

Resources

Safety

matters

VOL. 1 NO. 3 SEPTEMBER 2013

ISSN 2201-5604



Government of Western Australia
Department of Mines and Petroleum
Resources Safety

Driving home the dangerous goods safety message

SUPPLY OF TRUE AND ACCURATE INFORMATION

FAQS ABOUT DOGGING AND RIGGING

INVITATION TO INNOVATE



**CME Safety & Health
Innovation
Awards**

1 FROM THE EXECUTIVE DIRECTOR

DEPARTMENTAL NEWS

- 2 We are listening – and acting
- 4 The world comes to WA

DIVISIONAL NEWS

- 6 Full house at Exploration Roadshow
- 8 Taking on NORM
- 9 Driving home the dangerous goods safety message
- 10 Latest on SRS
- 11 Lifting the lid on crane registrations

NATIONAL NEWS

- 12 Chief Inspectors fly into WA for 55th meeting
- 13 National strategic issues group established for explosives

DIRECTOR'S CUT

- 14 Dangerous Goods Safety
- 15 Petroleum Safety
- 16 Mines Safety

CALENDAR OF EVENTS

- 17 2013 Mines Safety Roadshow
- 18 MERC 2013 – bringing emergency response to the city

LEGISLATIVE AND LEGAL NEWS

- 19 Supply of true and accurate information
- 20 Prosecution for failing to provide and maintain a safe working environment

SAFETY AND HEALTH CULTURE

- 21 A novel approach to raising OHS issues
- 22 Do your rosters minimise fatigue?

SAFETY ALERTS AND GUIDANCE

- 25 Diesel emissions survey underway for Goldfields mines
- 26 Stay alert
- 28 Seeking industry input
- 30 Multi-purpose machines used as cranes and EWP's

- 32 FAQs about dogging and rigging

- 34 Stopping to think about brakes

- 36 Ignorance of ammonium nitrate hazards leads to Texas explosion

- 38 Guarding against BEZ breaches

- 40 Responding to dangerous goods emergencies

- 41 2013 SURFACE MINE EMERGENCY RESPONSE COMPETITION

- 42 Companies keep up competition support

- 43 Preparing the competition scenarios

INDUSTRY ACTIVITIES

- 47 Know your load!
- 48 Get into mining
- 49 Invitation to innovate

CRUNCHING THE NUMBERS

- 50 How is petroleum performing?
- 51 Distribution of safety and health representatives

- 52 WA's monthly mining workforce

- 53 WA's monthly mineral exploration workforce

- 54 Resources Safety news alert subscribers

SIGNIFICANT INCIDENT REPORTS AND SAFETY BULLETINS

- 55 Petroleum Safety Significant Incident Report No. **02/2013**

- 56 Petroleum Safety Significant Incident Report No. **03/2013**

- 57 Petroleum Safety Significant Incident Report No. **04/2013**

- 58 Mines Safety Significant Incident Report No. **183**

- 60 Mines Safety Significant Incident Report No. **184**

- 62 Mines Safety Significant Incident Report No. **185**

- 65 Mines Safety Significant Incident Report No. **186**

- 66 Mines Safety Bulletin No. **105**

- 70 Mines Safety Bulletin No. **106**

- 72 RESOURCES SAFETY CONTACTS



Scan this QR code for past issues of *MineSafe* and *Resources Safety Matters*



Simon Ridge (third from right) with members of the confined space event team at the MERC 2012, held at Burswood Park

Welcome to the year's final issue of *Resources Safety Matters* — the Department of Mines and Petroleum's flagship safety publication covering mining, dangerous goods, petroleum and geothermal energy.

LEGISLATION UPDATE

Resources Safety has embarked upon an evaluation of the existing occupational health and safety legislation for the resources sector with a view to identifying possible synergies if all the sector's workplaces were brought, as far as possible, under a single piece of legislation. This would be a single resources safety act and single set of regulations for mines, petroleum operations and major hazard facility workplaces.

At present, this project is conceptual and a wide range of consultation will be undertaken before any final decision is taken. It is hoped that the final outcome will be a high degree of consistency across Western Australia with common regulations in place for workplaces regulated by Worksafe WA and the Department of Mines and Petroleum. The resources safety legislation would include specialised components for mines, petroleum operations and major hazard facilities. Resources Safety would assume responsibility for occupational health and safety regulation in all major hazard facilities.

MINE EMERGENCY RESPONSE COMES TO THE CITY

MERC 2013 will be held at Langley Park on the weekend of 21 and 22 September. I encourage everybody who has the time to take the opportunity to share this event with family and friends as it is a great day out with both a serious and fun side to be experienced. The kids will enjoy the excitement of the event as they see equipment and activities that they would not ordinarily see, and relatives will get to know that there are well-trained experts in the workplace to make sure that their loved ones are given the best care should the unthinkable happen.

THANK YOU FOR CONTRIBUTING

I would also like to acknowledge industry input into raising awareness of hazards and control measures through a variety of mechanisms such as participation in roadshow workshops, public comment on publications, and involvement in working groups. We have made a lot of progress this year in establishing a resilient safety culture in our industry. It is particularly gratifying to see the willingness of industry to take part in the development of new codes of practice and guidance material. The commitment of time and money is not insignificant and is greatly appreciated.

MAINTAIN YOUR VIGILANCE

It was with sorrow that we reported that a maintenance worker had died at a northwest mine site in August, the first workplace death at a Western Australian mine in almost two years. This was a sad day for the entire Western Australian resources industry and our thoughts are with his family, friends and colleagues. Mines safety inspectors and investigators have commenced a thorough investigation into this incident, which will establish the root cause of this tragic event.

I urge everyone involved in mining operations to be vigilant. Know the hazards in your workplace and employ the right risk management processes to control them.

Simon Ridge
Executive Director, Resources Safety

WE ARE LISTENING – AND ACTING



The Department of Mines and Petroleum believes that, under the Reform and Development at Resources Safety (RADARS) strategy, there has been significant progress since 2010 in improving the delivery of safety regulatory services for mining, petroleum and major hazard facilities (MHFs). However, the first biennial perception survey conducted in 2012 indicates that some enhancements are not yet fully recognised by all stakeholders and there is still room for improvement.

ADDING VALUE FOR MINING PROFESSIONALS

Overall, the perception of mining professionals is that the situation is improving.

Based on the survey results, one area requiring attention is the perception that the regulator can do better in encouraging the consistent application of safety standards across all operations. A number of activities have been ramped up to address this perception. The need to improve risk management has been highlighted, with joint regulator-industry G-MIRM 3 training commencing in April this year.

Stakeholders were also asked about how a regulator might best add value to their operations. Almost all mining professionals surveyed wanted the regulator to provide practical advice and examples of how things can be done better, and be available to answer queries when needed.

Raising awareness of hazards and the risk management approach has been a priority for Resources Safety for many years, but activities are reaching new heights with the greater focus on timely safety alerts, inclusion of more participative sessions in the roadshow programs, and expanding the range of codes of practice, guidelines and supporting resources and increasing industry involvement in their development.

Although inspectors cannot be on call as an industry consultancy service, the expanding suites of online one-stop shops and information sheets on frequently asked questions on specific topics should help answer the need for ready access to information.

Some 90 per cent of respondents indicated that they are keen for the inspectorate to provide positive feedback on what has

been done well. Where possible, inspectors will conduct site visits with supervisors and safety and health representatives, and acknowledge and encourage improvements in risk management during those visits.

Resources Safety Matters magazine is proving to be an ideal medium through which to share industry successes. Not only can it provide positive feedback to industry but can be used to share practical examples of how to move up the hierarchy of control.

EXPANDING CONTACTS WITH MINING SAFETY AND HEALTH REPRESENTATIVES

The survey results for safety and health representatives on mining operations suggest that there has been no significant change in their perception of the performance of mines inspectors, with a decrease in the number of outstanding ratings awarded in some areas, despite increased resources being directed at this stakeholder group.

There are currently about 2,300 representatives so it is logistically difficult for the inspectorate to interact personally with each representative and, consequently, some may feel neglected. To address this concern, the focus group dedicated to empowering safety and health representatives has implemented a range of strategies to increase contact with the inspectorate. About 35 per cent of the respondents had contact with the regulator in the previous year, and over half of those were through the safety roadshows. Forty per cent had contact with an inspector during an audit or inspection. These numbers provide an indication of how the regulator might best improve perceptions.

It is now a priority for inspectors to seek out and meet with representatives during site visits. Resources have been developed to assist with the introductory training for newly elected representatives and raise Resources Safety's profile and highlight the role of the mines inspector. Information is also available that suggests practical ways for management to support this important human resource.

The inclusion of more participative sessions in the roadshow programs has resulted in record attendances and Resources Safety is working hard to maintain this trend.



Resources Safety's Peter O'Loughlin and Quinn Kearney chat about safety and health representative matters with Rio Tinto Iron Ore's Roz King (centre) at Nammuldi mine site

SH

IMPROVING PETROLEUM STAKEHOLDER RELATIONS THROUGH A TEAM APPROACH

The survey results for petroleum operations are based on a very small sample and findings must be interpreted cautiously. However, the feedback from those who did respond still needs to be considered.

