cope with the devastating impact of a real emergency situation.

That situation is only exacerbated when the emergency is at a mine, hundreds of metres underground, when visibility is limited, and team members are reliant on breathing apparatus.

'People use their vision for 70 per cent of everyday activities so you have to get team members used to relying on touch and sound,' he said. 'In an underground emergency, you can lose all your reference points and you have to learn how to move safely in darkness and smoke.'

'Coupled with this, team members have to get used to using breathing apparatus, be able to monitor and regulate their breathing.'

John is ideally suited to the task of training emergency response teams, having worked for the Fire and Emergency Services Authority (FESA) for 20 years, including training new recruits.

One of the first exercises new recruits are put through involves blindfolding members and teaching them how to move around in a building while using breathing apparatus.

'They have to get used to using their other senses while monitoring how much air they are using so, when the time comes to leave, they have enough air to get out.'

'In a real life emergency, it's a long way to run when you have run out of air.'

Team members are taught to monitor their heart rate and calculate the impact that environment and physical activity have on their air consumption.

For example, strenuous activity, such as carrying a person on a stretcher, and even shock or panic will use up

more air. Working in a hot and humid environment also has an impact because it is more difficult to cool down.

When using closed-circuit breathing apparatus, team members have to get used to the sensation of the air they breathe getting hotter.

'A team is only as strong as its weakest link. That's why you have to find their breaking point,' he said. 'You are training them to gain the skills to not only save other people's lives in an emergency but their own and their team members.'

'Building team trust is vitally important because you've got to feel confident with the people you are working with.'

John described the preparation for this year's underground mining competition as intense with 12-hour training days, including a bushfire fighting exercise with two other mine sites.

'Competitions are crucial for learning. It not only tests their own skills and capabilities but they learn new ideas from other teams,' he said. 'And, if they are called out to an emergency in a mutual aid situation, they know the other team members (their competitors) and can be confident in their abilities.'

MineSafe asked John why people volunteered to be a member of emergency response teams, knowing the dedication and sheer hard work involved, and the potential risk to their own lives if they were involved in a real emergency?

'We get all sorts of people volunteering — drivers, engineers, administration staff. They want to belong to a team and they enjoy the skills and physicality of it,' he said. 'It's just something innate in them that makes them want to do this — they want to contribute.'

There are 28 people in Newcrest Telfer's emergency response team.



Newcrest Telfer team manager John McIntosh

MineSafe team

The *MineSafe* team of Gay McNamara, journalist with the Department of Consumer and Employment Protection, and Tse Yin Chang, Resources Safety's Publications and Promotions Administrative Officer and part-time photographer, received expert guidance from Resources Safety staff and others involved in the emergency response competition.

In addition to all those interviewed and photographed during the weekend, they are particularly grateful to Anthony 'Fin' Finlayson, ERCMRC chairman, and Sean Heathington, Safety Officer with Focus Minerals, for the opportunity to experience the underground working environment and scenarios up close.

2008 Underground Emergency Response Competition

Meet the Best Captain

People, who have the ability to take action, have the responsibility to take action.

This is the motto used by Sunrise Dam captain Michael Nugus to inspire his team to victory in the 2008 Underground Mine Emergency Response Competition.

Michael, a geologist, said his team worked and lived by that motto. And it has proved successful, with his team winning the *Fire Fighting, Search and Rescue, Rope Rescue, Breathing Apparatus Skills* and *Team Safety* categories, capping it off with *Best Team* and *Best New Team* awards.

It is quite an achievement considering six of the eight-member team had not previously competed in a competition.

As testimony to Michael's leadership skills, he won the Best Captain award, echoing his success in the 2008 Surface Mine Emergency Response Competition when he won *Best Captain*



Sunrise Dam captain Michael Nugus

and his team, the *Best Team* award.

But this unassuming man attributes his success to his team members, vice captain, his managers and trainers and the support of the mine.

'A good vice captain and a hardworking team always makes a captain look good, and the guys worked tirelessly,' he said. 'It's so important to have a team of guys that you can rely upon because at the end of the day, you are training to save lives.'

'This win is all down to the hard work of the mine rescue team and the reserves who worked their guts out, and the strong support we receive from the managers and trainers.'

Michael said about 30 people were part of the Sunrise Dam's emergency response team, with regular training sessions held every Thursday. To accommodate the various work schedules, the full team trained together for two days every three weeks.

The company had also set aside a disused mine purely for training exercises for the emergency response team.

'It costs the mine a lot of money to allow us time off to focus on preparing for this competition and emergency response training in general,' he said. 'The mine has been very supportive. They even recognise how important it is for families to be involved and have paid for families to attend the weekend.'

Michael was uncertain about whether he would captain the team at next year's surface competition, saying it was important that other team members were given the opportunity.

'It's important to have a good succession plan to ensure everybody gets the opportunity to compete and to challenge their own capabilities,' he said.

While Michael was full of praise for his team members, he was retrospective about his own performance in the competition.

'I made one major mistake which I am still chastising myself over. In the First Aid event, I didn't turn off the electricity because I was concerned about losing ventilation and it resulted in one of my team being "electrocuted", putting him out of the event,' he said.

'I really take mistakes to heart and if this had been a real life situation, I had put my team at risk.'

'That is the good thing about competitions. It provides the opportunity to learn from your mistakes so you wouldn't replicate that in a real situation. And while a mistake can really knock your confidence, it also teaches you that you have to get over it and get on with the event.'

Michael thanked the ERCMRC and its chair Anthony Finlayson and the Chamber for allowing Sunrise Dam team to compete in the underground competition.

'It's tough to get into this competition and we had been trying for three years. We are just grateful for the opportunity to compete,' he said.

Team manager Dick Phillpott was full of praise for his team, saying they had achieved beyond expectations. He described Michael as 'one of the best'.



Resources Safety's Jim Boucaut with the winners of the Breathing Apparatus Skills Challenge

2008 Underground Emergency Response Competition

Meet a new captain

In two years, Kath Hay has gone from a desk-bound administration manager to leading a team of five men as captain of Barrick Kanowna's emergency response team.

The decision to join the mining industry and drive haul packs has opened up a world of new experiences and opportunities for the 27-year-old.

'I needed to do something totally different from listening to people and their problems so I followed my sister into the mining industry,' she said. 'From the outside, it appears stereotypical male but inside, the guys are really good.'

It didn't take long for Kath to volunteer for the emergency response team.

'I've always been a physical person and I wanted to do something more involved, rather than just sitting in a truck (haul pack), staring down the decline,' she said.

Kath has competed in two surface competitions as a medic and 'grunt'.

'It's a huge learning curve (being a member of an emergency response team). It's not only the emergency response skills you learn but life skills in general,' she said. 'Doing the competitions gives you something to aim for in the training sessions.'

Kath volunteered to lead her team in this year's underground competition.

'When you are a team member, you just focus on your role whether it is medic or grunt,' she said. 'Being a captain is a different. You have to take a step back and delegate, to make decisions, take on board suggestions, and be aware of everything that is going on.'

Of the competition, Kath said, 'A few of the scenarios didn't go the way we thought and we didn't attack them the way we should have but, overall, we were very pleased at how we performed and it's a great learning experience.'

'The hardest challenge, physically, was the Search and Rescue event because

we were required to go up and down the ladder in our gear. But the hardest as captain was the Team Skills event because it wasn't the norm and made you think outside the square. It was also the first time we had used an optic-fibre camera. I was really impressed with the Team Skills event.'

Her team came fifth in the *Team Skills* event.

'From a captain's perspective, I've learnt (from the competition) how important it is to have control of the team. You have to stand back and it's hard to do because a lot of times you want to jump in and help out. However you can't, you have to delegate. But I have really enjoyed the competition and hope to keep doing them.'

Kath believes she will be able to use the leadership and life skills she had learnt from her participation in the emergency response teams and the competitions in any future career she undertakes.

The *Best New Captain* award was won by Cosmos's Shane Skinner.

Shane led his team to victory in the *Overall First Aid* category. The team came third in the *Best New Team* category and in four other individual categories, placing fourth overall out of 13 teams.

'Everybody knows that the team makes the captain,' Shane said. 'The guys made it easy for me — when you can look at a member of your team and say "go do this", and know they will.'

'With what we do, one person can't make a massive difference, you need the whole team.'

During the presentation, Shane thanked team members on behalf of all the captains.

Shane described all the scenarios as 'awesome' and agreed with Kath that the most challenging scenario was the Team Skills event.



Barrick Kanowna team captain Kath Hay



Kath (at right) in the Search and Rescue Challenge

2008 Underground Emergency Response Competition

Meet a competition **veteran**

Sunrise Dam team manager Dick Phillpott knows from experience the importance of mine rescue competitions.

The competitions prepared him for what every mine rescuer dreads — a real mine rescue.

Dick, a 12-year veteran of competitions, was involved in the Bronzewing inrush tragedy in which three miners tragically lost their lives.

On 26 June 2000, a barricade wall failed, causing more than 18,000 cubic metres of backfill sand to flood the lower levels of the mine, trapping 12 men. Thankfully, nine were able to escape.

It took 105 rescue personnel four weeks to remove the wet backfill to

recover the bodies of the three dead miners.

Dick said the competitions were vitally important in preparing mine rescue teams for the real life events.

'I'd say that the competition scenarios are about 90 per cent realistic so if an incident does occur, you are prepared mentally. You are confident about knowing what you have to do and you have confidence in the other guys,' he said. 'Competitions are all about preparing for someday having to do it for real.'

Dick said few mine sites allow teams to light fires underground to simulate a real life underground fire.

'During a fire underground, the ground cracks and pops above your head. It can really put the wind up you so it's important that you experience that so you can identify that sound for what it is and not freak out,' he said.

'A few years ago they got a pig's head and cut off its snout, smothered it in fake blood and put a rock over it. When you lifted the rock, it looked like a face that had been smashed in by a falling rock,' he said.

'Preparing yourself for something that devastating in real life is difficult and that's why it needs to be as realistic as possible. When you are wearing breathing apparatus, you need to be able to get over the initial shock and control your breathing so you conserve your air and retain your composure. If you freak out, you are no good to anybody.'



Sunrise Dam team manager Dick Phillpott

Honour board

Team Skills:
KCGM

Breathing Apparatus Skills:
Sunrise Dam

Fire Fighting:
Sunrise Dam

Rope Rescue:
Sunrise Dam

Search and Rescue:
Sunrise Dam

First Aid:
Barrick Yilgarn 1

Theory:
Barrick Yilgarn 2

Team Safety:
Sunrise Dam

Overall First Aid:
Cosmos

Best Captain:
Michael Nugus,
Sunrise Dam

Best New Captain:
Shane Skinner, Cosmos

Emergency Response Coordinator:
Steve Targett, Mincor
Operations

Individual Theory:
Todd Smoker, Barrick
Yilgarn 2

Best Scenario:
Team Skills

2008 Underground Emergency Response Competition

Competition teams

Barrick Kanowna

Barrick Australia Pacific (Kanowna Belle)

Barrick Yilgarn 1

Barrick Australia Pacific (Plutonic)

Barrick Yilgarn 2

Barrick Australia Pacific (Lawlers)

Black Swan Nickel

Norilsk Nickel Australia

Cosmos Project

Xstrata Nickel Australasia

KCGM

Kalgoorlie Consolidated Gold Mines

Jundee

Newmont Australia

Leinster Nickel

BHP Billiton Nickel West

Mincor Operations

Mincor Resources

St Ives

Gold Fields Australia

Sunrise Dam

AngloGold Ashanti Australia

Telfer

Newcrest Mining

Waterloo & Co.

Norilsk Nickel Australia (Waterloo) & Jabiru Metals (Jaguar)

Sue's 'magic bag'

A casualty lies on the ground with one leg stretched out and only the 'bloodied' knee cap of the second leg showing. Nearby lies her 'severed leg', a raw mutton leg covered in thick congealing 'blood', encased in a rubber boot.

The sight is meant to shock and it does, thanks to the handiwork of Sue Steele.

For the past eight years, Sue has been responsible for creating realistic-looking injuries and first aid scenarios for the mine emergency competitions.

She draws on her experience as a nurse and her 13-year involvement in emergency mine response teams, including as a competitor and adjudicator.

Sue was one of the first nurses to be trained in mining safety and emergency response.

'Telfer made the decision that all nursing staff should be trained in mine rescue with the thought that, if there was a mine disaster, you should have nurses that were trained in mine rescue,' she said. 'At the time, there was only a handful of women involved in mine rescue, which is such a contrast to today.'

Her first real mine emergency involved a truck that had fallen off a 52 metre mine wall. She has also been involved in emergency responses to rock falls, land slides and vehicle accidents.

Sue said it was important to make the scenarios and injuries as realistic as possible to get people used to the type of injuries and conditions they would confront during a real emergency.

Sue sources her material from a company supplying theatrical props. What has become known as 'Sue's magic bag' includes eyeballs, latex (to simulate burn injuries) and theatrical blood.

She works closely with fellow First Aid event manager Andrew Chandler on the events.

One of her most memorable scenarios involved a woman going into labour and giving birth following a 'tourist bus crash' at a surface mine site. To add a touch of reality, Sue borrowed a 'birthing baby' used to teach women about childbirth.

'Most of the adjudicators had to stand outside because they couldn't stop laughing,' she said.

Coming from a Wheatbelt farming family, the mining industry has become her life and it is where she met her husband Andy French. Today, Sue is a contractor providing occupational health and emergency response training to mining companies. She also does the theatrical make-up and event scenarios for competitions around Australia.

Sue received a 10-year service medal at the 2008 Underground Emergency Response Competition presentation night.