Although petroleum stakeholders awarded fewer outstanding ratings to the regulator than those for mining, it is pleasing that the perception of the petroleum safety regulator is improving as shown by an across the board increase in the average rating. This positive movement in stakeholder perceptions may be influenced by the implementation of a more client-focused approach and operational structure.

Three new operational teams were established in January 2012 and an extensive recruitment campaign was undertaken to ensure the teams were resourced with the necessary competencies and skills. Officers are required to complete an extensive training regime to ensure there is a consistent and appropriate regulatory approach.

Petroleum clients have been allocated across the teams and each client is allocated a case manager for direct dedicated contact to develop more effective long-term working relationships.

The teams have a similar mix of expertise and are capable of providing specialist safety regulatory services covering a broad spectrum of activities from exploration and drilling through to complex process facilities. Each team administers all the Western Australian petroleum legislation for safety onshore and in coastal waters allowing the workload to be effectively balanced across the teams as demand fluctuates by appropriately allocating new clients and through cross-team interaction.

Regular formal liaison meetings with clients have been introduced and these provide a forum for the exchange of ideas for improvement. This comprehensive liaison with

industry stakeholders about regulatory requirements should also help to address areas flagged by industry as requiring attention, such as the provision of guidance when an operator is developing documentation to meet legislative requirements, and increasing the willingness of authorised officers to consider industry safety innovations.

COMMUNICATION THE KEY FOR MHFS

For the most part, indications from non-MHF dangerous goods operators are that industry is satisfied with the regulatory services delivered. However, an analysis of the surveys completed by the small number of MHF managers and safety representatives who responded indicated only slight increases in some average ratings and few outstanding ratings. Although based on few responses, it appears that the MHF stakeholders have a poor perception of the regulator, and it is important that this is addressed. Establishing better lines of communication in both directions is critical.

The MHF stakeholders indicated that they see Resources Safety as being able to add most value by providing positive feedback on what has been done well, as well as practical advice and examples of how things can be done better. Unlike other stakeholder groups, they are less inclined to believe that the provision of information and guidance material will help them undertake their business safely – probably because, by their nature, MHFs require tailored safety management systems.

To ensure a continued and more substantial positive trend, the staff recruitment and training program has been tuned to recognise good communication skills as being equally important for success as technical knowledge.

WHERE TO NOW?

It is hoped that, after running for several years, these initiatives will be reflected by more positive perceptions in the 2014 survey results.

THE WORLD COMES TO WA

In partnership with the Australian Government, The University of Western Australia and The University of Queensland have established the International Mining for Development Centre (IM4DC) to help lift the quality of life in developing nations through the more sustainable use of mineral and energy resources.

In 2012, the Department of Mines and Petroleum was approached by IM4DC to deliver short courses and professional training programs, and an activity agreement has now been signed to formalise arrangements between the two organisations. The Department is in a unique position to provide assistance to developing countries because of the extensive experience of staff in relevant fields.

Many international delegations are already hosted on a regular basis. The formal partnership with IM4DC is an opportunity to share knowledge and expertise, and positively influence the way developing countries establish their own resources governance arrangements. The partnership will also enable

Departmental staff to develop new skills through participation in the delivery of IM4DC courses.

Two Ghanaian inspectors participated in the Global Mineral Industry Risk Management (G-MIRM) training course hosted by Resources Safety in Kalgoorlie recently. They said that the course opened their eyes to risk management processes that they will introduce to the Ghanaian minerals industry.

In August 2013, a large delegation of Peruvian industry and regulator representatives received a briefing on the mines safety legislation administered by Resources Safety, and how regulatory services are delivered. The importance of getting the balance right between reactive (enforcement, inspection) and proactive (raising awareness) strategies was discussed at length, as were issues associated with artisanal miners in Peru.

Interaction with international visitors helps build stronger working relationships, and emphasises the importance of Western Australian industry as a safety leader.



Peruvian delegation with Resources Safety staff after the safety legislation presentation in August 2013

INTERNATIONAL VISITORS IN 2013

Who visited the Department in 2013 to find out about safety legislation?

May

- Afghan delegation (IM4DC)

June

- Ghanaian mines inspectors (IM4DC)

July

- Papua New Guinea Mineral Resources Authority government officials (DMP-PNG MRA)

August

- Peruvian mines inspectors and industry representatives (IM4DC)
- Ghanaian mines inspectors (IM4DC)
- African mines inspectors and government officials (AusAid/AAPF Mining Governance – Africa Down Under tour Group 2)



Obiora Chikwuka Azubike (left) of the Nigerian Ministry of Mines and Steel Development thanking Resources Safety's Executive Director, Simon Ridge, for hosting the African AusAid/AAPF Mining Governance delegation in August 2013



Following their visit to Resources Safety, the African AusAid/AAPF Mining Governance delegation headed off to Kalgoorlie

STRENGTHENING TIES WITH PNG MINES INSPECTORATE

Representatives of mines safety regulators from around Australia, New Zealand and Papua New Guinea meet annually at the Conference of Chief Inspectors of Mines (CCIM). These meetings not only provide an opportunity to discuss the National Mines Safety Framework and share lessons learnt, but also strengthen inspectorate relations.

In 2012, while attending the 54th CCIM in Port Moresby, Simon Ridge, State Mining Engineer, and Mohan Singh, PNG's Chief Inspector of Mines, finalised an agreement for the Department of Mines and Petroleum to assist with the training of inspectors from the PNG Mineral Resources Authority.

Under the agreement, the Authority covers flights and accommodation while the Department provides places in some higher level training courses.

Two PNG inspectors have since attended Resources Safety's Investigative Techniques course to learn how to conduct legally rigorous investigations. They found the experience enlightening and were also able to contribute interesting examples from their home experience.



FULL HOUSE AT EXPLORATION ROADSHOW

Resources Safety's sixth annual Exploration Safety Roadshow was held in Kalgoorlie and Perth on 24 and 26 July 2013, respectively. About 200 people registered to attend and most turned up, so there were few spare seats, particularly in Perth.

Presentations covered potential changes to occupational safety and health legislation in Western Australia and what this might mean for the exploration industry, mineral exploration's safety performance in 2012-13, recent exploration incidents, and the findings from some recently completed exploration audits.

Workshops focused on hazards facing the exploration industry. Topics included the management of fibrous minerals (such as asbestos), licensing and other requirements for high risk work on exploration sites, the dangers of homemade and improvised tools, and how stored energy can be a hidden hazard.

The emphasis throughout the program was on using a risk management approach to control the working environment, and the need for competent people, fit-for-purpose equipment and safe work practices.

There was ample opportunity for feedback and questions, which often led to further discussion and clarification. The mineral exploration audit has been revised as a result of feedback provided at the roadshow sessions.

The session on stored energy involved items such as an apple, stiletto and dingo trap. It was well received as a practical demonstration of the energies existing in exploration activities.

Andrew Chaplyn, Director Mines Safety, was pleased with the variety of industry participants. Exploration companies and drilling contractors were well represented, with other attendees including safety and training professionals and several mining companies.

"Events such as the Exploration Safety Roadshow provide an opportunity for the regulator and industry to discuss a wide variety of safety issues face-to-face," Mr Chaplyn said. "It is always beneficial to communicate our safety concerns to industry in a positive environment – and vice versa."

"The roadshow format is a great forum for us to get firsthand feedback on the guidelines and information that DMP provides, as well industry's safety concerns."

"When we survey roadshow participants, one of their common requests is for the sharing of safety innovations. I am particularly pleased with the increasing emphasis on engineered solutions to safety problems, especially for exploration drill rigs. We were able to see an example of this in Perth, with J & S Drilling making one of their rigs available for participants to check out some safety features."

Some of the roadshow presentations are now available online for industry use. Visit www.dmp.wa.gov.au/ResourcesSafety to check out the toolbox presentations in the mining safety guidance section.



EXPLORATION TARGET FOR THE NEXT YEAR – AUDIT THE AUDITOR

Over the next 12 months, Resources Safety will be conducting an intensive program of audits of exploration activities, ranging from exploration headquarters to exploration camps and drill sites. The audit program will focus on the adequacy of control measures to address identified hazards (e.g. exposure to rotating or moving parts on RC drill rigs). It is expected that operators will undertake their own audits over this period, and any visits by mines inspectors will essentially be to “audit the auditor”.

The Western Australian mineral exploration audit tool used by mines inspectors is available online for industry use. It was developed using the previous exploration audit and incorporating the new code of practice for mineral exploration drilling, released by Resources Safety

in November 2012. Both the code and audit tool were developed in consultation with industry.

The audit comprises three sections that cover management, site and drilling. These can be completed individually or as two or three sections at once, depending on the company’s structure, its sites and contractors.

The aim of the audit is to confirm that exploration activities comply with the *Mines Safety and Inspection Act 1994* and *Mines Safety and Inspection Regulations 1995*. It is also a helpful check that the control measures in place are adequate to address hazards identified in the risk register.

Visit www.dmp.wa.gov.au/15565.aspx to download the mineral exploration audit and guide.