Of course, Sue's creations couldn't come to life without the acting talents of volunteers.

Crush 'victim' Nicole Cluse, a cost controller for BHP Billiton, said, 'A friend volunteered so I thought I would too. I was a bit apprehensive at first

but I'm so glad I did it because it's good fun. I even started to see the differences between teams.'

Megan Howitt, an exercise physiologist who helps train the Newcrest Telfer team, found herself a 'casualty' in the *Emergency Response Coordinators* challenge.

Megan said she learnt a lot as a casualty and will be using her experiences when developing fitness and training regimes for the team.



Sue's handiwork



Sue Steele (left)

2008 Underground Emergency Response Competition



WELCOME



TEAM SKILLS

THEORY



2008 Underground Emergency Response Competition



FIRE FIGHTING



SEARCH AND RESCUE

Photo's by TYC

2008 Underground Emergency Response Competition

BREATHING APPARATUS SKILLS



ROPE RESCUE



EMERGENCY RESPONSE COORDINATORS

2008 Underground Emergency Response Competition



FIRST AID



PRESENTATION EVENING



Photo's by TYC

Maintenance of refuge chambers

During recent routine inspections of underground operations, mines inspectors identified deficiencies in regards to the maintenance of mine refuge chambers. Examples of defects observed include:

- ineffective door seals;
- out-of-date consumables (e.g. gas detection equipment, first aid supplies);
- lack of gas monitors;
- inoperational radios or phones; and
- inadequate first aid provisions.

It was also evident at some mining operations that there is no procedure for regularly auditing and checking each refuge chamber at the mine.

These are issues of concern to Resources Safety. Underground managers are reminded of their statutory duties and responsibilities to ensure that the underground workplace is safe for persons working there.

The provision of refuge chambers in underground operations is central to any mine emergency preparedness plan, which, in turn, is fundamental to the duty of care.

It is obvious that for a refuge chamber to fulfil its purpose in an underground mine, it must be ready at all times for immediate and dependable use. This requires:

- selection of a suitable type, size and number of refuge chambers;

- their placement at appropriate locations; and
- regular inspection and maintenance.

Refuge chambers need to be inspected regularly by competent persons basic tests carried out to ensure full functionality. Manufacturer's specifications for service requirements should form the basis of any inspection and test work. Records of those checks and tests must be made and retained.

Essentially, this practice is no different to the maintenance, checks, tests, and records made and retained in respect of mobile and fixed plant. However, because refuge chambers are used only at times of emergency, their regular inspection and maintenance tend to be overlooked.

Factors such as relocation of a unit, usage and location (e.g. proximity to vehicular traffic, blasting effects) need to be considered when structuring a checklist and determining the regularity and frequency of the inspection and test work.

Depending on the type of refuge chamber, critical service requirements must cover aspects such as:

- condition of door seals, batteries and filter cartridges;
- expiry dated items such as chemicals and consumables;
- calibration of gas monitoring equipment;



- scrubber unit check;
- power failure test;
- air-conditioning unit check; and
- vacuum test.

Preventative maintenance should be able to provide dependable refuge chambers at all times.

Any deficiencies need to be identified to the underground manager, who can then direct a course of action to ensure that the refuge chamber is repaired and returned to full functionality as soon as possible. Alternative arrangements may need to be put in place until the defects are rectified. Importantly, underground crews must be informed of the non-availability of the refuge chamber and advised of the alternative arrangements in the event of an emergency.

Resources Safety's *Refuge chambers in underground metalliferous mines – guideline* provides for further details on this topic.



What's new at Resources Safety?

See page 37 to find out!

Old records key to subsidence assessment

The scenario

In March 2008, Resources Safety was requested to provide expert input into an investigation of cracking in Shotts Road, Collie. The cracks, which were 1 to 60 millimetres wide and up to 2 metres deep, ran along a 70 metre section of the road near the intersection with Coalfields Road. Further inspection of the general vicinity revealed other cracks, typically between 1 and 5 millimetres wide and typically less than 0.5 metres deep in several areas. These cracks were only visible across gravel tracks — elsewhere they were covered by leaf litter from the local vegetation.

There was no obvious vertical displacement either side of the cracks, indicating tensile cracking with the ground subsiding as a trough-like depression, similar to mining subsidence. Indeed, a search of Resources Safety records revealed that the cracks were aligned above the edge of the old Stockton Colliery mine workings. It was clear that the surface cracking in the Shotts Road area had resulted from surface subsidence.

Follow-up site inspections, carried out in April 2008, identified that there had been mining subsidence elsewhere — cracking was noted on the Coalfields Road to the west and east of the intersection with Shotts Road, above the edge of mine workings.

Resources Safety subsequently undertook to review historical mining and associated subsidence in this area to:

- help the Shire of Collie and other stakeholders determine the likely longer term impacts; and
- provide technical documentation that would assist local stakeholders to determine appropriate actions in this and other areas with similar geological and mining environments.

Mining history

Stockton Colliery opened in 1927 and produced some 2.7 million tonnes of coal from two coal seams — the Stockton Seam and underlying Wallsend Seam. Although present above the

full extent of the Wallsend Seam, the Stockton Seam was only mined in the southeast of the ore reserve.

Mining was largely carried out by hand with pick and shovel, and the coal brought to the surface in rail-mounted skips pulled by pit ponies. A form of mechanised mining was introduced where the face was undercut at floor level with a coal cutter creating a void or open end. The face was drilled and charged with explosive and blasted or fired into the void created by the coal cutter.

Following loading of the coal, ground support was installed and comprised split logs (slabs) fitted against the roof and supported under each end with round timber supports (props). The slabs were installed at 800 mm centres, depending on the ground conditions. The rail line into the face was extended by track-laying teams and the mining process repeated.

The mining height in both seams was typically 7 feet (2.1 m), largely to maintain easy access to the roof. The roof in the Wallsend workings terminated at 'stone', which was typically a shale and sandstone laminate. The Stockton workings maintained about 1 m of coal in the roof to assist with roof stability.

Pillar splitting was introduced in the 1940s to increase productivity levels during high demand for coal. To address the potential deterioration of mining conditions, this was achieved by mining a drive or roadway through large coal pillars 'on the retreat'.

As Alf Sanford, a former miner, recalled in 2008, the general mining conditions were considered to be good throughout the mine, with a strong competent roof and floor. However, there was one significant event where a fall between the lower and upper seam created a void in the upper seam. It occurred on a rail line and was identified when the pit pony pulling the skip refused to go any further — the miner walked to the front of the pony and found the void.

In fact, it was commonly recognised by the experienced miners that the



Measuring cracks on Shotts Road

pit ponies would 'feel' a change well before the miner could. These miners took note of any change in pony behaviour and became more vigilant when looking for hazards.

But the ponies also proved somewhat problematical — they would walk out to the surface unaided at knockoff time and stay there awaiting meals. The miners had to tie up the ponies if they wanted them to remain underground. Experienced ponies also knew how many skips they would have to pull in a shift — if an extra skip was added, the pony would stand and refuse to move until the skip was removed.

The Stockton open cut mine, the first in the Collie region, was developed in the central section of the orebody in 1943. The mine operators excavated a combination of coal pillars left by underground mining in the lower seam, a central section of the lower seam that had not been mined by underground methods, and the upper seam, which had not been mined by underground methods.

After the mine closed in 1960, the open cut was allowed to flood with ground water and is now known as Stockton Lake.

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Pothole in bushland near Stockton Lake

Assessing the potential for mining subsidence

Details of the geotechnical assessment are covered in a recent paper presented at the First Southern Hemisphere Rock Mechanics Symposium by Ian Misich, Senior Geotechnical Engineer at Resources Safety, and Rob Sherwood, formerly a mines inspector with Resources Safety. The factors considered are summarised below, with data from old mine plans and mines inspectorate correspondence being crucial to the assumptions and calculations.

Mining subsidence characteristics

Two forms of subsidence prevail in the Collie region — steep-sided potholes and trough-shaped depressions.

The potholes are steep-sided 'holes' in the ground surface, typically 1 to 2 metres deep. They are limited to shallow mining areas and usually result from the collapse of ground above a wide intersection of underground mine drives.

Subsidence troughs, which are 'gentle' depressions in the ground surface (e.g. Shotts Road case study), result from a 'regional' collapse of ground.

Assessing the potential for trough subsidence in Shotts Road area requires an understanding of parameters such as mining depth, panel width and length, average bord or drive width, average cut-through width, average pillar length and width, mining height, extraction ratio and panel dimensions. Using methods established during research by Ian Misich and reported in his 1997 thesis, and mining parameters derived from old mine plans and reports archived by Resources Safety, it was estimated that the expected maximum

subsidence in the central section of the Shotts Road area would be about 0.7 metres.

Geological and geotechnical characteristics

The Collie Basin has two lobes and axial dimensions of about 25 km in a northwest direction and 15 km across.

The mechanical properties of the rocks were not known for the Shotts Road area, so the mechanical properties given in the 1997 thesis for typical coal, shale and sandstone materials in the Collie Basin were used.

Hydrological characteristics

It has been interpreted that the Stockton workings are flooded with groundwater; the standing water level in the nearby Stockton Lake, which has direct connection to the underground workings, was measured to be at about 195 m RL. Given that the seam below the middle of the collapsed ground below Shotts Road is at 180 m RL, the mine workings at that location are about 15 m below the standing water level at this location. As with all other coal-bearing strata in the Collie Basin, the coal and shale materials are aquitards (low permeability), with other materials considered to be aquifers.

Subsidence analysis

Based on Ian Misich's 1997 research, three failure mechanisms could have

produced the type of subsidence trough noted in the Shotts Road area (where the only visible signs of ground movement are tensile cracking above the edge of shallow mine workings):

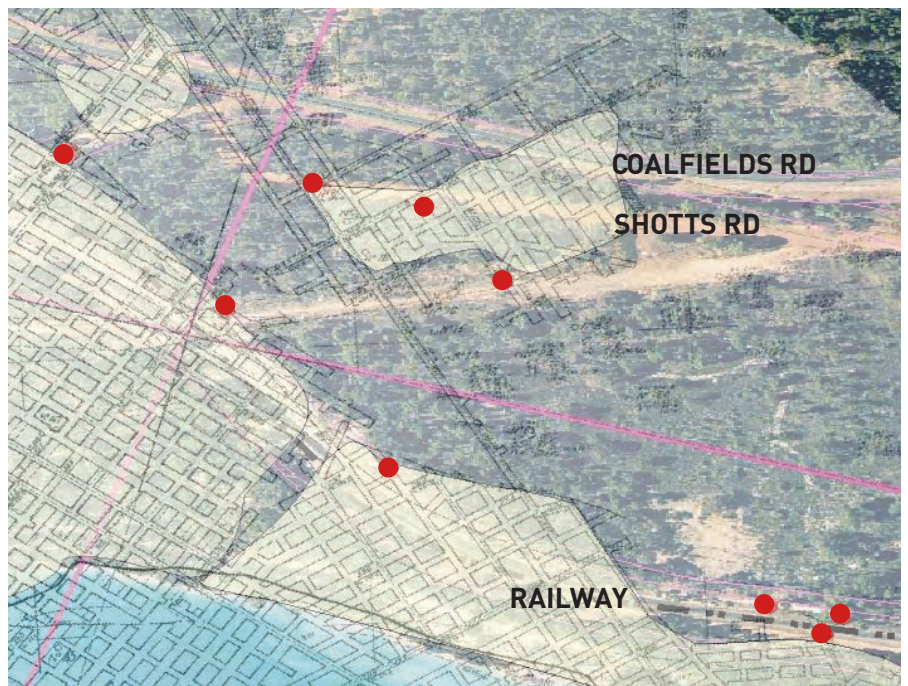
- coal pillar failure or creep;
- pillar punching or creep; and
- failure or creep of sandstone columns formed by collapses of mine roof surrounding mine pillars.

Each involves widespread failures within, below or above the underground workings that tend to manifest a relatively gentle sagging of the overlying strata when the minimum lateral extent of mining approaches the mining depth.

Initial investigations indicated that the first two mechanisms of failure were unlikely to be responsible. Investigations into the third mechanism, sandstone pillar failure, are summarised below.

Earlier investigations by Ian, in 1985, suggested that when there is caving on all sides of a pillar (largely due to excessively wide bords with insufficient support), the resultant pillar consists of coal for the lower section and sandstone for the upper or caved section.

It follows that the resultant pillar, with upper weak sandstone and a significant reduction in width to height ratio, is far more prone to failure than coal pillars. Once one composite pillar has failed,



Aerial view showing location of cracking (red dots) detected during Resources Safety inspection, overlay of old mine workings, and areas (shaded) of known or interpreted subsidence

stresses are redistributed to adjacent roadways and pillars and the process continues, resulting in a creep. When the area of creep is of sufficient dimension, subsidence will occur.

Evidence of this failure mechanism is difficult to obtain, as access to areas with extensive roof falls is usually prohibited, and there is limited visibility to the upper caved roof horizon. Ian's 1997 thesis provided direct evidence (physical modelling using the geotechnical centrifuge technique) and anecdotal (in-mine observations) in support of this phenomenon. Some examples of the anecdotal evidence are given below.

Correspondence on 13 December 1927 between the Inspector of Mines and the State Mining Engineer expressed concern for the stability of the Collie-Narrogin railway because roof falls in underground workings, initially mined in 1916, extended beneath the railway and subsidence cracking was noted on the ground surface. The average subsidence was estimated at 0.5 metres, according to mine records dated 11 December 1928. The railway was reballasted, the surface closely monitored, and the offending bords or drives were 'well chocked up' to prevent further collapse. The ground stabilised following this remedial work and no further subsidence was detected.