2013 EXPLORATION SAFETY ROADSHOW





Thomas Kim (left) and Dean Crouch

TYC

TAKING ON NORM

The Department of Mines and Petroleum recently recruited two new officers for the mines inspectorate who have a wealth of experience in the field of radiation safety management.

Thomas Kim, who joined Resources Safety in July 2013, has extensive experience in decommissioning and disposal of nuclear facilities and chemical weapons, firstly with submarines in the US Navy, then with Magnox reactor power stations in the United Kingdom, and finally in the Middle East.

Thomas also spent time developing and testing radiation instrumentation at the US Department of Energy.

As a civil and environmental engineer, he has worked on indigenous environmental justice cases in the USA, particularly with respect to contaminated uranium mining and processing sites.

In Australia, his work has included investigating and scoping the extent of contamination at the former Mary Kathleen uranium mine in northwest Queensland.

Dean Crouch, who commenced in early September, started as a radiation safety officer before becoming the manager of a medical laboratory that prepared radiopharmaceuticals.

Dean then moved into technical and project roles relating to laboratory and radiation measurement, before taking on the role of State Manager of Radiation Safety Services, which involved the audit and inspection of fixed density gauge nucleonic devices.

More recently, Dean has consulted on radiation protection for the uranium mining and drilling industry, before working with off-shore petroleum companies and regulators regarding the assessment of worker radiation exposure and disposal of waste contaminated with naturally occurring radioactive material (NORM).

Both Thomas and Dean have broader experience related to occupational health that will be important in their roles as mines inspectors.



Manager Dangerous Goods, Iain Dainty, and Dangerous Goods Officer, Peter Xanthis, at a dangerous goods transport roadblock

DRIVING HOME THE DANGEROUS GOODS SAFETY MESSAGE

The Department of Mines and Petroleum continues to urge dangerous goods transport companies to adhere to high safety standards following a number of serious breaches of dangerous goods transport safety regulations.

Since September 2012, there have been 111 prosecution cases authorised, most involving multiple offences, against companies and individuals transporting dangerous goods in the Wheatbelt region of Western Australia. Of these, 34 have been determined in court.

The breaches were detected during joint Resources Safety and WA Police (Northam) operations that targeted the unsafe transportation of dangerous goods in the Wheatbelt, with dangerous goods vehicles inspected at various roadblocks.

The 34 prosecution cases include charges against 11 companies, with two of the trucking companies having more than one case against them. In some instances, multiple charges against a repeat offender were combined into a single case. The penalties for the 34 prosecutions total over \$77,000, with individual penalties ranging from \$1,500 for failing to provide proper dangerous goods documentation to \$14,000 for a repeated offence involving safety equipment.

The fines included:

- \$14,000 for a repeat offence involving inadequate safety equipment
- \$9,000 total charge consisting of \$7,500 for failing to carry required transport documents, incorrect placarding, using a vehicle without an emergency procedure document

holder and not having the required safety equipment, and a further \$1,500 for a repeat offence for having incorrect transport documentation

- \$7,500 for non-compliant placarding, transport documentation, emergency information and safety equipment
- \$7,500 for failing to have the correct emergency information and safety equipment
- \$6,500 for the incorrect segregation (i.e. separation) of dangerous goods and failing to have the required safety equipment and emergency information
- \$6,000 for inadequate transport documentation and dangerous goods segregation
- \$6,000 for inadequate insurance of the vehicle.

Philip Hine, the Department's Director Dangerous Goods, said that the transport of dangerous goods was a serious matter.

"Although many drivers are doing the right thing, this enforcement should send a strong message to dangerous goods transport companies that regulations must be followed at all times," he said.

"Transport companies should understand that WA Police officers are also authorised to administer aspects of the dangerous goods transport safety legislation. In the past 12 months, over 200 officers have received additional dangerous goods training from Resources Safety.

"The dangerous goods transport regulations exist for a reason — the safe transport of dangerous goods to protect those involved as well as the public. Those who disregard the regulations not only put their own lives in danger but also those of other road users and emergency response personnel."

LATEST ON SRS

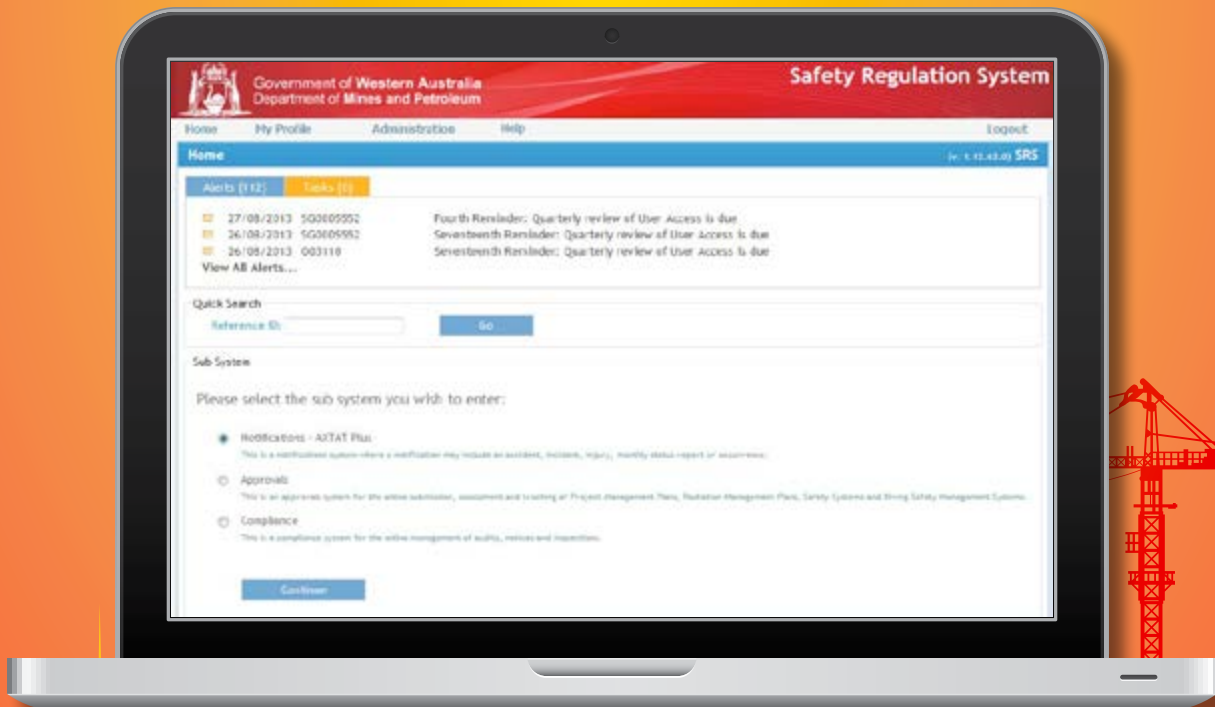
A wide range of processes is being streamlined for both industry and the Department of Mines and Petroleum through the Safety Regulation System (SRS). This system has been a crucial component of the Reform and Development at Resources Safety strategy (RADARS) as it allows the electronic lodgement of documents and data, and industry can monitor the progress of submissions.

To August 2013, over 1,700 industry users had been granted access to SRS, with several hundred mining industry representatives attending half-day information sessions. The sessions showcase the current functionality of SRS and provide a glimpse into the future, as well as practical tips on how to use the system more effectively.

For the Department, SRS ensures consistency and accountability over a range of processes, including data management. Workflow modules implemented during 2012-13 include petroleum safety case assessments, dangerous goods audits and notices, mines safety audits and notices, and the electronic issuing of reminder notices when required submissions are overdue.

A pilot module enabling the bulk upload of health and contaminant information is being trialled. Once implemented, this module will eliminate the need for double entry of data and allow Department staff to focus more on quality assurance tasks.

Future developments will continue to deliver benefits to industry by simplifying and streamlining processes and improving transparency.





Director Mines Safety, Andrew Chaplyn (left), with WorkSafe representatives

LIFTING THE LID ON CRANE REGISTRATIONS

Over the 12 months to August 2013, 104 incidents involving cranes on Western Australian mine sites, including construction activities, were reported to Resources Safety.

Based on these reports, the results from investigations, and a review of documentation submitted to the Department of Mines and Petroleum, two key areas of concern have been identified:

- safety in design for fixed cranes
- safe use of cranes (mobile and fixed).

SAFETY IN DESIGN (FIXED CRANES)

Safety in design is a priority target for the mines safety regulator in 2013-2014.

The Mines Safety and Inspection Regulations 1995 require the registration of certain types of cranes before they may be used at a mine. This involves the submission of detailed drawings, design calculations and verification by a third party that the design complies with Australian Standard AS 1418 *Cranes, hoists and winches*.

A review of this documentation as well as investigations into recent incidents has shown that some:

- designers are not fully complying with all clauses of the AS 1418
- third-party verifiers are not performing the diligent reviews required by the regulations
- crane suppliers and designers have poor or no quality management procedures.

The Department has initiated actions to work with industry to deal with these issues.

On 22 July 2013, Resources Safety ran a joint forum with WorkSafe for about 45 designers, verifiers and crane suppliers to communicate concerns identified during the Departmental review — and encourage industry to address them.

Individual meetings have also been held with mine site representatives, crane designers and suppliers to discuss problems found on specific and general applications.

Guidance for crane designers and suppliers is being updated and expanded to encompass these emerging issues and will be published shortly. *Mines Safety Bulletin No. 105* was

released in July 2013 to address the under-design of bridge and gantry crane end connections.

The Department is following a more rigorous approach with crane registration applications. While industry comes to terms with its responsibilities, the Department has contracted additional engineering assistance to manage the work generated in the short term and minimise delays.

SAFE USE OF CRANES (MOBILE AND FIXED)

Although the majority of the 104 reported incidents involve mobile cranes, there are also concerns about the safe use of fixed cranes. Two initiatives commenced recently for mobile and fixed cranes:

- sideways stability of pick-and-carry cranes — activities focus on improving industry's understanding of the risks associated with pick-and-carry cranes and how to better manage these risks. *Mines Safety Bulletin No. 102*, released in December 2012, addresses the potential for mobile (pick-and-carry) cranes to topple sideways, and another bulletin is being developed to expand on this topic.
- "Lifting the game" — project to address poor or unsafe lifting practice by raising awareness of issues such as training and assessment, and improving the competency of riggers and doggers.

WHAT DOES THE STATE MINING ENGINEER SAY ABOUT CRANES?

"Cranes are pieces of machinery that must be treated with respect and receive adequate maintenance, especially as they often carry heavy loads near workers," Simon Ridge said following the crane forum.

"It is important that cranes can be operated safely and do not fail, as the consequences can be fatal. For this reason, it is vital to address safety issues at the design stage, rather than trying to retro-fit safety features or down-rating the operating conditions when flaws are identified later.

"It is encouraging to see attendees take up this invitation, with many entering a discussion with the Inspectors during and after the presentations," he concluded.

CHIEF INSPECTORS FLY INTO WA FOR 55TH MEETING

The Conference of Chief Inspectors of Mines (CCIM) is an independently constituted body drawing its members from the various mines inspectorates of Australia, New Zealand and Papua New Guinea. The CCIM provides high-level technical advice to governments and takes the lead to improve safety and health outcomes for a sustainable Australasian mining industry.

The CCIM meets on an annual basis, with ongoing issues being dealt with out-of-session. The CCIM Chair rotates annually among member jurisdictions. The Commonwealth, through Geoscience Australia, provides administrative and secretariat support.

The CCIM's primary task is facilitating the development and implementation of a more consistent approach to mining safety and health. Members contribute to the National Mine Safety Framework (NMSF), and the CCIM has a major role in the Framework's implementation.

A typical agenda for the annual CCIM meeting comprises:

- an in-camera (i.e. private) session reviewing the contributing causes and circumstances for fatalities and major or high potential incidents over the past year, to share relevant lessons learned
- a progress report by the NMSF Secretariat on implementation of the NMSF strategies
- governance issues, such as
 - implementation of the NMSF
 - harmonisation as applied to mining safety and health legislation
 - exchanging information and sharing experience and lessons learned to promote consistent approaches across the jurisdictions.

The 55th CCIM was held in Perth on 9 to 13 September 2013. Significant outcomes will be reported in the January 2014 issue of *Resources Safety Matters*.



NATIONAL STRATEGIC ISSUES GROUP ESTABLISHED FOR EXPLOSIVES

On behalf of the Select Council on Workplace Relations, Safe Work Australia is sponsoring a process to develop model explosives safety regulations and has established a strategic issues group (SIG-Explosives) to steer this process.

The group has representation from the Commonwealth, all States and Territories, industry and unions. Its role is to:

- oversee the work on nationally consistent explosives legislation
- make recommendations to Safe Work Australia on a framework to deliver greater consistency in explosives legislation across Australia
- develop documentation to support the nationally consistent explosives framework
- assist the agency to identify and obtain input from relevant parties with an interest in explosives
- consider other explosives policy matters when they are raised by members.

The first meeting of SIG-Explosives was held on 4 July 2013 and the next is planned for mid-November this year.

The initial focus of the group is to propose and consult on a number of strategic policy areas before any specific elements of the regulations are drafted. Key topics of discussion include:

- the scope of the regulations (e.g. whether to include substances such as ammonium nitrate and other oxidising agents that are not Class 1 dangerous goods)
- licensing (e.g. what activities or persons need licensing)
- authorisations (e.g. whether explosives authorisations are necessary or could be done differently).

The project should be completed within three years.

Western Australia's government representative is Philip Hine, Resources Safety's Director Dangerous Goods. Industry is represented by Paul Harrison, Australian Chamber of Commerce and Industry, and Tracey Browne, Australian Industry Group. Anyone with an interest in this area is welcome to contact these representatives for further information.



DANGEROUS GOODS SAFETY

CONCERNED ABOUT SECURITY

The *National Code of Practice for Chemicals of Security Concern* was launched on 25 July 2013 by the Commonwealth Attorney General.

This voluntary code will help Australian businesses prevent potentially dangerous chemicals finding their way into the hands of terrorists. It contains practical information about how businesses can assess their chemical security vulnerabilities and take steps to reduce these risks.

Of the 40,000 chemicals approved for use in Australia, authorities have identified 96 chemicals that are of particular security concern. The code focuses on 11 of the highest risk chemicals that can be used to make explosives, including hydrogen peroxide, nitromethane and potassium nitrate. It applies to businesses involved in the import, manufacture, transport, storage, sale and use of these chemicals. This could be in a factory, shop or laboratory, on a truck or online.

Rather than using direct regulation, as is currently applied to explosives and ammonium nitrate, a code was chosen as the most practicable approach. It is an important component

of a wider strategy to reduce the diversion of chemicals for illegal purposes, and will be progressively supported by more detailed guidance documents and other tools tailored to specific sectors such as university laboratories, hardware stores, pharmacies and pool supply companies.

The code was a collaborative project of the Commonwealth, State and Territory governments, with key representation from the chemicals industry. Resources Safety's Director Dangerous Goods, Philip Hine, represented the Department of Mines and Petroleum on a joint panel that assisted in its development.

In addition to the code of practice, the Chemical Security Unit has produced a range of awareness-raising resources. If you would like copies of these resources, please contact Philip Hine at philip.hine@dmp.wa.gov.au

For more information about this topic, including a copy of the *National Code of Practice for Chemicals of Security Concern* and other awareness-raising resources, visit www.chemicalsecurity.gov.au

Philip Hine, Director Dangerous Goods



PETROLEUM SAFETY

REVIEW OF THE PETROLEUM AND GEOTHERMAL ENERGY SAFETY LEVY

As part of the Government's annual review of fees and charges, the petroleum safety levy rating unit cost was reviewed for the fiscal year 2013-14.

The rating unit cost may increase or decrease, depending on fluctuations in demand for service delivery, which in turn responds to changes in the sector's activities.

When considering operation requirements for 2013-14, a reduction in the rating unit cost of some 15 per cent was determined to be achievable. This is partly a result of introducing the safety levy for activities in coastal waters on 1 October 2012, but also reflects improved internal arrangements and systems implemented in the last year.

The amendment regulations to put this reduction into effect were gazetted on 28 June 2013 and came into operation on 1 July 2013. The reduced rating unit cost will be applied to all notices of assessment until further notice.

Resources Safety continues to explore ways to enhance and improve its regulatory service delivery to industry.

PETROLEUM SAFETY LEGISLATIVE AMENDMENTS

The State's petroleum safety regime exists alongside that of the Commonwealth. The State has jurisdiction to the three nautical mile limit from the baseline along its coastal

boundaries, and the Commonwealth safety regime takes over from there. The efficient regulation of the petroleum industry depends on these safety regimes being harmonised as much as possible so there is no confusion within industry regarding provisions under the two sets of legislation.

The Commonwealth government has amended its legislation over the last few years and, consequently, the State legislation requires amendment to better reflect these changes.

In addition, since the implementation of the *Petroleum Legislation Amendment and Repeal Act 2005* in May 2010, some areas of duplication and inconsistency have been identified and need to be rectified for the various State Acts that regulate safety in the petroleum industry, as well as the *Dangerous Goods Safety Act 2004* and *Occupational Safety and Health Act 1984*.

The Department of Mines and Petroleum has moved to an outcomes-based approach for safety regulation, rather than routine compliance inspections based on prescriptive regulation. To improve the legislation's effectiveness and better reflect the needs of industry and the safety regulator, the State legislation needs to be further amended to address issues such as terminology and the processes for safety documentation submission, assessment and acceptance.

Ministerial approval is being sought to attend to these proposed legislative amendments, with the intention of completing them by the end of 2013.