Later correspondence between the Inspector of Mines the Government Geologist indicated that, below the areas of surface subsidence, falls of mine roof had 'gone across' heavily supported bords (with no reported signs of pillar distress). It was the inspector's view that the cause of the falls was swelling of a 6 metre thick clay layer, 10 metres from the surface, as winter rains percolated down (24 m above the mine).

According to Alf Sanford, a similar sequence of roof-collapse events, outside the influence of overlying weak clays, occurred in 6B East Panel in 1986.

Roof collapses are known to occur randomly, many years after the closure of a mine. The usual method of identification is the sudden appearance of pothole subsidence at the ground surface. In the Stockton Colliery, the last known subsidence event occurred in 2005.

Using the design criteria set out in the 1997 research and the assumed material properties, sandstone pillar stability analyses supported the premise that if there had been widespread roof collapses in the Stockton Colliery beneath Shotts Road, they would manifest as ground subsidence.

Impact of subsidence on local infrastructure

Potholes

It is well known in the Collie region that irregular forms of subsidence (e.g. potholes) can be associated with collapses of ground above shallow mining areas (typically less than 40 metres deep) and these are far more hazardous than the trough form of subsidence troughs in the Shotts Road area.

Previous research, including field observations, closed form engineering equations, and numerical and physical modelling indicated that pothole subsidence is not likely in shallow areas where the mine workings are overlain by stiff coal or shale strata capable of preventing shearing or collapse through to the surface (e.g. Misich et al., 1994; Goldsmith et al., 1995).

As the Stockton workings near the public roads are overlain by the (unmined) Stockton Seam — which, at the widths mined, exceeds the design limit for minimum thickness of stiff material required to prevent caving — it is considered unlikely that pothole subsidence will develop in these areas.

This premise is supported by observations of pothole subsidence to the south of the abandoned Stockton open cut mine (i.e. Stockton Lake), where potholes were only noted at locations where the top seam had been mined by either open cut or underground mining.

This dispels concerns for pothole subsidence across the local public roads or railway. However, additional potholes could develop in natural bushland to the south of Stockton Lake, near the public toilet to the east of Stockton Lake, and beneath tracks used infrequently by the general public.

Pothole subsidence in bushland is reported in most years to relevant stakeholders and is treated on a case-



Close up of Stockton open cut in 1949 showing pillars of underground workings. Photograph from 100 years of Collie Coal (Stedman, 1988), reproduced with permission Shire of Collie

by-case basis. Where considered appropriate, access to a subsidence area can be barricaded and the potholes carefully back-filled (e.g. a pothole that developed suddenly in February 2004 near the public toilet was temporarily barricaded before being backfilled by CALM). Most potholes in natural bush are left untouched.

Potholes can occur at any time, whether the mine workings are filled with water or not.

Subsidence troughs

As demonstrated by the Shotts Road subsidence event, subsidence resulting from regional failure of initially the mine roof, then sandstone columns above coal pillars, can also happen at any time. This mechanism of subsidence can occur in mining areas once considered to be adequately designed to prevent extensive subsidence.

The impact of trough-forms of subsidence such as that in the Shotts Road area is far less severe than that of pothole subsidence.

Impacts

Design limits for surface infrastructure differ between mining regions, as do the ground movement parameters used for establishing the subsidence design limits. The most commonly used classification for damage to surface structures is provided by the National Coal Board (1975) and is based on ground strains at the surface.

A site-specific subsidence prediction has not been carried out with respect

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to the railway track. Tolerance levels for changes in super elevation and camber are dependent on a number of factors including track curvature, train speed and the length of track the change is expressed along. The configuration of the railway track with respect to the mine workings is complex so any prediction requires considerable additional work. The authority responsible for track and land tenure has driven a track recorder over the area, and no priority faults were identified.

With respect to public roads, the only clear impact has been cracking in the trafficking surface. Any other changes have been 'over-riden' by natural topography. The observed subsidence cracking has brought two responses from the respective stakeholders:

- sealing the cracks in the bituminised Coalfields Road with emulsion, primarily to prevent water ingress to the sub-base; and
- closure of the gravel Shotts Road due to the potential for wide cracks to reappear after regrading, as loose infill reconsolidates in the deeper, wider cracks.

Potential impacts

Given the evidence, it is difficult to completely rule out this form of subsidence developing elsewhere in the Collie Basin. Truly representative geological material testing in the floor and roof of mines in each area would be required to determine, with any degree of certainty, the potential for creep-type collapses of ground. Furthermore, given that roof falls in abandoned mines can occur several decades after mining ceases, even when the mine is filled with water, there is considerable potential to develop sandstone columns above coal pillars over time.

Given the degree of uncertainty involved with the status of underground excavations and the actual strength of materials close to the mines, across the full extent of mining, it is recommended that land owners and potential developers

adopt the view that subsidence troughs are likely to occur and take necessary actions — as required. Any land development that cannot tolerate such ground subsidence or cannot be adequately repaired should not be planned above underground mines.

Summary

Using earlier research and old mine records, Resources Safety showed that cracking along Shotts Road in the Collie Basin is due to the collapse of ground immediately above the Stockton Colliery mine workings.

The subsidence mechanism involved collapse of the mine roof surrounding a number of coal pillars, which led to the development of sandstone pillars above existing coal pillars. Once the area of roof collapse spread over a sufficiently wide area (some 47 years after closure), the tributary load exceeded the strength of the sandstone pillars, which subsequently failed en masse.

The subsidence event shows as a shallow trough-like depression with minimal impact on the ground surface. The two main concerns for local infrastructure were for cracking to force vehicles to travel against the alignment of tracks or roads, and the potential for subsidence to alter the camber of the railway track around two bends. The relevant stakeholders are aware of these concerns and are understood to have undertaken necessary steps, as appropriate, to account for these potential hazards.

There is minimal concern regarding pothole subsidence at locations of significant public risk due to an overlying sufficiently stiff and thick bridging layers of coal or shale. However, there is potential for potholes to develop beneath seldom-used bush tracks on the southern side of Stockton Lake and near the public toilet to the east of Stockton Lake.

Any land development proposed for the future that cannot tolerate such ground subsidence or cannot be suitably repaired should not be planned above underground mines.

Importantly, this assessment relied on access to old plans and records to obtain an understanding of the mining history and likely ground conditions.

It is an excellent example of why there is a legislative requirement for mines to submit mine plans to Resources Safety and keep accurate records themselves.

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- Note: This research indicated that there can be inherent inaccuracies on scanned mine plans, due to the potential for significant distortion associated with scanning devices. Care must be taken when using Resources Safety's scanned mine plans for design purposes.*

Importance of **research** to mining safety

There is no doubt that mining-induced seismicity and rockbursts have become more common hazards in Western Australian underground mines as mining depths increase.

Fortunately for the industry, there have been many people working extensively over the past 16 years on research projects overseen by the Minerals and Energy Research Institute of Western Australia (MERIWA) and undertaken to improve safety on mine sites.

Established by the Western Australian Government to encourage development of the minerals and energy industries within this State, MERIWA also awards one or two scholarships annually for postgraduate research.

There have been tangible benefits for mine safety and increased knowledge of the methodologies used to reduce or eliminate potential risks.

Since 1992, there have been 11 MERIWA research projects dedicated to improving mine safety, from improved seismic monitoring and rockburst risk management to the elimination of rockfall fatalities.

Mine seismicity and rockbursts

One area of research, mine seismicity and rockburst risk management, commenced in 1999 and has involved several phases. It was led by Professors Yves Potvin and Richard Jewell from the Australian Centre for Geomechanics, a mining research centre based at The University of Western Australia. The research included a survey of seismicity in underground, mechanised hardrock mines at 73 mines in 11 countries.

In Western Australian mines, the study addressed rockburst and mine seismicity issues by better defining the nature and extent of the problem. It introduced ideas and technology being used overseas and developed analytical methods to better quantify the associated risks.

Initial assessment at mines operated by the project sponsors found there was:

- no quantitative means to evaluate seismic risk;
- limited seismic data analysis and a lack of tools to achieve this; and
- varied knowledge of mine seismicity by on-site staff.

The challenge was to improve training and apply the research results to address these gaps.

As a result of the research, a methodology to quantify mine seismicity risk was established, and a numerical parameter developed that relates fault-slip seismicity to the deformation and stress state on mine faults. The MS-RAP software (Mine Seismicity Risk Analysis Program) was created to improve data analysis.

Professor Potvin continued with the second phase of the research in 2003, providing interpretation of micro-seismic data through supervised on-site studies at sponsors' mines, as well as supporting the ongoing design, tuning and application of seismic monitoring systems on mine sites.

The study recommended improved use of seismic information, as currently only a fraction is being utilised. Some 83 rockburst case histories were investigated to estimate the potential for rockburst damage.

A third phase is underway to improve real-time, on-line seismic hazard mapping systems with the ability to perform risk analysis.

Rockfalls

Another area that interested Professor Potvin was the industry aim of eliminating rockfall fatalities. Realising that there was no single database for Australian rockfall information, he decided to collate data such as the causes, contributing factors and other information allowing the determination of common causes and main factors.

As a result, a collaborative research approach by mining companies, regulatory bodies and the Australian Centre for Geomechanics was adopted to accelerate the progress of better management of the risks associated with rockfalls in underground mines



and elimination of this cause of mining fatalities.

A final report details a better understanding of the main causes of rockfalls, rockfall injuries and fatalities, and identifies trends, main causes and their consequences.

The rockfall research by Professor Potvin then moved from the creation of a comprehensive database to analysing the data, which established there were two types of rockfall risks.

These are the risks in the intense work areas near active faces, and those present in the rest of the mine. The study focussed on gathering and analysing critical information for both types of risk to develop practical solutions for the industry to reduce the incidence of related injuries and fatalities.

The mining processes, activities and personnel near the active face were investigated for rockfall incidents to determine circumstances leading to injuries, and at what stage injuries occurred.

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In general, rockfalls causing injuries were found to originate from the unsupported rock surfaces near active faces, so the highest risks were associated with tasks that exposed workers to the active surfaces.

The study found that implementing flexible risk management and control measures at individual mines, and targeting local rockfall hazards and personnel exposure have greater merit than a 'one-size-fits-all' solution.

Seismic monitoring

A related study by Professors Potvin and Daniel Heal, also at the Australian Centre for Geomechanics, looked at broadening the application of seismic monitoring in Australian underground mines.

One outcome is the enhancement of regional seismic monitoring networks in the Kalgoorlie-Kambalda and Leinster regions, which has also resulted in improving the techniques for interpreting data in high stress and rockburst-prone mines.

Other research projects involved high resolution seismic monitoring in open pit mines to precisely identify failure initiation locations, and provide information on failure processes and mechanisms.

Mine stress measurements

In other MERIWA projects, a major interest in mine stress measurements has been generated by the transition from open cut to underground mining and concurrent observations of high stresses.

Professor Ernesto Villaescusa of the Western Australian School of Mines in Kalgoorlie is the principal investigator on a project examining stress measurements from cored rock.

The aims are to investigate a promising new stress measurement technique and compare its results with those of conventional overcoring.

The new method determines stresses from tests on rock cores, allowing stress measurements to be obtained even for remote and undeveloped areas of a mine or proposed mine. For an accurately oriented core, full information on the

magnitude and orientation of the stress field at the mine can then be recovered.

Until now this technique has only been used experimentally and needs to be proven in the field. Establishing an acoustic emission laboratory at the School of Mines will be an important component of the project.

Information

Information on these and other research projects relating to mine safety is available at www.doir.wa.gov.au/meriwa

Prof's mesh invention wins award

During October, Professor Yves Potvin from the Australian Centre for Geomechanics was awarded the 'Ready for Market' category at the 2008 WA Inventor of the Year Awards.

As mines go deeper to explore for resources, the stability of underground operations becomes increasingly problematic.

Professor Potvin's HEA Mesh invention is designed to absorb the energy of seismic events, such as rock bursts and collapses during underground mining. It also significantly improves surface support technology over the existing rock.

The HEA Mesh system provides a number of advantages over existing underground stabilisation technologies, including improved energy absorption, flexibility and easy installation.



Photo by ACG

Simulator excellence recognised

A world-leading supplier of operator training simulators, considered vital to key mining companies in more than 20 countries, has received the major award in the 2008 WA Industry and Export Awards.

Premier Colin Barnett announced Immersive Technologies Pty Ltd, a Perth-based company, as the winner of the Premier's Award for Excellence at the official award ceremony held in late October.

Immersive Technologies' simulators increase safety and efficiency while decreasing maintenance costs and mining companies overall cost per tonne.

Mr Barnett said the company was a great example of a local business making a valuable contribution to Western Australia's economic development.

'Immersive Technologies is known throughout the world for its innovative technology. Countries including Australia, the United States of America, South Africa, Jordan and South America have used the simulator modules to train their staff,' he said.

The Premier said that with many pressures on the Australian manufacturing sector, it was important to remain internationally competitive and Immersive Technologies commitment to excellence had been recognised through the prestigious award.

The WA Industry and Export Awards also featured 15 industry and export categories. The State's export category winners automatically compete as finalists in the Australian Export Awards, held in Melbourne in December.

2008 Mines Safety Roadshow

Promoting a culture of safety and consultation

Promoting a positive safety culture and consultation in the resources industry were the two key themes running through the 2008 Mines Safety Roadshow, attended by some 340 safety and health representatives, supervisors, managers, occupational safety and health professionals and others.

Now in its fourth year, the roadshow travelled during October to Kalgoorlie, Bunbury and Karratha, with the final session held at the Perth Convention and Exhibition Centre during Safe Work Australia Week.

The annual event is an initiative of the regulator, Resources Safety, and brings information into regional areas and provides easy access to information on occupational safety and health issues and changes to safety laws.

It provides an opportunity for people in the Goldfields, South West, Pilbara and Perth to meet with Resources Safety staff, including inspectors, and encourages discussion and networking between stakeholders.

One of the difficulties in determining the roadshow content is to devise a program that has general appeal across the industry, but with some

topics covered in detail and others addressing specific issues of concern to the mines inspectorate. In response to feedback and suggestions from the 2007 series, the 2008 program had a mix of standard PowerPoint presentations and break-out sessions, including group exercises, directed discussions and videos on safety culture, communication and consultation.

Topics included identifying and addressing hazardous manual tasks, prevention of noise-induced hearing loss, with a display of hearing protection, and arc welding electrical and fume hazards and safeguards.

The afternoon session provides an insight into what inspectors look for when identifying hazards, and covered the importance of incident reporting and consultation in the workplace, including dealing with challenging behaviour.

This was followed by a session that explores the consequences of workplace accidents, discusses ways to get involved in promoting workplace safety, and highlights the importance of telling stories.

Local inspectors were called upon where possible, including Jim Boucaut

(Senior Inspector) and Terry Siefken (Senior Occupational Health Inspector) in Kalgoorlie, Peter O'Loughlin (Senior Inspector) and Gary Hussey (Senior Occupational Health Inspector) in Bunbury and Karratha, and Lindy Nield (Occupational Health Manager) in Perth.

Wendy Pietrocola, the ergonomist engaged by Resources Safety to assist with its manual task project, presented a session at all venues, and launched the fact sheet series associated with the project. Other Resources Staff who participated at all venues were Denis Brown (Principal Engineer), Brett Boneham (Special Machinery Inspector), Barry Healy (Education and Training Officer) and Su Ho (Communications Manager).

Of course, the roadshow series depends on industry participation if it is to continue. Participants are thanked not only for their attendance and contribution to discussions, but for completing the survey forms and suggesting topics and resources for future events.

The Karratha participants are particularly thanked for their forbearance while we waited for one group of registrants to arrive — their bus had a flat tyre!

SHIRMS

SHIRMS 2008 was an innovative symposium held in Perth in September 2008. The Southern Hemisphere International Rock Mechanics Symposium brought together more than 230 rock mechanics researchers and practitioners from the main areas of earth sciences to exchange ideas and lessons learnt, and to develop further collaboration and synergies. The symposium set the agenda for future research and operational directions.

SHIRMS featured the four main rock

mechanics' streams:

- mining;
- civil;
- fundamental; and
- petroleum.

The symposium proceedings were edited by Yves Potvin, John Carter, Arcady Dyskin and Rob Jeffrey, and published by the Australian Centre for Geomechanics. There are two volumes featuring 104 papers. Volume one covers mining and civil rock mechanics, and volume two covers fundamental and petroleum rock mechanics.

To purchase copies, contact the ACG:

Phone 08 6488 3300
Email acg@acg.uwa.edu.au
Web www.acg.uwa.edu.au



2008 Mines Safety Roadshow



BUNBURY



2008 Mines Safety Roadshow

KARRATHA



PERTH



Photo's by TYC

Successful week in the west

More than 130 Western Australian businesses recently took part in workplace safety and health activities for the 2008 Safe Work Australia Week, which ran from 19 to 25 October.

Safe Work Australia Week aims to raise awareness of workplace safety, preventing workplace incidents and managing injuries with the message of 'keeping the workplace safe'.

Activities and events across the State included information sessions, safety workshops, safety displays, training sessions, quizzes and competitions and displays of safety promotional material. The organisations who registered their workplace activities

with WorkSafe are listed at www.worksafe.wa.gov.au/swaweek

Key events of the week in Western Australia included:

- 2008 Mines Safety Roadshow;
- Work Safe 2008 Forum, where about 570 delegates discussed workplace safety issues, as well as the latest ideas, strategies and developments;
- Work Safety Awards Western Australia; and
- Safety Achievers Dinner, where 36 companies and individuals received certificates and trophies in recognition of their excellent performance in the occupational safety and health arena — some of

the award winners will compete in the national occupational safety and health awards.

The Work Safe 2008 Forum theme was 'Come home safe'. A highlight was the keynote address by Professor Niki Ellis from the University of Queensland. Professor Ellis spoke about the effects of occupational stress on health and productivity at work, the causes of occupational stress and how to tackle occupational stress by improving the quality of the working environment.

Papers for some of the forum speakers are available from the WorkSafe website at www.worksafe.wa.gov.au/forums

Safety award winners lead the way

The 2008 Work Safety Awards Western Australia recognised outstanding occupational safety and health management, solutions and innovation in Western Australian workplaces. The winners were announced in October and are entered in the national Safe Work Australia Awards.

The award for best *workplace safety and health management systems* was won by Main Roads Western Australia. Employing 1,100 people, Main Roads manages a network of more than 17,800 kilometres of national highways and State roads, and works with local government to create an efficient transport network. Main Roads has an excellent integrated management system incorporating occupational safety and health, environment and quality, and has achieved a very clear improvement in safety and reduction in injuries.

The best *workplace safety and health practices in small business* award went to Albany small business Southern Brake and Services Pty Ltd. Employing only 11 people, Southern Brake and Services

is a small business incorporating a petrol station, head machining, vehicle servicing and gas conversion. The company identified hazards and made the appropriate changes in collaboration with the Motor Trade Association, and has now implemented excellent safety management systems and practices.

The Department of Agriculture and Food WA received the award for *best public sector leadership for injury prevention and management*. Employing 1,900 people in metropolitan and regional locations, the Department's role is to improve the competitiveness and sustainability of agriculture. The diversity of work undertaken by the Department presents a broad range of hazards and risks. Safety and health is integrated into all work activities, and excellent consultation mechanisms have been established throughout the department.

The award for *best solution to an identified workplace safety and health issue* was won by APC Storage Solutions. Employing 130 people, APC

Storage Solutions manufactures and installs industrial storage and handling systems, including pallet racking. The company developed a mechanical aid for the installation of pallet racking frames in response to a recognised manual handling risk when raising frames that weigh up to 100 kilograms.

Suzie Johns from Bunnings Morley was recognized for the *best individual contribution to safety and health*. Suzie is the Night Fill Team Leader at the store, and her team nominated her because of her caring attitude and emphasis on working safely. Suzie encourages her staff to spot and report hazards or to make small changes, and they trust her to take their concerns to management. She constantly motivates her staff to work safely, and they describe her as 'inspirational'.

Nominations for the 2009 Work Safety Awards Western Australia open in April 2009. Visit the WorkSafe website at www.docep.wa.gov.au/WorkSafe for details.

The Flying Doctor — a miner's mate

To the almost 75,000 mining-related workers scattered throughout the State, many in isolated locations, there is no doubt that the existence of the Royal Flying Doctor Service (RFDS) is a comforting thought — like health insurance, though, you hope you don't have to use it.

RFDS Medical Director Dr Stephen Langford agrees, saying it is important to recognise the role of the RFDS in providing 'peace of mind' and the secondary evacuations of families and children of mining employees from larger towns and regional centres.

It is an important role indeed, with around 200-250 employees from the resources industry being evacuated by the RFDS each year, providing a potentially life-saving resource.

'The RFDS is critically important to everyone living, working and travelling in rural and remote areas of WA, almost a third of the entire continent. With most specialist medical services centred in Perth, a service like the RFDS is essential,' Dr Langford said.

'Every year, we travel the equivalent of seven times to the moon and back (or 5.2 million kilometres) and transfer more than 6,000 patients, about 16 per day, every day of the week, 24 hours a day,' he said.

Some of the operations are huge logistically and there is no doubt they save lives, including the evacuation of those seriously injured at the FMG construction camp from the destructive Cyclone George.

As the mining industry has grown, with a 48 per cent increase in workers over the past five years, there has also been a dramatic 20 per cent increase in primary evacuations in the same period, many from mine sites, according to Dr Langford.

Records for 2007-08 show at least 135 emergency evacuations directly from named mine sites during the year — averaging about three every week.

'With the patients being transferred from hospital sites, especially in the Pilbara and Goldfields, the total numbers are larger,' Dr Langford said.

'While we have specific mine sites listed when patients are evacuated directly from them, it must be recognised that, in many locations, employees of mine sites may be taken to the nearest hospital initially — so it is not clear how many additional mine-based cases we handle from other health service locations,' he said.

Likewise, Dr Langford said employees of mine sites injured in rollovers and other road accidents when travelling to and fro, were not categorised as mine evacuations.

The spread of illnesses and injury for primary evacuations are:

- 30 per cent trauma (including industrial and motor vehicle accident);
- 20 per cent cardiac (heart attacks);
- 20 per cent respiratory problems (e.g. pneumonia); and
- 20 per cent abdominal pain and non-specific surgical conditions (e.g. bowel obstructions, appendicitis).

The balance is spread across other diagnostic groups, including a small number of cases of mental illness and substance abuse.

About 20 per cent of all primary evacuations involve incidents at remote mining sites throughout the state.

It is interesting to note that not all evacuations from mine sites are accidents.

'Safety and accident prevention are clearly high priorities and while they happen, we have significant numbers of evacuations due to such things as heart attacks, asthma, infections and stomach ulcers,' Dr Langford said.

He said there is no doubt mining workers and the industry itself appreciate and support the work and efforts of those involved in the RFDS.

'We have excellent relationships with mining companies throughout WA. Our service is invaluable to workers and their families, and both companies and workers raise and donate funds and sponsor projects. The biggest project sponsored by a mining company is the

\$5 million jet sponsorship by Rio Tinto,' he said.

The mining industry is vitally important to the existence of the service and is the source of most of its large donations. It is not unknown for major companies to donate up to \$250,000 per year, or sponsor large projects up to \$750,000 per year. In testimony to the importance of the RFDS, some donate in the million dollar range including, among others, Rio Tinto, BHP Billiton, Woodside, Chevron and Newcrest Mining.

Dr Langford said mine site workers also raising funds at quiz nights and novelty events, with many also participating in 'regular giving' programs and responding to regular direct mail appeals.

The RFDS provides 24 hour medical advice via its 1800 line to thousands of callers every month, including mine sites. This can assist in diagnosis and advice on initial treatment and referral for further treatment.

For further information on the service, visit rfdswa.com.au



Photographs courtesy of RFDS

An RFDS medical team prepares a patient for transport to hospital at an outback station



Critical care and a comforting touch are provided to a patient on board an RFDS aircraft by Flight Nurse Kim Jacobs and Medical Officer Dr Luke Pritchard

Introducing Resources Safety staff

A new section starts in this issue of MineSafe. It will feature the profiles of two to three Resources Safety staff, highlighting the experience and expertise they bring to their area of work, as well as their thoughts on occupational safety and health.

Mike Rowe, Director Health Management



Resources Safety's Director Health Management, Mike Rowe, has developed a wealth of experience working within State Government agencies in their various guises for more than 35 years.

Following the completion of a chemistry degree, Mike commenced work as a food chemist researching oilseed processing before joining Coca-Cola. He joined the Government Chemical Laboratories (now Chemistry Centre Western Australia) in 1971.

By 1975, Mike began undertaking occupational health surveys of workplaces and started visiting mine sites as a consultant to the Mining Operations Division, which in those days was part of the Department of Mines.

He progressed through the ranks in the Chemistry Centre, becoming Chief of Health Chemistry in 1988, before joining the Mining Operations Division in 1992.

His first tasks as both a Special Inspector of Mines and Dangerous Goods Inspector were to undertake the first audits on mine sites and retrofit the application of the then-new Explosives and Dangerous Goods (Dangerous Goods Handling

and Storage) Regulations 1992.

Mike continued his career progression to Manager Occupational Health in 1997 and his current position as Director Health Management in 2005.

These days, when his time as a manager allows, Mike specialises in process plant and refinery safety management systems, particularly in relation to chemical and emission controls.

As Director Health Management, Mike oversees a diverse branch with two main areas of focus:

- occupational health, covering major areas such as chemical management, personal exposure monitoring, biological monitoring, radiation management and noise; and
- information services, managing Resources Safety's AXTAT, MineHealth and CONTAM databases, which are collectively recognised as the most comprehensive mining, health and exposure databases in Australia.

'The two sections combine knowledge and experience to review the data and provide information to industry and government, and to direct research projects. The branch also provides many of the guidelines and bulletins found on the Resources Safety website,' Mike said.

An important part of the job is providing a link between the technical and policy areas of mining health and safety by representing Resources Safety in State and Federal interagency groups, including the Wittenoom Steering Committee, Esperance Interagency Committee and National Mines Safety Framework.

The Esperance Interagency Group also includes the Department of Health and Department of Environment and Conservation.

'Resources Safety is still working with the Esperance Port Authority and lead and nickel miners, with the priority being the removal of the remaining lead concentrate in the port,' Mike said.

'We also want to improve storage in general, and the shipment and storage of nickel concentrates to minimise any further impact on the community and environment.'

In his role, he has also represented Resources Safety at three community open days in the town.

Mike also represents Resources Safety on the National Mines Safety Framework Data and Research Working Group. This Group has already designed the dataset in the National Mine Incident Management Reporting System and discussed mechanisms for governments to foster research into occupational safety and health in the mining industry.

His current focus is a review of the mining databases and, since Resources Safety holds a large amount of data, a priority is to provide industry with feedback and to underpin projects where the data show areas of concern.