Alan Gooch, Director Petroleum Safety



CD

Left to right: New mines inspectors Richard Shedlock, Marcus Rader, Jeb Bromley, Greg Bailey and Craig Little with the Minister for Mines and Petroleum

MINES SAFETY

INTRODUCING FIVE NEW MINES INSPECTORS

The Department of Mines and Petroleum continued its commitment to improving resources safety regulation with the recent appointment of five new mines inspectors based in Kalgoorlie and Cannington. The newly graduated inspectors were congratulated by the Minister for Mines and Petroleum, Hon Bill Marmion, during his visit to Cannington in July.

Inspector training is intensive and lasts some six months. It is tailored to provide the required skills and knowledge to more effectively oversee safety regulation of the minerals industry and support the necessary cultural changes to improve safety outcomes for Western Australia.

Greg Bailey is an Inspector of Mines – Mechanical for the East Inspectorate, based in Kalgoorlie. Greg grew up in Kalgoorlie-Boulder. In his new role as an inspector, he wants to make a difference to mechanical safety by working with mine sites across the Goldfields.

Justine (Jeb) Bromley, who is an Inspector of Mines – Occupational Safety and Health, looks after the southern part of the East Inspectorate. Based in Kalgoorlie, her focus includes diesel emission management, fibrous minerals management, working at heights, risk-based hygiene monitoring and exploration safety. Jeb is looking to forge long-term relationships with key people on sites to support and promote regulatory compliance and a safe working environment.

Craig Little is an Inspector of Mines – Mechanical with the Midwest team, working out of the Cannington office. Industry's move into a period of tighter budgets is a challenge for everyone, and Craig is committed to working with mines to identify and resolve potential hazards before they become incidents.

Marcus Rader has a background in underground safety after about seven years in the WA Police, primarily as a major crash investigator. As an Inspector of Mines – Occupational Safety and Health for the southern part of the East Inspectorate, Marcus believes education and sharing knowledge with industry will achieve the best safety outcomes.

Richard Shedlock is based in Cannington and is an Inspector of Mines – Structural. He looks after structural engineering issues, including the review of registered classified plant submissions. Using observed conditions and reported incidents, Richard is working to “catch things before they happen”. His emphasis is on a proactive approach involving education and information.

Andrew Chaplyn, Director Mines Safety

Mines Safety Roadshow



2013 MINES SAFETY ROADSHOW

The 2013 Mines Safety Roadshow is the ninth in an annual series presented by Resources Safety.

This year's proceedings start with a look at mines safety and the changing safety culture in Western Australia, followed by a review of mining fatalities covering over a decade to 2012. Trends and clusters identified in the fatalities project will be discussed, and immediate or underlying issues examined to provide a better understanding of what can go wrong — and how it might be addressed.

A major focus is on improving our understanding of hazards, risks and controls. Questions posed at interactive sessions include:

- How does the hierarchy of control apply to our operations and can we do better?
- Why should we be concerned about design?
- What mobile plant issues need to be addressed in WA?
- Why should anyone be concerned about stored energy?

There is also an opportunity to provide feedback on resources covering working hours, fatigue and related topics.

The roadshows are an opportunity to have a dialogue with Resources Safety staff on issues of concern, hear the latest news about safety performance, and network with other industry participants.

Lunch and refreshments are provided, as well as a roadshow pack of guidance material. Roadshow attendance is free but you must register to confirm your place. Visit www.dmp.wa.gov.au/events for more details.

Visit www.starsevents.com.au/DMPRoadshow to register for the 2013 Mines Safety Roadshow.





MERC
MINING EMERGENCY RESPONSE
COMPETITION

MERC 2013 – BRINGING EMERGENCY RESPONSE TO THE CITY

Mining safety is taken seriously in Western Australia but much of the population is probably not aware of the planning and work that goes into being prepared should there be an incident.

On the weekend of 21 and 22 September, Langley Park will host emergency response teams from mining operations across the State. They will showcase their skills at the third annual Mining Emergency Response Competition (MERC).

The competition aims to improve the scope of learning through basic skills training and exposure to realistic scenarios performed under pressure. Teams comprise a combination of volunteer emergency response members and full-time emergency service officers. They are assessed on a range of emergency and rescue disciplines including first aid, hazardous chemicals (HazChem), vehicle extrication, confined space, rope rescue, fire fighting and emergency response team readiness.

Many mines have mutual aid agreements with their local shire, so some incidents that they attend are outside the mine's perimeter. They may assist the local community in emergency situations such as road accidents, medical emergencies, fires, floods and much more.

All money raised from the event will be donated to MERC's charity of choice – Miners' Promise. This is a charitable organisation established to assist families that have suffered

the loss or disability of a family member involved in the resources sector. Over \$50,000 was raised at last year's MERC, bringing the total donation to August 2013 to over \$95,000.

"We are truly grateful for the money donated from MERC. Using these funds, we are able to develop and improve support networks for families and partners who have suffered a loss or disability following a workplace fatality," said Helen Fitzroy, Miners' Promise committee member.

"This event shows possible traumatic scenarios emergency response teams might face. It can be a confronting experience but it demonstrates the importance of a safe work environment and having a highly skilled rescue team nearby when accidents do occur," added Helen.

On Friday 13 September, the Perth CBD witnessed firsthand the skills of emergency response teams as a mock scenario took place in Forrest Chase, with Nathan Morris from Nova's Breakfast Program taking up the role of "casualty".

MERC 2013 provides an opportunity for mining families and the general public to get an insight into how these teams work in real-life emergency situations. Come and see the teams demonstrate their skills. There will also be a range of free activities for the kids. Visit www.themerc.com.au for more information.



SUPPLY OF TRUE AND ACCURATE INFORMATION

Simon Ridge, State Mining Engineer, recently reminded company officers of their obligation to check the veracity of formal qualifications, documents and records, and to supply clear and accurate information to authorised officers of the Department of Mines and Petroleum.

In a recent incident, a worker was seriously injured while performing a routine task. The company investigation report provided to the Department included a copy of a personal risk assessment card that confirmed the injured person was aware of the hazards associated with the task, and the actions required to reduce exposure. However, the injured person insisted that the personal risk assessment card was a forgery, and the subsequent forensic document examination confirmed this allegation.

The purpose of an incident investigation is, first and foremost, to establish what happened so that a recurrence can be prevented. Registered Managers and Exploration Managers are responsible for ensuring that investigation reports supplied under the regulator's direction contain true and accurate information, and do not constitute obstruction under section 29 of the *Mines Safety and Inspection Act 1994*.

Earlier this year, false high risk work (HRW) licences were found at mining operations in Western Australia. This is concerning not only because it is a statutory requirement that workers performing such work should hold the correct HRW licence, but there will be uncertainty about whether they have been adequately trained and assessed to undertake tasks that are inherently high risk. The importance of verifying competency to perform the assigned work cannot be overstated in these situations.

In a further example, a man pleaded guilty in early 2011 to providing forged documents so he could work as a quarry manager. The competency of supervisors and managers is critical to the safety of employees, and the highest standards are required to ensure sites are operating as safely as possible.

Employees should be reminded that providing false and misleading information is an offence under section 101 of the *Mines Safety and Inspection Act 1994*. Individuals engaged in such fraud can irreparably damage their chance of future employment in the industry and, in a worst-case scenario, endanger lives.

PROSECUTION FOR FAILING TO PROVIDE AND MAINTAIN A SAFE WORKING ENVIRONMENT

Carpenter Mine Management was fined \$100,000 at Bunbury Magistrate's Court in August 2013 after a worker was injured during a 2008 explosion at a South West coal drying and char trial plant.

Electrical contractor Anthony Eames, who was 61 years old at the time of the incident, suffered severe burns to the upper part of his body and head at Griffin Coal's Ewington Trial Char Plant near Collie, which was being operated by Carpenter Mine Management.

The company pleaded guilty to the charge of failing to provide and maintain a safe working environment, following a thorough investigation and prosecution led by the Department of Mines and Petroleum.

The court heard that there was an explosion on 23 October 2008 when oxygen levels became too high for the plant to be operated safely without causing a fire or explosion. In addition to seriously injuring Mr Eames, the explosion damaged infrastructure and equipment within the plant.

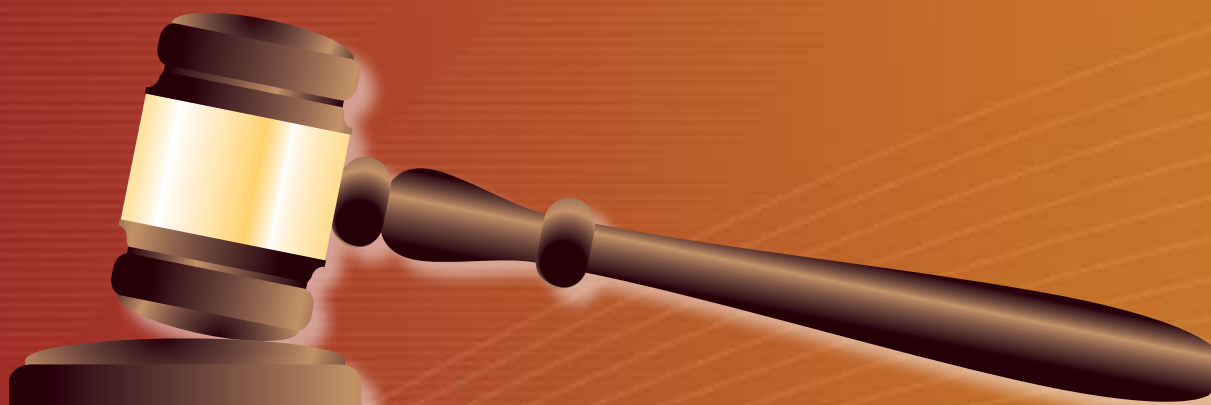
When delivering the sentence, Magistrate Elizabeth Hamilton said that she accepted Carpenter Mine Management was aware of the fire and explosion risks, and a fire or explosion was entirely foreseeable.