The AXTAT database reveals continuing high frequencies of musculoskeletal disorders arising from hazardous manual tasks, contributing to significant direct and indirect costs to the resources industry. This has led to the first phase of a manual tasks project with the preparation of 10 fact sheets on manual tasks at work.

The CONTAM database also shows two areas needing higher priority. Firstly, diesel particulate matter (DPM) monitoring data indicates that about a quarter of people assessed are exposed to levels greater than the designated safe level of 0.1 mg/m³ total carbon. Resources Safety has undertaken a review of DPM in underground mines.

Introducing Resources Safety staff

Another area requiring significant attention is managing exposure to welding fumes, as CONTAM data indicate a significant proportion of monitoring results exceed the exposure standards.

Interestingly, the MineHealth data indicate the smoking rate among miners is more than double that of the Australian population.

As the MineHealth data suggest that lung function deteriorates at a faster rate among people who smoke — and at an even faster rate for people who smoke and have been working in the mining industry for longer — there is a case to promote non-smoking workplaces and the adoption of suitable 'Quit' programs as part of Resources Safety health promotion activities.

One of the main findings from a review of the MineHealth data is that noise-induced hearing loss is still a substantial problem for the mining industry.

'Considerable numbers of mining employees are demonstrating substantial hearing threshold shifts between their initial and periodic health assessments, with some demonstrating a significant percentage of hearing loss,' Mike said.

Noise dosimetry results, noise surveys and noise control audits show that both employers and employees understand the risks involved with excessive noise exposure, yet there is still room for improvement in terms of reducing noise exposure.

'The key message is that the industry should continue working towards noise reduction through engineering controls, and employees should be provided with — and wear — the correct hearing protection to avoid excessive noise exposure,' he said.

Anil Atri, Senior Inspector of Mines



For Anil Atri, Senior Inspector of Mines and sometimes acting State Mining Engineer, the role of middle management in changing the safety culture in the mining industry is very important.

Part of Anil's role is to liaise with mines to improve safety management systems. While often detailed safety policies and procedures are laid out in company safety management system (SMS) documents, not all companies 'walk the talk'.

'Because of production pressures, sometimes policies and procedures are not implemented with all the sincerity they deserve from the site managers and supervisors,' Anil said.

He said the fast expansion of the industry has created its own problems, and the shortage of skilled and trained employees is a major concern.

'This high turnover of employees is another factor affecting the development of a stable safety culture at a site. It also affects maintenance of 'corporate memory' and implementation of lessons learnt,' he said.

Anil has been involved in the mining industry for more than 35 years, graduating from the Indian School of Mines in 1972 with a Bachelor of Science in Mining Engineering with Honours.

He was awarded a Master of Science in Rock Mechanics in 1987 in the United States, and holds a First Class Mine Manager's Certificate of Competency in Western Australia.

Anil has worked around the globe, with stints in Australia, Zambia, India and

the United States, working in many industry fields including ventilation, geotechnical evaluation and design, mining technology, production, financial planning and project evaluation.

An avid researcher, he has also gained extensive knowledge in areas such as geotechnical assessment of ground conditions, selection of mining methods based on geotechnical evaluation, ground support and providing solutions to mining-related problems.

He is currently involved as an administrator of mines safety legislation, including its development, the inspection and auditing of mines, and investigating incidents and complaints.

His role with Resources Safety involves coordinating a team of inspectors for the Perth inspectorate, covering a huge area from the Plutonic mine in the north to Mandurah in the south, west of Wiluna to the coast, Sandstone and Southern Cross in the east, the Kimberley region, and an area covering the Telfer, Nifty and Woodie Woodie mining operations.

As well as being a member of the Board of Statutory Examiners under the *Mines Safety and Inspection Act 1994*, he has been on the panel of judges for the past three years for the Safety Awards organised by the Chamber of Minerals and Energy WA, and has had a number of technical papers published.

Anil's top safety tips

- Sincere communication is required between all parties to achieve better safety and health standards. Safety and health representatives are a valuable resource in this regard.
- Managing activities and safety standards of contractors is vital. Merely reviewing the policies and procedures is not enough. Practices by the contractors on the ground need to be checked as often as is necessary. Short term contractors should maintain the same safety standards.
- It is better to stop and think before you act — to save time and perhaps a mishap later.

Introducing Resources Safety staff

Ian Misich, Senior Geotechnical Engineer



Photo courtesy Paul Gillespie

For Dr Ian Misich, as a senior geotechnical engineer with the Mines Safety Branch of Resources Safety, the challenges of keeping people safe keep life interesting.

People want to mine deeper and this has consequences for the safety of miners.

Ian has extensive experience in design, operations control and environmental issues for underground and open pit mines. As a senior geotechnical engineer, he provides expert advice to government, all levels of mining personnel, legal representatives and even the public.

Like most of the Mines Safety staff, Ian is well qualified and has a Masters of Applied Science (Mining Geomechanics) from the University of New South Wales, a PhD (Mining Engineering) from Curtin University of Technology, and is a Chartered Professional and 25 year member of The Australasian Institute of Mining and Metallurgy.

Ian commenced his career in the late 1970s, starting with a brief stint for the Australian Minerals Development Laboratories (AMDEL) where he helped evaluate the use of

recyclable magnetite in purifying untreated groundwater for public consumption.

He then worked for Western Collieries Ltd (now Wesfarmers Coal) in Collie as the site's geotechnical engineer. His main responsibilities were to design and maintain safe and cost effective open pit and underground mining operations.

Since then, Ian has developed a sound knowledge base of geotechnical issues in most forms of mining — expertise that he applies with Resources Safety.

In his current position, besides working to keep miners safe, he also promotes and raises awareness of the importance of geotechnical safety with mining companies and the public.

Ian has presented several technical papers over the years. The latest, *Implications of recent mining subsidence on infrastructure in the Collie Basin, WA*, was co-authored with former Resources Safety staff member Rob Sherwood.

Presented in September this year at the 1st Southern Hemisphere International Rock Mechanics Symposium, this paper describes a new design method for pillar stability.

'Research is also an important facet of mining geomechanics, and I'm pleased to have been able to have been, and continue to be, involved in this area,' he said.

'Between 1991 and 1997, as part of my PhD dissertation, I worked on developing site specific mine design criteria with respect to the caving subsidence and hydrological characteristics of the unique Collie Basin sediments,' Ian said.

In order to complete the PhD to the highest standard, he incorporated this research within

a tripartite sponsored project with the Minerals and Energy Research Institute of Western Australia (MERIWA) called *Project M156: Subsidence due to underground mining in the Collie Basin*.

Practical use of that research in the region has been limited since 1994, with the closure of all local underground mines. However, there is renewed interest in mining subsidence in the Collie area with the closure of a local road following cracking in the road surface, above a 50-year-old mine. This was the driver for his recent paper (see *Old records key to subsidence assessment* in this issue of *MineSafe*).

Ian also investigates significant incidents and rockfall fatalities, and provides assessment reports of investigations to relevant parliamentary, Resources Safety and legal personnel. When required, he gives expert evidence at criminal law and coronal courts.

He undertakes detailed audits of the ground conditions and relevant safety strategies implemented at mines, including reviews (underground, open pit, tailings dam), and design and remedial action reports, and advises the State Mining Engineer, among others.

As a Special Inspector of Mines (geotechnical), he is also called on to pro-actively inspect ground conditions and assess geotechnical strategies to ensure compliance with environmental and safety requirements.

Ian's ground control messages

Ian has many message with respect to ground control in mines for this article, but raises three important points here.

- *Avoid applying a never-ending short-term 'mine life'*. Many geotechnical problems in

Evaluation of working hours code

Western Australian mines arise from mines working to a short-term mine-life. During the pre-mining stage, design the mine for its expected maximum mine life — use geotechnical data derived from suitably representative drillcore and other samples, and appropriate modelling techniques. Long-term mine modelling helps identify when changes to mine design are likely to be necessary — for example, if the depth of mining will reach 'critical levels' where seismic failure of rock is possible.

- *Do it right (or don't do it at all).* During operation, apply all design criteria correctly, down to the finest detail. If, for any reason, any component of the design cannot be practically met, modify the design and verify the changes using a suitable formalised process. Do not encourage, accept or undertake arbitrary shortcuts or modifications because it is difficult, expensive or some other excuse. Allowing short cuts often cultivates a poor working culture in the workforce.
- *Monitor, learn and act.* During the full mine life, closely monitor and assess ground performance. Expect that, at some stage, ground conditions will change for the worse, and it is likely these changes will eventually require modifications to any number of mine design criteria. When it does, follow the second point above.

At the 2006 Mines Safety Roadshow, there was an afternoon session on the then-recently released *Code of practice: working hours*. At the time, participants were advised that feedback would be sought in a year or so to review its usage and effectiveness.

The code was also sent to mine and exploration managers on the Resources Safety database, and is available at www.docep.wa.gov.au/ResourcesSafety or can be purchased from WorkSafe (phone 1300 307 877).

Together with the accompanying risk management guidelines, it outlines employers' duty of care in relation to occupational safety and health risks that can arise from working hours arrangements, and provides guidance on conducting a risk management process.

The code was published by the Commission for Occupational Safety and Health (COSH) and endorsed by the Mining Industry Advisory Committee (MIAC) for use in the mining industry. At the time, COSH agreed to monitor its uptake to evaluate its effectiveness after twelve months. Its Emerging Issues and Risk Management Advisory Committee oversaw the project.

In addition, the Chamber of Minerals and Energy WA has collected annual data on working hours in the resources industry since 2003. The data from about 100 mining and petroleum sites were collated in 2006 and published as a report, *Western Australian resources sector working hours 2007*, available from the Chamber's website at www.cmewa.com.au

The COSH evaluation comprised a survey form with questions focused on the key objectives of the document. The survey commenced in early December 2007 and closed on the 28 March 2008. It was advertised on the WorkSafe and Resources Safety websites, and through letters, *MineSafe*, WorkSafe's newsletters, and emails to industry associations, unions and members of the Working Hours Stakeholder Reference Group.

Thirty survey forms were received from various industries. One third

of the responses were from industry associations rather than individuals. Most respondents either worked in an occupational health and safety role or were the CEO of the responding organisation.

Industries represented among the respondents included forestry, mining, manufacturing, electrical and gas, construction, retail or wholesale, transport and storage, government, health and community, education and one not specified.

Industries that did not respond included accommodation, cafes and restaurants, communication services, finance and insurance, property and business services, cultural and recreational services, personal and other services.

Uptake and use

- Over 70 per cent of respondents said they had used the code, and more than 83 per cent said they had identified safety and health matters arising from working hour arrangements at their workplace. Issues identified included shift rotation, transport-related issues, fatigue management and out-of-hours unpaid work.
- Some 83 per cent of respondents identified someone in their industry as using the code, with 76 per cent being occupational safety and health management and committees, managers and supervisors.
- Over 73 per cent of the respondents used the code for risk management, development of policy and guidelines and training.

Readability and relevance

- Seventy per cent of respondents said the code was understandable and easy to use. One respondent suggested there was too much methodology and it was not prescriptive enough, while another found the code was too vague.
- Seventy per cent agreed that the risk management guidelines are easy to

Continued on page 32...

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use. One suggestion was the use of a fatigue matrix.

- Over 63 per cent agreed that the code gave sufficient information. Of those who neither agreed nor disagreed, one suggested it was a good base.
- More than half the respondents said the code was very relevant. They indicated that it created awareness and prevented excessive hours, demonstrated problems and shift workers' needs, and assisted in providing feedback to industry members. Of those respondents who thought the code was somewhat relevant, one suggested that it provided only general advice for very complex situations while one noted the need for additional information for groups such as migrant and office workers.

Suggestions for improvement

- In addition to those items noted previously, respondents suggested

future versions of the code could include:

- case studies;
- information on the impact of shift work;
- information on the average age of workers; and
- separate headings for individual life style factors, work-life balance, unpaid work and travel out of hours.

Conclusion

While the overall number of respondents was small, limiting the conclusions that might be drawn, it is evident that those using the code are finding it practical and relevant. In general terms, respondents see it as a useful tool to guide the risk management and policy making processes, and are using the code, including its risk management guidelines, as an aid to training.

It is pleasing to note the proportionally high level of responses from industry associations, particularly those traditionally associated with extended working hours. This response rate

supports the view that these associations are playing a critical role in disseminating information and increasing awareness of the occupational safety and health issues associated with working hours. Their continued support will be enlisted in an ongoing effort to promote awareness of the code and its role in providing practical guidance across all industries.

While there were no matters raised that would necessitate immediate changes to the code, suggestions for improvement will be considered in more detail when the code is reviewed.

In considering the survey results, COSH discussed the need to keep pace with developments in working hours arrangements. While the code is due for a full review in 2011, it was decided it would be beneficial to commence a review in the first quarter of 2010, with another survey conducted as the first phase. Issues arising from activities such as 'sleeper shifts' in aged care facilities and lifestyle villages may be considered during this review.

Occupational health news

Assess the hazards in your manual tasks

Most workers in the Western Australian resources industry undertake manual tasks every day. Some of them regularly incorporate repetitive movements, awkward postures, repetitive or sustained application of force (sometimes high force), and sometimes in combination with sustained vibration, unsteady or unstable loads, or both. These factors contribute to making a manual task hazardous in a way that is known to increase the risk of musculoskeletal disorders, with the most common being sprains, strains and back, joint, bone and nerve injuries.

During the 2008 Mines Safety Roadshow, a series of fact sheets was released to assist the

resources industry to apply the National Standard for Manual Tasks and *National Code of Practice for the Prevention of Musculoskeletal Disorders from Performing Manual Tasks at Work*, both published in 2007. An overview of the material was also presented by Ms Wendy Pietrocola, the author of the scoping study report entitled *Manual Handling Review of the WA Mining Industry*. A break-out session followed where roadshow attendees investigated a common scenario from their own workplaces. A toolbox presentation on this topic is available on the Resources Safety website under the mining guidance material.