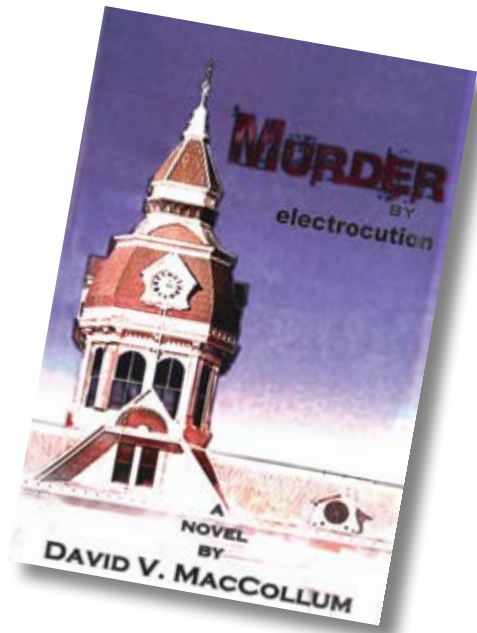
Resources Safety's Executive Director Simon Ridge said that he welcomed the sentence.

"This was a terrible incident for Mr Eames, his family and work colleagues. Companies that aren't providing safe workplaces need to be brought to account," Mr Ridge said.

"The safety and health of workers in the Western Australian resources industry is and will always remain the number one priority for the Department," Mr Ridge said.

"Most companies operate to high safety standards but we should always be alert to improvements that can make Western Australia's resources industry even safer. It is important that government and industry continue to work together to achieve safe production."





Barry Healy is Resources Safety's Senior Education and Training Officer. He regularly contributes to the magazine's "Barry's bookshelf" series. Here he reviews a novel by David V. MacCollum, published by MacCollum Books, Arizona, and available from the American Society of Safety Engineers (www.asse.org) and International System Safety Society (www.system-safety.org).

Everyone in the safety field is constantly looking for a new angle to teach safety. Retired safety engineer David MacCollum has a nifty method — write and publish a novel about a courtroom drama.

What is the scenario? A young worker dies when a crane he is working with touches an overhead power line. The story looks at the legal swings and roundabouts of the US court system, but in doing so it explains much about the safety systems operating there.

Readers can pick up all sorts of information as they are led through the story. They can learn about:

- how safety legislation evolved in the US
- the effectiveness of electrical current sensors in preventing crane booms from touching power lines
- how to build in safety at the design stage

A NOVEL APPROACH TO RAISING OHS ISSUES

Ever wondered how to get elected as a judge in a small American town? It is in this novel – and could be very handy if you are thinking of moving to Arizona.

Throw in a touch of love and a bit about the Masonic Lodge and Rosicrucians, and you have a pretty interesting tapestry.

The differences between the US and Australian legal system make a lot of the court room material exotic for Australian readers, but the scientific evidence for designing for safety is relevant.

I must say that MacCollum is a better engineer than a novelist, but that isn't the point. The point is to make the complexities of safety easy to understand.

I couldn't help thinking as I read this book that Western Australia could make fertile ground for an Australian equivalent. Surely a safety and health representative somewhere could let their imagination soar?



DO YOUR ROSTERS MINIMISE FATIGUE?

Fatigue and working hours are one of Resources Safety's top ten priorities for the mines inspectorate, and are typically at the top of the list when roadshow participants are asked what they would like to hear more about. Here Jim Huemmer of Shiftwork Solutions discusses how rosters and actual hours of work can be tailored to an organisation's needs and its workforce while minimising fatigue.

Jim has over 23 years' experience in optimising rosters, sleep and safety, and a large part of his career has been dedicated to working with shift workers and improving health, alertness and safety. His article is based on information collected from over 23,000 shift workers.

Optimal work rosters have a tough assignment. They need to satisfy three key requirements for any organisation or work area:

- business needs (e.g. workload changes, 24/7 coverage, costs)
- worker desires (e.g. pay, time off, work/life balance)
- health and safety requirements (e.g. wellbeing, alertness, workplace safety).

Although sometimes these needs compete, minimising workplace fatigue can benefit all three areas. Minimising fatigue improves business performance and worker satisfaction and reduces the risks of safety-related incidents.

While factors such as age, health, diet and lifestyle choices are important for safety, these factors are ultimately not ones that organisations and managers can control. However, rosters and actual hours of work can be tailored to an organisation's needs and its workforce.

Opportunities for sleep, the hours of work (per day and per work cycle), shift rotations, breaks between shifts and work cycles, and worker commutes need to be evaluated when trying to minimise fatigue.

Workers do not require the same amount of sleep to be fully alert the next day. Many individuals require seven to eight hours to be fully alert, while others require more hours of sleep and some can get by with less. Similarly, not everyone copes with shift work and changes to their sleep-and-wake patterns the same way.

SO HOW DO YOU KNOW IF YOUR ROSTERS ARE MINIMISING FATIGUE?

You need to obtain information from the work site. Useful measurements for evaluating fatigue include information on hours of work, leave usage or patterns, production volumes, safety statistics, quality measures and employee feedback.

If your mining workers are averaging 5.9 hours of sleep when working on night shift, would you be concerned or think that this amount could be improved? What if they are averaging 5.9 hours of sleep when working on day shift, would you think that this amount is a problem?

To better understand the relationships between fatigue, sleep and hours of work, information has been obtained directly from over 23,000 shift workers. Gathering information about sleep quantity, sleep quality, caffeine usage, health habits, worker commutes and other site-specific parameters provides a comparative tool for measuring how well workers are coping with their current arrangements.

The industry benchmarks for the sleep patterns of individuals working 12-hour shift rosters are shown in Figure 1 and show that workers typically accumulate sleep debt while working day and night shift assignments compared to their days off. Returning to the earlier questions, we can see that achieving 5.9 hours of sleep on average on night shift is quite common, but achieving 5.9 hours of sleep on average on day shift is not.

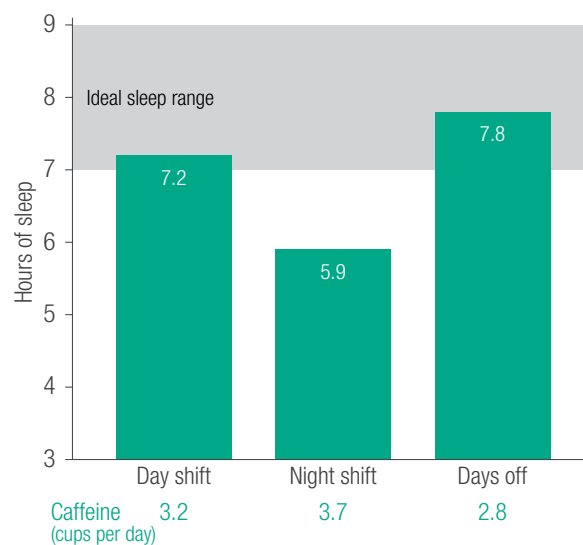


Figure 1 Graph showing average hours of sleep obtained and average daily coffee consumption for various work arrangements for 23,000 shift workers

Our experience with mine workers shows that most individuals short change themselves of sleep on days that they work and then try to catch up on their sleep on days off. It is this accumulation of sleep debt or sleep loss during work cycles that creates fatigue.

Information obtained directly from workers provides insight for evaluating how many shifts in a row is optimal for this type of work and managing fatigue. It also shows that individuals typically obtain 18 per cent less sleep when working night shift assignments compared to day shift.

Caffeine usage by mine workers can raise their alertness (in the short term) and this usage is also an indicator of fatigue. As shown in Figure 1, caffeine usage (measured as cups of coffee) is typically inversely proportional to the amount of sleep obtained by individuals (i.e. the less sleep obtained, the higher the caffeine usage).

MINING CASE STUDY

Responding to worker interest in 12-hour shifts, an Australian residential mine (Mine X) changed rosters from 8-hour to 12-hour shifts. To measure the impact of these changes on workplace fatigue, we obtained information from those working the new roster. Figure 2 shows the sleep quantity by shift and on days off.