The tripartite working group

investigating manual tasks in the Western Australian resources industry is currently reviewing a number of assessment tools designed to assist workers, supervisors and occupational safety and health professionals to work together to identify and assess the more common hazardous manual tasks. The initial aim is to introduce simple and effective tools to some trial workplaces to identify the most effective means of promoting a participative ergonomic approach.

If you would like more information on this project, contact Lindy Nield, Occupational Health Manager:

Phone 08 9358 8088

Email lnield@docep.wa.gov.au

New health surveillance guideline

Resources Safety has released a new guideline on risk-based health surveillance and biological monitoring to encourage the best occupational health practices in the State's mining industry.

'This guideline will assist mining companies to meet their statutory requirements relating to biological monitoring and the additional health surveillance required when employees are exposed to hazardous substances,' said Resources Safety's Director Health Management Mike Rowe.

'Particular attention is paid to toxic metals being mined or present as significant ore contaminants in Western Australia, or used in mining operations.'

The guideline focuses on how to measure employees' exposures to chemicals using biological monitoring and how this monitoring will allow an assessment of whether the exposures have negatively impacted on employee health.

'Another important part of the guideline outlines when to implement risk-based health surveillance to address any issues that may arise from exposure to a specific chemical,' Mr Rowe said.

Any mining or exploration company mining, concentrating, processing or handling toxic materials or hazardous chemicals is required to identify, assess and monitor employees' exposures and the effects of these hazards.

The guideline outlines the step-by-step processes for these requirements, including pre-placement assessments

of workers prior to undertaking high exposure risk work.

It also outlines the process of monitoring the uptake of hazardous substances that may have entered the body following ingestion, inhalation or absorption through the skin.

Exposure to some minerals mined in Western Australia, or present as contaminants in mined ores, can cause serious health problems including cancer, reproductive effects, kidney or liver damage and neurological damage.

'The over-riding goal of any exposure monitoring or health surveillance program is to identify hazards that employees may face while undertaking their daily duties,' Mr Rowe said.

'Where exposure measurements indicate levels that may impact on health, control measures must be implemented promptly to reduce these levels.

'Risk-based health surveillance should be reviewed regularly and whenever conditions change, and control measures revised until exposure levels are as low as reasonably practicable and no adverse health effects are detected.'

The guideline also has a comprehensive list of appendices containing links to information about specific heavy metals, legislative provisions, exposure standards and control measures.

The guideline is endorsed by the Mining Industry Advisory Committee (MIAC) and is available from the Resources Safety website.

Stop breathing in welding fumes

Hazards associated with inhaling welding fumes and ways to prevent these exposures were promoted at the Mines Safety Roadshow during October 2008.

Roadshow attendees were reminded that toxic gases and dusts will be released into the breathing zone of welders during welding if the wires, electrodes or fluxes contain toxic metals. Nickel, chromium, manganese, cadmium and lead are all toxic metals that can be present in welding consumables.

Inhaling too much fume can lead to 'metal-fume fever', which feels like a bad flu. These symptoms are sometimes accompanied by a metallic taste. If the fumes also contain toxic metals, the risk increases for other health conditions ranging from reproductive effects to severe kidney damage if exposures are elevated and prolonged for many years.

The main messages of the roadshow presentation were:

- take measures to ensure fumes are not inhaled during or after doing welding jobs by using local exhaust ventilation and appropriate respiratory protection, in addition to the welding visor; and
- read the material safety data sheet (MSDS) before using a new type or brand of rod, wire or flux — depending on its composition, reconsider using it or consult a ventilation expert to ensure the welder and other workers in the vicinity are adequately protected from breathing in any fumes.

The presentation is available from the Resources Safety website for use in toolbox meetings.

Guideline addendum

There is a typographical error in Appendix 6 on page 46 of the hardcopy version of the guideline on risk-based health surveillance and biological monitoring. The medical removal level for lead for females of reproductive

capacity is 15 µg Pb/dL (not 5). An addendum for insertion in hardcopy versions of the publication is provided in the mining guidance material section of the Resources Safety website.

Note: The online version of the guideline has been corrected.

Impact of FIFO

The May 2008 issue of MineSafe (vol. 17, no. 1) reported on a large research project underway at The University of Western Australia (UWA) examining the lifestyles and health of the Western Australian mining community. There was also information on the report by the Chamber of Minerals and Energy WA on fly-in fly-out (FIFO) workplaces in the Western Australian resources sector.

Other research is underway on this topic, as reported below. The study of the impact of FIFO on children is relevant in that the family situation can affect employees when at work.

FIFO seminar

The resources boom has seen the debate on FIFO versus residential workplaces become a key regional development issue.

FIFO is not limited to workforce planning. It is also a topic of interest to families, psychologists, urban planners, political scientists, health professionals, local and State Government economists, corporate and small business.

A recent seminar brought together a diverse group of researchers who are or have examined the impact of FIFO on a variety of people and communities.

The 'Fly-in Fly-out Seminar', held in October 2008 at the Curtin Graduate School of Business, was jointly sponsored by the John Curtin Institute of Public Policy, and Housing and Urban Research Institute of Western Australia (HURIWA). The speakers were:

- Janine Watts, author — *Best of both worlds: seeking a sustainable regional employment solution to fly in fly Out in the Pilbara*;
- Susan Clifford, PhD candidate, UWA — *Impacts of fly-in/fly-out community and extended working hours on the stress levels, lifestyles and health of Western Australian mining employees and partners*;
- Dr Linley Lord, researcher, Curtin University of Technology — *Women and FIFO: take it or leave it?*
- Greer Bradbury, PhD candidate, Curtin University — *Children and the fly-in/fly-out lifestyle: the psychosocial implications of occupational parent absence*;
- Anne Sibbel, PhD candidate, Edith Cowan University — *When the dust settles, how do families decide, FIFO or residential?; and*

- Professor Fiona Haslam McKenzie, researcher, Curtin University — *Regional development and FIFO*.

Ms Clifford featured in the May 2008 edition of *MineSafe* talking about her research project, and her findings will feature in the next issue.

Professor Fiona Haslam McKenzie told the seminar that there were some real issues surrounding a transient workforce and how it impacted on regional communities.

Politicians and community leaders have suggested that FIFO undermined community and regional development. However, Professor Haslam McKenzie said that the rapid onset of the current resources boom had placed enormous pressure on infrastructure, human resources and public services. Without careful planning, appropriate and affordable housing, service capability, community supports and regional governance arrangements, any reduction in FIFO would have monumental negative impacts on resource-dominated communities.

Curtin University researcher Dr Linley Lord outlined the perceptions of young women in the mining workforce and the difficulties faced in retaining them in the industry.

Although women were increasingly part of the mining workforce, the mine site was often not a comfortable environment for them, she said.

Women surveyed reported that FIFO arrangements were inflexible and often lacked the sensitivity to women's intrinsic needs.

The women survived for a period of time but did not thrive, thus their full potential was lost to the sector at a time when skill and experience were precious resources.

Dr Lord's research is outlined in the report 'Unearthing new resources – attracting and retaining women in the Australian minerals industry'.

Edith Cowan University PhD candidate Anne Sibbel told the seminar it was important to understand why people chose FIFO or residential so that government, industry and community stakeholders could more adequately address the developmental needs of mining employees and their families.

She said the decision to do FIFO or residential was commonly based on employment satisfaction (including remuneration and career advancement) and on the developmental needs of the workers and their families. These included educational, health, employment, career, social and support needs.

Some people with a rural upbringing were more opposed to FIFO while those who had an urban upbringing and family in Perth were less likely to opt for residential employment. Those who had extended family in mining towns were more likely to choose residential employment.

For the majority of participants, however, their reasons for choosing FIFO or residential workforce mainly related to their family life-cycle.

More single people chose FIFO because it allowed them to keep up their city social life and commitments. Families with young children favoured residential work because of the ability to be home at night and the safety of smaller towns. However, as their children grew to teenagers, FIFO became a more popular choice because of the greater educational and social opportunities it presented for their older children. Empty-nesters based their decisions on family (being near grandchildren or elderly parents) or lifestyle (using regional centres as a basis for further travel).

Children and FIFO

What do children really think about their parent or parents' choice to undertake fly-in fly-out (FIFO) employment?

And, more importantly, how does it really impact on a child's emotions, behaviour and attitude?

A Curtin University researcher aims to answer these questions in a new research project entitled 'Children and the fly-in/fly-out lifestyle — Implications of occupational parent absence'.

Researcher Greer Bradbury, who is completing her PhD (Clinical Psychology) at Curtin University, said there is no doubt that children in FIFO families experience a unique pattern of family life compared to children whose working parent or parents return home daily.

'About 70 per cent of mine workers are married with children and with more Western Australians choosing FIFO employment, the community is recognising this lifestyle may pose different challenges for families,' she said.

While there was research on the impact of FIFO on workers, children tended to be the silent voices in work-family research, she said.

She posed the questions, 'How do children cope with the experiences of departures and reunions, and changes in routine and social support? How do they communicate with Dad when he is away? How does his absence impact on how the family functions?'

'Family dynamics are never static and families experienced different types of stress — regardless of whether their parent is an FIFO worker.

'I want to determine whether there are any unique differences in the behaviour and perceptions of children from FIFO families compared to those of residential workers, and whether parent and family factors play a role in the differences.'

Ms Bradbury became interested in the impact of FIFO work on children when her sister had her first child in 1999. Her sister's husband was a master mariner

working internationally on an eight-weeks-on eight-weeks-off roster.

'I observed the departures and reunions and watched the children (a nephew in 2002) and parents adjust to different challenges and it got me thinking,' she said.

Ms Bradbury said the research would contribute to community awareness of the strengths and difficulties of the FIFO lifestyle for children, and provide new information for families, health professionals and the resources industry.

She is seeking to interview families with children aged between nine and 15 years with a working parent in FIFO employment or where the working parent or parents return home daily.

Children and parents will be asked to complete questionnaires about themselves and family life. The questionnaires take about 15 to 30 minutes to complete and all information remains strictly confidential.

Ms Bradbury has already interviewed 55 children and their families where the father is a FIFO worker, providing a tantalising glimpse into her final research.

'My research so far has found that children understand a lot more about the impact of FIFO employment on their family life than many people would give them credit for,' Ms Bradbury said.

Children miss their fathers on a practical and emotional level. The children talk about not having Dad around to oil their pushbike, go to the cinema with, or to talk to about sports and school projects. For some, the emotional impact appears greater.

'If I have a serious question I need to ask him, I have to ring and try and express it over the phone,' an 11-year-old boy said.

These feelings can be compounded if Dad misses important milestones year after year, like birthdays.

Ms Bradbury said children seemed to cope better if they had an opportunity to visit the mine site where their father worked.

'The kids who go up to the mine site really have a ball. Mining companies that provide this opportunity are to be congratulated because it's important for children to see what their father is doing,' she said.

Ms Bradbury said while the children recognised their own needs, they believed their father's absence was harder on their mother.

'I miss him so much, with all my heart and it's hard to cope, because there is just mum and my little two and a half year-old sister who is very annoying and stresses anyone out,' said a 12-year-old.

'My mum is a bit afraid about sleeping in the house alone so she doesn't let me sleep over at my family or friend's house,' an 11-year-old girl said.

They are also very savvy about the impact of Dad's absence had on family dynamics.

'Living by two sets of rules came up quite often — one rule when Dad was away and another when Dad returned home. The household shifts from that of a single parent to having to renegotiate boundaries with Dad,' she said.

'Older children and adolescents saw Dad being away as an opportunity to be more independent and, for some, Dad leaving was like a 'pressure valve being released', she said.

'Well, from when he's away, the rules change and so the house is a bit more relaxed so I can have more people over and everything is smooth,' a 15-year-old girl said.

'When he is up north for two weeks, Mum treats me better but when he comes down they both exclude me, because all they want to do is see each other,' a 14-year-old girl said.

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Impact of FIFO

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Ms Bradbury said the interviews had shown that it was not all bad news, and the children recognised that there were real benefits in Dad doing FIFO work.

'Kids see it as a real bonus or perk because it gave them quality time with their father,' she said. 'Some children spoke about seeing Dad more than when he was working locally, particularly if he had been working long hours in the construction industry.'

'When he's at home during the entire weekend, he'll be there for you. He can always help you because he's home for that solid five weeks. None of this "Sorry, I'm in a real rush, gotta go straight to work";' a 15-year-old boy said.

Ms Bradbury said one of the most striking things was the extent of the children's knowledge about family finances.

The children spoke about their father's work allowing them to live in a nice house and have nice things.

'I'd like our mortgage to be paid off so Dad doesn't have to go and Dad could just be in an ordinary job to pay off the bills — a job where he goes out and he can drop us off at school and then come back,' a 10-year-old boy said.

'One of the things I didn't expect to come through is children's recognition of community attitudes to FIFO workers and the awareness of the "cached-up bogan image";' Ms Bradbury said.

'Some of the kids want to come over to play to see our house — they think we live in a castle or something,' a 12-year-old said.

'A 13-year-old recounted how her mother told her not to tell her teachers at school about her father's FIFO work — now what does that say about community attitudes?,' Ms Bradbury said.

However, there seems to be a difference between children who have recently experienced FIFO and those who are FIFO veterans.

'FIFO veterans are more accepting because they have never known anything different,' Ms Bradbury said.

'It doesn't really affect me at all; it never really did 'cos it's a routine like a timetable so it's just a common thing,' a 14-year-old said.

Ms Bradbury said her research would also look at what impact rosters and other support structures had on children's experiences and whether this made a difference to overall family stress. If your family is interested in participating in the study, please contact Ms Bradbury:

Phone 08 9266 2561

Email children-fifo@psychology.curtin.edu.au

Support services for separated families

The Child Support Agency is part of the Australian Government Department of Human Services. The agency encourages separated parents who need assistance

with shared parenting and care arrangements for their children to seek advice and support.

There is a range of government, community and private organisations that provide support services to separated families. For example, the Family Relationship Advice Line (1800 050 321) offers family dispute

resolution and support services, and Mensline, Parents Support Line and Relationships Australia provide counselling and specialist courses.

For further information, visit www.csa.gov.au and use the Community Services Directory to find local services in your area.

Safety and health representatives section

eForm takes off

The August 2008 issue of *MineSafe* (vol. 17, no. 2) contained information on electronic submission of the safety and health representatives election notification form. The new eForm has been very popular, and now comprises over half of the notifications received.

If you who haven't seen it yet,

visit the safety and health representatives section under the mining tab at www.docep.wa.gov.au/ResourcesSafety, where you will also find a guide to using the form.

Please note that this form only applies to representatives elected under the *Mines Safety and Inspection Act 1994* — contact WorkSafe for forms relating

to elections on non-mining operations under the *Occupational Safety and Health Act 1984*.

Note also that the mining safety and health representatives do not receive an identity card. However, they do receive a pack of relevant publications and other guidance material within a couple of months of the notification form being received.

Changes at Resources Safety

Web navigation improved

Following the launch of a new look for Department of Consumer and Employment Protection (DOCEP) websites, a usability survey was recently undertaken of the Resources Safety website to assess its content and navigability.

Thank you to the industry participants in the hands-on survey who provided constructive feedback.

The recommendations resulting from the survey were accepted and recently implemented. The changes, particularly the addition of page indices and brief descriptions of page content, should make finding relevant information simpler and faster.

Kalgoorlie office has moved

After being located, in various guises, at Brookman Street for more than 30 years, the mines inspectorate in Kalgoorlie has relocated to new premises at the corner of Hunter and Broadwater Streets. Other government agencies located here include the Regional Mining Register, Geological Survey of Western Australia and Consumer Protection.

The contact details for Resources Safety remain the same:

Phone 08 9026 3200
Fax 08 9021 7670
Email kalgoorlie.inspectorate@docep.wa.gov.au
Postal address
PO Box 10078,
Kalgoorlie WA 6432

New departments in the new year

As announced by the Premier Colin Barnett on 30 October 2008, a more efficient mining approvals process and clarity for the mining industry and Western Australian businesses should result from a restructure of the Department of Industry and Resources (DOIR) and DOCEP. There will be a

specialist department for the mining and petroleum industry.

As a result of the restructure, DOIR and DOCEP will be reconstituted as the Department of Mines and Petroleum, Department of State Development and Department of Commerce.

"The State Government's restructure of DOIR and DOCEP means there will be clearer lines of responsibility for Ministers and a more logical structure which will provide clarity and confidence for mining companies and businesses," the Premier said.

"Mining companies will now be served by the Department of Mines and Petroleum; businesses will be served by the Department of Commerce; and the facilitation of major new developments will be the responsibility of the Department of State Development.

"The mining and petroleum industry is so large and is of such significance that it is in WA's best interests to have a dedicated department arrangement re-established," the Premier said.

The Department of Mines and Petroleum, for which Norman Moore will have Ministerial responsibility, will deal with mining approvals, resources and resource safety.

The Department of Commerce, for which Troy Buswell will have Ministerial responsibility, will be a clear point of reference for businesses and will look after broader issues including WorkSafe, labour relations, consumer protection and industry development. The Small Business Development Corporation will work collaboratively with this department. Science and Innovation will also be overseen by the Department of Commerce.

The Department of State Development, for which Premier Colin Barnett will have responsibility, will lead, attract and facilitate major developments. It will also be responsible for the State Agreement Acts and strategic policy co-ordination.

The changes are expected to be completed early next year. In the interim, all contact details for Resources Safety remain the same. In any case, redirects for the Resources Safety webpage at www.docep.wa.gov.au/ResourcesSafety and email addresses, including ResourcesSafety@docep.wa.gov.au, RSDComms@docep.wa.gov.au and mineshreps@docep.wa.gov.au, will be in place for at least six months after the change-over.

No longer a representative?

Safety and health representatives are elected for a term of two years to represent employees in an area, workplace or group determined during consultation before the election. This term starts ten days after the date of the election, so a safety and health representative's term expires two years and ten days after election, unless re-elected before the expiry date.

Safety and health representatives also cease to hold their positions if they:

- leave their job;
- resign from the position;
- transfer from the area they were elected to represent; or
- are disqualified by the Occupational Safety and Health Tribunal.

In any of these circumstances, either the employer or the safety and health representative should notify Resources Safety so the database can be updated.

Fax 08 9358 8188
Email mineshreps@docep.wa.gov.au

Employability **skills and** workplace culture

Labour Relations, a division of the Department of Consumer and Employment Protection, has contributed to a new information booklet produced by the Department of Education and Training (DET) to assist new migrants in their endeavours to enter the workforce. Entitled 'Employability Skills and Workplace Culture in Australia', it is a collaboration between federal and state agencies, and involved extensive community consultation.

Many people have been drawn to the State's mining industry from overseas, as well as elsewhere in Australia. Because of cultural and language differences, it is not always a straight forward process for newcomers to settle in to the new workplace.

The guide breaks employability skills into eight categories — communication, team work, problem solving, initiate and enterprise, planning and

organising, self-management, learning and technology.

It also captures some of the general features of the Australian workplace culture that are seen as most distinctive to Australia, and values most Australian workers would just assume everybody understood.

The guide acknowledges that as 80 per cent of Western Australians regard English as their main language, the ability to speak it proficiently is necessary to perform well in the workforce.

The guide offers tips applicable to the mining industry including workplace styles, slang and 'Oz speak' like 'should have' compared to 'shouda', and even humour and swearing.

It also looks at important issues such as workplace diversity and rights, and discrimination law, as well as religious practices, and the right to object to inappropriate behaviour or speech.

Management styles are discussed, as well as dress codes, socialising, protocols and body language in the context of most Western Australian workplaces.

The guide has tips on problem solving, and discusses the expectation in most Australian workplaces that workers will take responsibility for some of the everyday problems that arise in a job, using their initiative and enterprise to improve things.

Self-management, planning and organising skills are covered, including the importance of knowing and following systems and procedures.

The booklet provides a range of useful contacts for further information.

The guide is available from DET's Vocational Education and Training branch:

Phone 08 9264 5036

Email vet.infonet@det.wa.edu.au

Web vet.infonet.det.wa.edu.au or phone or email

Dangerous goods safety news

Company receives dangerous goods safety award

Grand Ballroom Hyatt was the venue, Transport Forum WA the host and the excitement was palpable in the countdown to announcement of the 2008 Transport Industry Awards. Some 300 people, representing the spectrum of professional operators and drivers in the Western Australian transport industry, attended the awards night on 18 October.

The proceedings included the inaugural Dangerous Goods Company of the Year Award, an award sponsored by Resources Safety and recognising innovation in improving dangerous goods safety in the transport field.

The judging panel comprised Mark Comber (Senior Dangerous Goods Officer, Resources Safety), Steve Rhodes (WorkSafe), John Rossiter (Main Roads WA) and Peter Cook (Sadleir's Transport).

The finalists for the award were Gas Cylinders Australia and Coogee Chemicals. Gas Cylinders Australia nominated its new LPG tanker design and delivery mode as an innovation to improve dangerous goods safety. Coogee Chemicals, represented by Rob Hennessey, submitted its driver trainer mentoring and customised truck fleet to the judging panel for consideration.

Resources Safety's Philip Hine, Director Dangerous Goods Safety, spoke about the trends emerging in transport of dangerous goods

and the importance for the industry to keep improving safety. Gas Cylinders Australia was announced as winners of the award. Brian Snashall and Linda Vasilevski accepted the award on behalf of the company.



2008 Transport Industry Award recipients, including Brian Snashall and Linda Vasilevski (second and third from right)

Dangerous goods safety news

Legislation relating to ammonium nitrate in Western Australia previously focused on safety. The Dangerous Goods (Security Risk Substances) Regulations 2007 (SRS Regulations) introduced in early 2008 focus on security around the manufacture, storage, transport and handling of ammonium nitrate classed as a security risk substance. This new approach to security risk management is based on a 2004 agreement of the Council of Australian Governments (COAG), aimed at enhancing the management of risk posed by terrorism.

Security expert Simon Hensworth (BSc Security Science, ICCP Advanced) expands below on some aspects to be considered. Simon is a Senior Security Professional at GHD Pty Ltd. He is a certified Crime Prevention Through Environmental Design (CPTED) practitioner, accredited by the International CPTED Association (ICA).

Security risk management of ammonium nitrate

SRS legislation

The SRS Regulations cover products containing 45 per cent or more ammonium nitrate, which are termed 'security risk substances' (SRSs) in Western Australia. These ammonium nitrate products are known as security sensitive ammonium nitrate (SSAN) in some other jurisdictions.

Other substances may be added to the list if the need arises.

Requirements of industry

The SRS Regulations require users of SRS to produce and submit a *security plan*, including a security risk assessment, that details identified security risks and how security management and controls will deal with risks relating to SRS.

The security plan is required to obtain a licence to manufacture, store, import or export, or transport SRS in Western Australia. The deadline for current SRS licence holders to submit their security plans to Resources Safety, if not already done, is 1 March 2009.

Potential risks to industry

Companies or individuals that fail to produce a thorough and robust security plan by the deadline face potential risks including fines, not being issued an SRS licence and under-management of the SRS security risk.

Not being issued an SRS licence

A licence required by an organisation or individual in order to continue their normal SRS business activity may not be issued by Resources Safety if the submitted security plan does not adequately assess or address the SRS security risk. Failure to obtain licences to continue normal business operations may present significant risk or disruption to the organisations or individuals.

Under-management of SRS risk

The SRS Regulations require organisations to identify and manage their own security risk. If the SRS security risk is not managed sufficiently and results in an incident, the licence holder may be held liable for not providing adequate control measures. The licence holder may be required to defend the documented process used to determine and manage the SRS security risk.

Other considerations

Familiarity with security risk

Another consideration for those undertaking a SRS security risk assessment is their familiarity with the management of security risk. While risk assessments for safety purposes have been a familiar process for those in the dangerous goods industries, security risk assessment may not be as familiar.

Security risk assessments can involve quite a different skill set. While safety risk assessment requires a sound knowledge of both the risk management process and dangerous goods, security risk assessments, depending on the risk posed, may require knowledge of criminology theory, security science and risk management. Management of security risk can take a very different approach to safety risk.

SRS risk precedents

The security risk of SRS has been realised in many recent worldwide and local incidents. These confirm the motivation of individuals and groups to gain *unauthorised access* or steal SRS.

There have been reports of large quantities of ammonium nitrate stolen overseas and politically motivated groups studying the ballistic properties of ammonium nitrate blasts, blast effects on buildings and which vehicles are most appropriate for carrying out attacks.

In Australia, there have incidents where ammonium nitrate has been stolen or otherwise gone missing. Being a common ingredient in terrorist bombs, there is always suspicion about the motive of the thieves.

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Dangerous goods safety news

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Theft is not the only method of attaining unauthorised access to SRS. As reported in the online National Post newspaper on 4 June 2006, would-be terrorists in Canada attempted to appropriate 3 tonnes of ammonium nitrate by purchasing it through the proper channels.

Potential SRS risk consequences

The Oklahoma bombing in April 1995, a so-called domestic terrorist attack that resulted in the destruction of a nine-storey building and caused 168 fatalities, provides a disturbing glimpse of the potential consequences of the theft of

SRS if successfully used for politically motivated events.

The disaster in Toulouse, France, where an ammonium nitrate explosion at a chemicals manufacturing plant in September 2001 resulted in 31 fatalities and 2,442 injuries, and cost an estimated 1.5 billion Euros in damage (as reported by the United Nations Environment Programme at www.unep.fr/scp/sp/disaster/casestudies/france), provides a glimpse of the potential consequences of sabotage of storage areas.

Summary

The new Dangerous Goods (Security Risk Substances) Regulations 2007

introduces a focus on security of ammonium nitrate in Western Australia. Most organisations involved with dangerous goods are familiar with managing safety risk, but security risk may require further adaptation.

Organisations and individuals must ensure that their security risk management preparations not only meet the requirements for attaining the SRS licences they need to continue business operations, but are also sufficient to protect themselves from liability and potentially significant consequences.

Dangerous goods safety on the road again

Series 1 of the 2008 Dangerous Goods Safety Roadshow, held in May and June, concentrated on mining aspects of the newly introduced dangerous goods safety and security legislation. It was very successful, attracting some 300 attendees. The number of queries and requests that followed indicated a need to extend the program in terms of the target audience and locations.

Series 2, held during September 2008, saw the roadshow re-visit Kalgoorlie and Perth, with additional regional shows in Albany, Bunbury and Geraldton. The aim was to assist more employers and employees in understanding the new legislation and how it may impact on them. There were about 320 attendees, with 170 in Perth alone.

Series 2 also complemented other Resources Safety activities in the metropolitan area that targeted specific groups (e.g. laboratories, particular companies), and have attracted over 400 attendees to date.