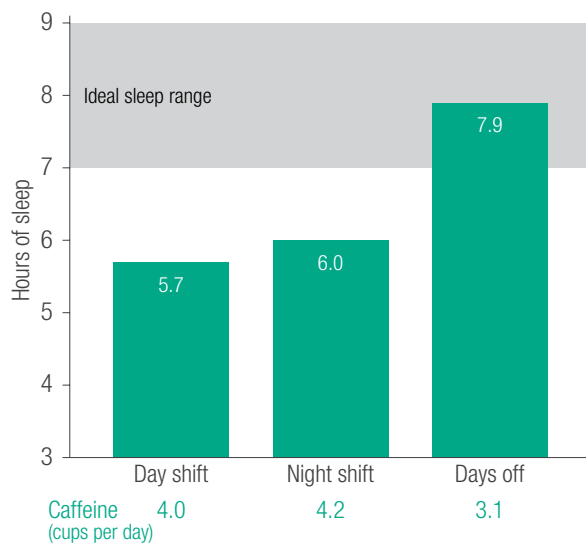


Figure 2 Graph showing average hours of sleep obtained and average daily coffee consumption for various work arrangements for workers at Mine X

Worker feedback suggests that this roster change does not minimise fatigue. Although there is a slight increase in sleep obtained during night shift assignments (0.1 hour) and on days off (0.1 hour) compared to industry norms, this benefit does not outweigh the significant loss of sleep that occurs on day shift assignments (1.5 hours). Caffeine usage on this roster also exceeds industry norms by over 16 per cent as workers try to cope with their new hours of work.

Other data acquired from Mine X supported conclusions that fatigue had actually increased as a result of these roster changes. Interestingly, these trends were not identified through the safety statistics from site (safety performance showed no change), but were primarily identified from production volume data. We found that fatigued workers at this mine site tended to pace themselves through their 12-hour shifts rather than take any additional safety risks.

In the end, it was an adjustment in shift start and finish times for the 12-hour shift roster that improved alertness for workers on site.

Key strategies for achieving acceptable levels of risk in the workplace include:

- identifying the optimal roster design (planned hours of work) for your site or work area
- worker education about sleep and fatigue
- managing actual hours of work.

WHERE ARE WE HEADING?

Mining rosters, hours of work and worker conditions have changed significantly in the last two decades. It was only twenty years ago that most rosters were residential based and not drive in, drive out (DIDO) or fly in, fly out (FIFO), and shifts were eight hours long.

Previously, mine workers typically moved to remote locations and lived there with their families and friends, contract mining was not widely used in the industry, and most mine sites had one roster for the entire site covering production, maintenance and processing.

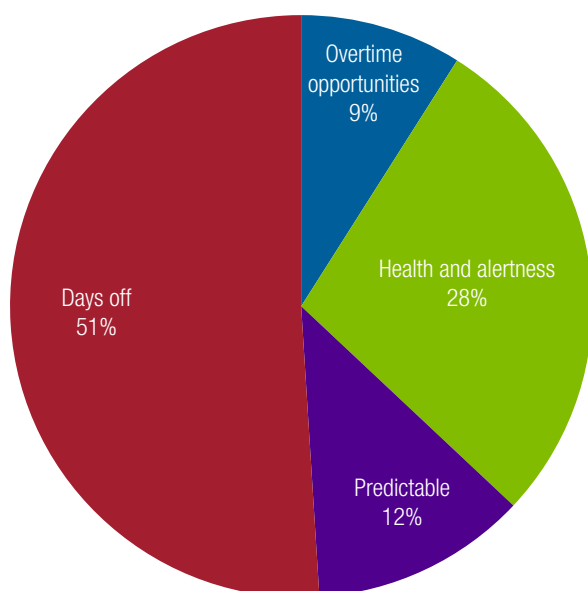
Today, when we ask workers to identify their single most desired improvement, most are interested in better health and alertness. Twenty years ago, most were interested in better days off. Figure 3 illustrates this change in worker sentiment.

The use of 12-hour shifts in mining operations that has occurred in the last twenty years appears to be driven more by worker interests (for time off) than by business interests. Yet profiles of mine workers indicate that they are less satisfied with their current rosters and hours of work than workers from other industries. Mine workers also prefer higher average hours of work per week and longer shift lengths than workers in other industries.

Each mine site is different and offers a unique set of circumstances or challenges for minimising fatigue. Areas of interest for sites trying to minimise fatigue-related risks should include a detailed understanding or analysis of:

- the lengths of work cycles and periods of time off
- hours of wakefulness between shifts and during first and last shifts in work cycles
- the use of long distance commute rosters in residential-based situations
- the amount of time off when rotating from night to day shift assignments
- hours of work for supervisors and team leaders
- managed camp environments and culture
- different travel and transport options to and from site.

Perspective in 1994



Perspective today

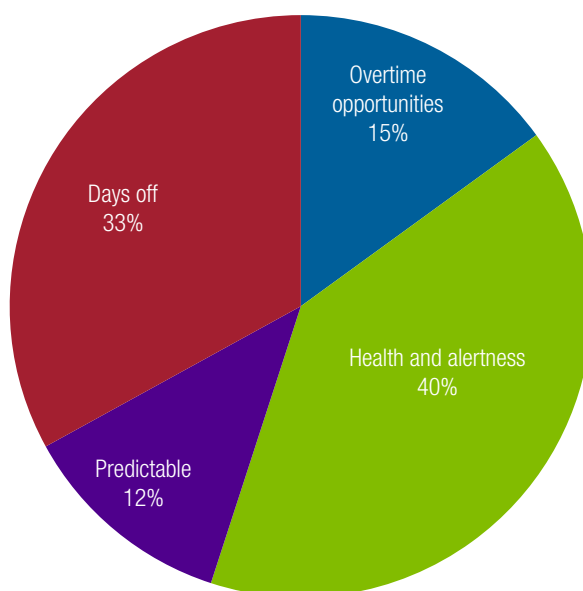


Figure 3 Pie charts showing change in worker sentiment regarding most desired improvement to their working lives

NSW'S TRAINING PACKAGE FOR FATIGUE RISK MANAGEMENT



New South Wales recently added an evaluation manual to its excellent fatigue management plan guide and suite of tools to enable industry to deliver their own fatigue management workshops. Although tailored to meet the mining and extractives industry's obligations under that State's occupational health and safety legislation, these resources may be useful for Western Australian operators.

The *Fatigue Management Evaluation Manual* provides mines with guidance on evaluating their fatigue management in-house. The goal is to establish a mine's capacity, culture and approach to managing fatigue.

The manual is structured like an audit but aims to gauge an organisation's systematic capacity and cultural readiness or maturity. It is easy to use, with a clear four-step approach, and includes all the tools necessary to complete the evaluation.

Visit www.resources.nsw.gov.au/safety/world-leading-ohs/fatigue for further information.



DIESEL EMISSIONS SURVEY UNDERWAY FOR GOLDFIELDS MINES

As the mines safety regulator, Resources Safety recently contacted underground mine managers in the Goldfields to outline the diesel emissions auditing program being undertaken over the next few months. Kalgoorlie-based occupational health and safety inspectors are surveying all underground mines serviced by the East Inspectorate. The preliminary outcomes will be presented in the next issue of *Resources Safety Matters*.

For some time, a number of mine sites have led the industry through trials of new technology in partnership with contractors, suppliers, manufacturers, developers and the regulator. The Department of Mines and Petroleum acknowledges and encourages this proactive work and is now aiming to further develop an understanding of the issues faced by industry.

The Department has acquired new instrumentation that allows for the real-time measurement of diesel particulate exposure in the workplace. This technology allows for the immediate display of exposure levels at any given location in the work environment, as opposed to the standard gravimetric process that requires laboratory analysis and therefore delivers a delayed data response.

The initial phase of the auditing program includes planned visits to all underground mines in the East Inspectorate. Diesel particulates, gases, temperature, and ventilation volumes and flow rates will be measured in different underground work areas to obtain baseline contaminant levels. Relevant mobile equipment movements, the use of exhaust treatment devices where fitted, and the general condition of ventilation equipment will also be recorded.

The mines inspectors will also be seeking information on how operations are managing diesel emission exposure. In particular, copies of the following documents will be requested:

- diesel emissions management plans
- diesel equipment lists inclusive of any exhaust treatment devices
- most recent primary and secondary ventilation survey data
- most recent emissions testing results (NO, NO₂, CO, diesel particulates)
- fuel delivery dockets stating type of diesel fuel and supplier.

The aim is to establish reference points for the industry as a whole against which mines can assess their own workforce exposure and effectiveness of controls. It is important that daily activities continue as usual during the surveys so that the information collected is an accurate reflection of the normal working environment.

STAY ALERT

The safety alerts described below are reproduced in full at the back of this magazine, and can be downloaded from the publications section at www.dmp.wa.gov.au/ResourcesSafety

SAFETY IN DESIGN

In the process of registering cranes on mine sites, Resources Safety established that many designs, particularly for bridge and gantry cranes, do not account for all load effects on the end connection of the bridge beams. These concerns led to the issuing of *Mines Safety Bulletin No. 105*, which discusses how to address this issue. Since the safety alert was released, the same issue has been identified in other cranes during checks initiated by crane owners as a result of this bulletin.

LOSS OF VEHICLE CONTROL

Mines Safety Bulletin No. 106 was issued following a number of serious accidents associated with the loss of control of service vehicles on declines in underground mines. The vehicles involved are usually surface vehicles designed to operate on sealed public roads — their service and auxiliary brakes and gear ratios may not be capable of controlling their descent into a mine.