Unless specifically requested by industry, there are presently no plans for this to be an annual event. Future Resources Safety presentations will target specific stakeholder groups as the need arises.

Lightning safety

One strike and you're out

With summer here, so is Western Australia's summer cyclone, storm and lightning season.

In the May 2008 issue of *MineSafe* (vol. 17, no. 1), readers were reminded of the dangers of lightning. The article was prompted by an interstate incident where a truck at a coal mine was struck by lightning, causing three tyres to explode and a wheel base weighing 1.6 tonnes to be propelled about 100 metres.

In this more comprehensive feature, attention is focused on how companies and workers can minimise and address the risks associated with lightning strike.

Employers in the mining industry are required to minimise such risks under the *Mines Safety and Inspection Act 1994*.

In Western Australia, the large scale of the mining and resources industries, with their remote and exposed locations, heightens the risk of deaths and injuries from lightning strike.

Yes! It can happen to you

Lightning is dangerous and it can strike anywhere.

Satellite data suggest there are more than three million lightning flashes worldwide per day, including cloud-to-cloud flashes, as well as the cloud-to-ground flashes that can kill, injure and cause extensive and expensive damage.

A large number of the state's mine sites are in areas of high thunderstorm

Lightning safety

activity and the majority are open cut, where workers are exposed to the elements.

Different ways to kill

Lightning can strike in different ways.

If the strike hits you directly, statistics show there is a 70 per cent chance it will kill you.

Touching an object that has been struck (contact potential) or standing near an object that has been struck (side strike) can also kill.

If you are close to or touching an electrical appliance, a power source or communication line such as a telephone when lightning strikes, you can also be killed.

If the lightning impulse travels through or along the ground and passes through one limb and out of another (called step voltage), you can also be harmed.

Reducing the risks

Two seminars on lightning strike risk were held in Perth and Kalgoorlie during August. The keynote speaker was Richard Kithill, President of the US-based National Lightning Safety Institute and author of more than 150 articles and publications on lightning safety. He was supported by Grant Kirkby, Lightning and Surge Technologies.

Mr Kithill emphasised the need for improved standards and regulatory guidelines for lightning protection. It was pointed out that the Australian Standard AS/NZS 1768:2007 *Lightning protection* was a 188-page document — but only three pages addressed personal safety.

Speakers at the seminar emphasised that, in a thunderstorm, no place outside is safe and no place outside can be made safe. They said your best lightning detectors are your ears.

Safe locations

Lightning safety experts advocate what they call the '30-30 rule'. That is, after you see lightning, if the time to when

you hear the associated thunder is less than 30 seconds, go immediately to a safe location.

Every three seconds between a flash to thunder is equal to a distance of one kilometre. So 30 seconds means the lightning activity is about 10 km away.

If possible, seek shelter in a substantial (normal headroom) metal-clad building and, if that's not possible, a metal-framed car. Inside your shelter, keep as far away as possible from any windows and any appliances connected to outside electrical conductors.

After the storm conditions seem to have moved on, wait a further 30 minutes, after hearing the last thunder before leaving the safe area.

Some mining activities, with longer evacuation times, may require a longer lead-time than implied by the '30-30 rule'.

If you cannot get to a shelter (for some mining or surveying operatives this may not be possible) then, to minimise your chance of being struck:

- avoid high places and, if you can, find a depressed area;
- if you are with others, stand at least three metres apart; and
- keep away from large isolated trees.

It is a myth that trees provide a safe haven. In a forest, yes! But an isolated tree can act just like a lightning rod. This is the 'step voltage' scenario — the charges will flow outward along the ground and, if you are standing nearby with your feet apart, the current will flow up one leg and down the other, possibly killing you.

If the worst occurs and you are hopelessly isolated in an exposed area and your hair stands on end (an indication that the electrical fields at ground level are rising fast and lightning is about to strike), crouch down with your feet together, or sit with your feet tucked in close to your body.

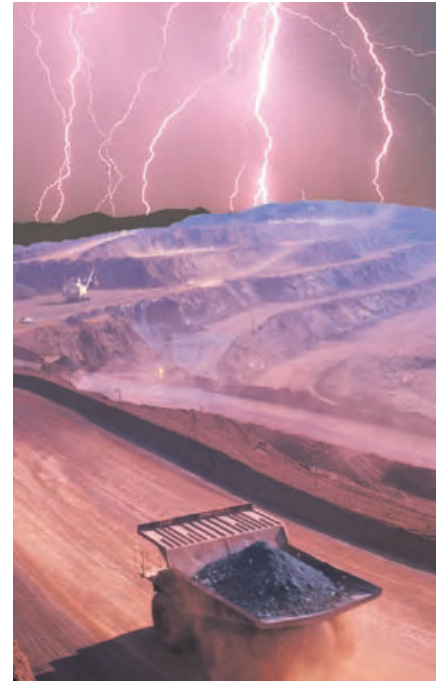


Photo courtesy Erico USA

Prevention most important

Prevention is the most important consideration and requires employers to be committed to improving safety, consultation with employees, training and education about the risks and systematic planning for action in the event of a potential lightning strike.

Every mining company should carry out a site audit of lightning risk and have a clear policy on lightning risk.

Particular structures may need direct strike protection to conduct strike energy to the ground — minimising side strike, step voltage and touch hazards.



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Lightning safety

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Earth and ground loops need to be eliminated, as do any potential differentials that may exist between different earthing systems.

Australian Standard AS/NZS 1768:2007 provides guidance on how to assess risks.

The lightning policy needs to be communicated effectively to all workers, contractors and visitors. They need to know what precautionary measures to take when thunder and lightning are present.

As well as ensuring protection for electrical and electronic systems, employers need to provide safe areas for people to shelter.

Old metal shipping containers can easily be converted to shelters at low-cost, but without electrical connections that could compromise the principle of the Faraday cage (i.e. enclosures that

block out external static electrical fields).

To reduce the risk of step voltage, metal mesh grids can also be provided.

Importantly, in these days of advanced technology, no one has to wait until they hear thunder before realising there is a risk. Early detection and warning systems are available that give advance notice of an approaching lightning threat.

There are hand-held, storm-tracking devices with a display that can give advance notice of storm and lightning activity from over 100 km away, or devices that provide warning 'beeps' that vary in tone, an illuminated display or both as the storm approaches. These devices measure the radio frequency (RF) bursts produced by active lightning, and the amplitudes of the associated waveforms, and accurately give the distance to active lightning.

Some devices can identify the direction of the lightning threat, whether it is approaching, at what speed and the estimated time of arrival.

Such devices can be life savers for those working in remote open areas away from main mining operations — people such as surveyors.

Companies have varying parameters for action and timing in relation to lightning strike, but lightning experts advocate a three-colour warning system:

- yellow alert when the lightning is 60–30 km away;
- orange at 30–16 km; and
- red at less than 16 km.

Each employer needs to assess the risks for their operation and site conditions, and determine the timing of stop work and resume work parameters.

Recent lightning incidents in WA

The following lightning-related deaths and injuries were reported for Western Australian mining operations between 2001 and 2007.

- A 39-year-old mine manager died when he was struck by lightning when inspecting a pond that collected overflow from the tailings dam. Thunder could be heard in the distance. [Jan 01]
- A Conservation and Land Management officer received an electric shock when sitting in the doorway of a building struck by lightning. [Jan 01]
- A utility hand, sheltering from the rain near the wheel of a truck was struck by lightning, thrown to the ground and suffered singeing, cuts and bruises. [Jan 01]
- A driller, leaning against a metal structure, received an electric shock when a power pole, some 80 m away, was struck by lightning. [Jan 02]
- An instrument technician was walking into a substation in wet thundery conditions when he received an electric shock from a lightning strike. [Mar 02]
- A fitter/welder was replacing a feed chute on a crusher when he received an electric shock from the hopper. [Dec 02]
- A leading hand was hospitalised for a check up and ECG examination after going outside to look at an approaching storm and being affected by step voltage travelling across the ground. Site operations had been shut down with the approach of the storm and all employees had been told to take shelter and stay inside. [Dec 03]
- A truck driver, walking to his light vehicle between two buildings, was struck by lightning, knocked to the ground and rendered unconscious for a brief time. His hard hat was knocked off and his right boot forced from his foot. [Feb 04]
- A draftsman received an electric shock when she touched the volume control on a radio cassette player in the office. There was lightning activity in the area and the radio's antenna was connected by a wire to an external antenna on the roof. [Nov 04]
- The operator of a front-end loader received medical attention when his vehicle was struck by lightning while being trammed out of the pit as a storm was passing. The loader was isolated for 24 hours in case of a tyre fire. [Dec 04]
- A mechanic at a mine was treated for burns to his face and two others were also burnt when fires were caused by lightning strikes. [Jan 07]

Lightning safety

Bolt from the blue

You don't have to see a thundercloud or hear its 'boom' to be in danger.

A 'bolt from the blue' is a cloud-to-ground lightning flash that typically comes out of the back side of the thunderstorm cloud, can travel a large distance in clear air away from the storm cloud, before angling down to strike the ground.

Such lightning strikes have been shown to travel more than 40 kilometres from the thunderstorm cloud in less than a second before striking the ground.

11 tips for lightning safety

- Carry out a lightning strike audit of buildings and equipment.
- Have a lightning risk policy and make sure everyone knows it well.
- Monitor weather conditions and local weather forecasts.
- Invest in early warning systems.
- Identify safe shelters.
- When lightning is near, suspend activities with enough time for people to take shelter.
- Wait a minimum of 30 minutes from the last observed lightning or thunder before resuming activities.
- You are safer inside an enclosed metal-bodied vehicle than outside.
- Seek low ground and avoid open ground and elevated positions such as ridges.
- Avoid touching, handling or being too near any metallic objects that may become part of the discharge path (e.g. towers, mobile plant, powerlines, pipes, rails, fences, clothes hoists).
- Last resort: If you are in an exposed area during close lightning activity and you feel your hair standing on end, hear 'crackling' noises or both, you are in lightning's electric field — place your feet together, duck your head, and crouch down low with hands on knees.

Accident and incident reporting

Under the *Mines Safety and Inspection Act 1994*, there are specific reporting requirements for:

- accidents involving injury to persons; and
- occurrences (commonly referred to as incidents).

The data obtained from mining and exploration operators are entered into Resources Safety's AXTAT and incident reports databases.

The **AXTAT database** is used to record and retrieve information about lost time and disabling injuries resulting from accidents in the workplace. It is a useful tool for identifying:

- those unsafe work practices causing frequent injury;
- the predominant types of accidents in particular occupational groups, workplaces or both;

- the frequency of injury to particular parts of the body;
- the frequency of particular types of injury sustained in accidents; and
- the activities being pursued at the time accidents occur.

The **incident reports database** is used to record and retrieve information about incidents in the workplace, and provides a useful tool for identifying trends in reported incidents and assessing risk. The database can be accessed at the Resources Safety website from the 'Accidents and incidents' section under the mining heading.

This section also has an overview of guidance material relating to reporting requirements.

There is a poster available



summarising the responsibilities for reporting an accident or incident.

The Resources Safety guideline on accident and incident reporting will help employers and employees to better understand their reporting duties. It is for use by anyone responsible for reporting accidents and incidents on mine sites and exploration leases.

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A procedure on completing AXTAT report forms is available to assist in the completion of accident report forms for mining and exploration activities in Western Australia. Similarly, a procedure has been prepared for completing an occurrence report form.

These procedures should be read in conjunction with the guideline and must be followed to ensure the uniformity and reliability of data collected for Resources Safety's databases.

Note that sites must submit a monthly status report — whether or not there has been a reportable accident during the month.



Where do I get the forms?

The reporting forms are not available at the Resources Safety website.

The mine or exploration manager

should contact the AXTAT Manager, who will determine the status of the site — that is, is it already on the Resources Safety system or is a new site identification number required?

The site will then be provided with the appropriate forms and instructions.

AXTAT Manager's contact details:

Mail Resources Safety,
Locked Bag 14,
Cloisters Square WA 6850

Phone 08 9358 8101

Fax 08 9358 8094

Email axtatmanager@docep.wa.gov.au



Significant incident report

Dangerous Goods Safety
Significant Incident Report No. 01-08
Released 28 August 2008

Transport incident involving the failure of a plastic intermediate bulk container (IBC) containing a mixture of hydrofluoric and sulphuric acids

Incident

On 13 August 2008, a plastic intermediate bulk container (IBC) containing a mixture of hydrofluoric and sulphuric acids (4% and 20%, respectively) cracked as it was being transported by truck. The container apparently failed as the truck travelled over a speed hump.

The crack in the 13-year-old IBC

allowed about 800 litres of acid to leak onto the road in a relatively localised area. However, given the presence of hydrofluoric acid, a substantial hazardous materials response was initiated by the Fire and Emergency Services Authority (FESA) and supporting agencies.

The acid spill was neutralised with slaked lime and the resultant material recovered for disposal.

No injuries were sustained as a result of the incident.

Cause

The cause of failure of the IBC (consisting of a rigid plastic inner receptacle and an outer metal mesh frame) is currently under investigation, although plastic embrittlement is suspected.

Recommendations

- Persons responsible for filling

and consigning IBCs should immediately check:

- IBCs to ensure that they are not damaged or defective in a manner that may cause the transport of dangerous goods to be unsafe;
 - the date of manufacture of IBCs and ensure that all inspections and testing required by the Australian Dangerous Goods Code have been performed; and
 - that plastics used in the construction of IBCs are adequately resistant to ageing, degradation caused by the dangerous goods contained and, where relevant, to ultraviolet radiation.
- Where dangerous goods are involved, it is recommended that plastic IBCs are not used beyond a period of five years from the date of manufacture.