Recommendations in the bulletin include adopting a more rigorous approach when assessing the safe operating conditions for service vehicles working on declines, and a more robust selection, service and maintenance regime.

The article *Stopping to think about brakes* in this magazine elaborates on this topic.

LOSS OF BRAKES

While the incident reported in *Mines Safety Significant Incident Report No. 183* also involves the loss of brakes, the report goes further to illustrate the importance of clear and accurate information being relayed from the support staff at the original equipment manufacturer (OEM) to mine service staff, and the importance of service staff adhering to OEM service recommendations.

FAILURE OF SHIPLOADER RAIL CLAMPS

In the incident reported in *Mines Safety Significant Incident Report No. 184*, employers and staff failed to address the underlying issue of misaligned rails.

A 4.5 kg rail clamp fell about 10 metres to the ground from a shiploader rail system after the nut-and-bolt assembly had loosened, allowing the clamp to vibrate free. Fortunately, no-one was injured. Rail clamps had fallen previously and many of the clamps had been modified from the OEM design. The actions taken had addressed the consequences of the rail misalignment, rather than fixing the misalignment itself.

ENTANGLEMENT DURING CLEANING

Mines Safety Significant Incident Report No. 185 highlights the consequences of failing to isolate a moving conveyor while performing a routine cleaning task. Unfortunately, the worker received third-degree burns and a fractured hand. The hazards of rotating and moving parts are well recognised and must be addressed.

HAZARDS OF MOVING PLANT HIGHLIGHTED FOLLOWING FATAL ACCIDENT

Mines Safety Significant Incident Report No. 186 was issued in August following a fatal accident at an iron ore processing facility. Although the investigation is at an early stage and probable causes are yet to be determined, the report was issued to remind managers and supervisors of the importance of conducting detailed risk assessments for work associated with or near moving plant.

DIVER'S UMBILICAL FOULED

A failure to identify adequate safe diver positions during the use of specialised purpose-built equipment led to the umbilical entanglement incident reported in *Petroleum Safety Significant Incident Report No. 02/2013*. Fortunately, the diver followed procedure and bailed out, leaving the water with the assistance of another diver.

TRAVELLING BLOCK STRIKES DERRICK CROWN

In the drilling incident reported in *Petroleum Safety Significant Incident Report No. 03/2013*, a failure to adequately risk assess the change in operating environment led to the travelling block of a work-over rig striking the crown of a derrick. The derrickman, who was in the rod basket, had braced himself as the travelling block passed the basket before colliding with the crown, and no-one was injured.



SHARING THE LESSONS TO STOP DÉJA VU

The US Mine Safety and Health Administration has reported on two fatalities in 2013 where the recommendations may be familiar to those who read Resources Safety's safety alerts.

THE DANGERS OF WORKING UNDER DOZERS

www.msha.gov/FATALS/2013/ftl13c01.pdf

On 26 January 2013, a worker in the United States was killed while repairing the metal liner on a bulldozer push blade. A hydraulic jack was being used to separate the wear plate and blade while the victim used an air chisel between the wear plate and the blade. When the jack slipped, he was hit by the metal liner and received blunt force trauma injuries.

Resources Safety's *Mines Safety Bulletin No. 93*, issued on 19 November 2010, describes a series of accidents involving maintenance on the bottom guards of heavy earth-moving equipment.

Some themes running through both reports include the need for:

- a comprehensive job hazard analysis
- documented safe systems of work that address all identified hazards
- formal controls for all assessed risks
- up-to-date OEM information to be available for maintenance work
- a working environment with sufficient space to complete the task safely
- workers carrying out the tasks to be appropriately trained and assessed as competent.

THE DANGERS OF ENTANGLEMENT WITH MOVING PARTS

www.msha.gov/fatals/2013/fab13m06.pdf

On 27 April 2013, a mechanic in the United States was killed when he became entangled in the conveyor from which he was attempting to clear a blockage.

Resources Safety's *Mines Safety Significant Incident Report No. 185* also describes a conveyor accident. A worker involved in a routine cleaning task became entangled in a moving conveyor. Fortunately, he was not fatally injured but he was seriously hurt.

The recommendations in both reports highlight the need to:

- establish policies for an approved safe system of work following a risk assessment of tasks on conveyor systems
- implement competency-based training for work on conveyors
- isolate the conveyor so that manual cleaning or maintenance tasks can be performed without risk of entanglement
- provide alternate means to carry out tasks on conveyors to protect workers performing the tasks.

SEEKING INDUSTRY INPUT

Industry consultation is critical when preparing and revising Resources Safety's guidance material. The Department of Mines and Petroleum does not claim to be the font of all knowledge and, by seeking industry input, it can tap into the wealth of experience and expertise found in the Western Australian resources sector.

Thank you to those who have participated (or will be participating) in the consultation process for the following resource materials. Your input is important and appreciated.

INDUSTRY INPUT RECEIVED

Tailings storage facilities

Following its August 2013 meeting, the Mining Industry Advisory Committee (MIAC) endorsed the code of practice for tailings storage facilities in Western Australia. The code promotes a proactive approach to monitoring and surveillance during construction, operation, and prior to decommissioning so it is possible to predict a facility's long-term performance and potential environmental impact after a tenement is relinquished. The Minister's approval is now being sought to approve its release.

The code was reviewed and revised by a departmental working group with geotechnical and environmental representation. Industry feedback was considered following two periods of public comment. When published jointly by Resources Safety and the Department's Environment Division, it will be complemented by a suite of guides to assist with the submission of:

- mining proposals
- design reports
- project management plans prior to construction
- construction reports
- periodic environmental reports
- periodic audit reports
- decommissioning plans
- radiation management plans

as required by the tenement conditions applied under the *Mining Act 1978*, and requirements of the *Mines Safety and Inspection Act 1994*.

Refuge chambers

The second edition of the guideline on refuge chambers in metalliferous mines was issued in 2008 by the then-Department of Consumer and Employment Protection. A working group comprising members of Resources Safety's Underground and Occupational Safety and Health Focus Groups reviewed and revised the guideline as part of the rebranding exercise for Resources Safety publications issued under the auspices of former agencies.

With a change in application and title to include underground diamond mines in Western Australia (e.g. Argyle), the scope still excludes underground coal mines, which have very specific safety requirements.

Nearly 20 submissions were received following the two-month public comment period. Industry's input, together with unsolicited feedback received over the previous 18 months, was considered and addressed by the working group.

The refuge chamber guideline was endorsed by MIAC following its August 2013 meeting. The hard copy version of the guideline will be released at the same time as the complementary guideline on preventing fires in underground mines.

Prevention of fires in underground mines

The public comment period for the guideline on preventing fires in underground mines closed in late August. Industry feedback has been addressed by a departmental working group, with the final draft reviewed by an industry liaison group working with Resources Safety's Underground Focus Group.

The final document will be submitted to MIAC for endorsement at its October 2013 meeting. Once endorsed, it will be released as a package with the refuge chambers guideline.

Outdoor fireworks

The public comment period for the code of practice on the safe use of outdoor fireworks has now closed. The feedback has been considered by a group of Dangerous Goods Officers and the code will be published online once it has received Ministerial approval.

INDUSTRY INPUT TO BE SOUGHT

Autonomous mobile equipment

Semi-autonomous, autonomous and robotic technology is already being used in the Western Australian mining industry, but autonomous safety guidance is limited. The Resources Safety Automation Focus Group was established to determine how to effectively regulate this rapidly developing technology. To help develop a framework for safe mobile autonomous equipment systems, a working party is being convened with industry and supplier representation.

It is proposed to use the framework as the basis for a new code of practice that will describe the desirable safety outcomes for autonomous mobile equipment. Stakeholder consultation will be important throughout the drafting process.

Working at height in underground mines

A third guideline for underground mines is nearing completion and will soon be available online for public comment. It focuses on the hazard of working at height in the underground environment.

If interested in reviewing this document, find out when it is available by signing up for Resources Safety's weekly news alerts (use the QR link).



REPORTING ACRONYMS FOR MINES SAFETY – FROM OCCURRENCE TO NIRF IN SRS

The 2013 Safety Regulation System (SRS) update that went live on 18 July 2013 formalised the use of the term "notifiable incidents" in the reporting module for mines. Rather than submitting occurrence reporting forms, companies now provide notifiable incident report forms (NIRFs).

The accident and incident reporting guideline has been amended to reflect this administrative change, with references to occurrences in the legislation being equivalent to a notifiable incident in SRS.

MULTI-PURPOSE MACHINES USED AS CRANES AND EWPS

Compared with purpose-designed cranes and elevating work platforms (EWPs), telescopic handlers, integrated tool (IT) carriers and other multi-purpose mobile plant that can be configured as mobile cranes or mobile EWPs present unique issues for duty holders and regulators. This article reminds duty holders of their obligations under the Mines Safety and Inspection Regulations 1995 and outlines the Department of Mines and Petroleum's policy and approach to these machines.

MULTIPURPOSE MACHINE CONFIGURED AS A CRANE

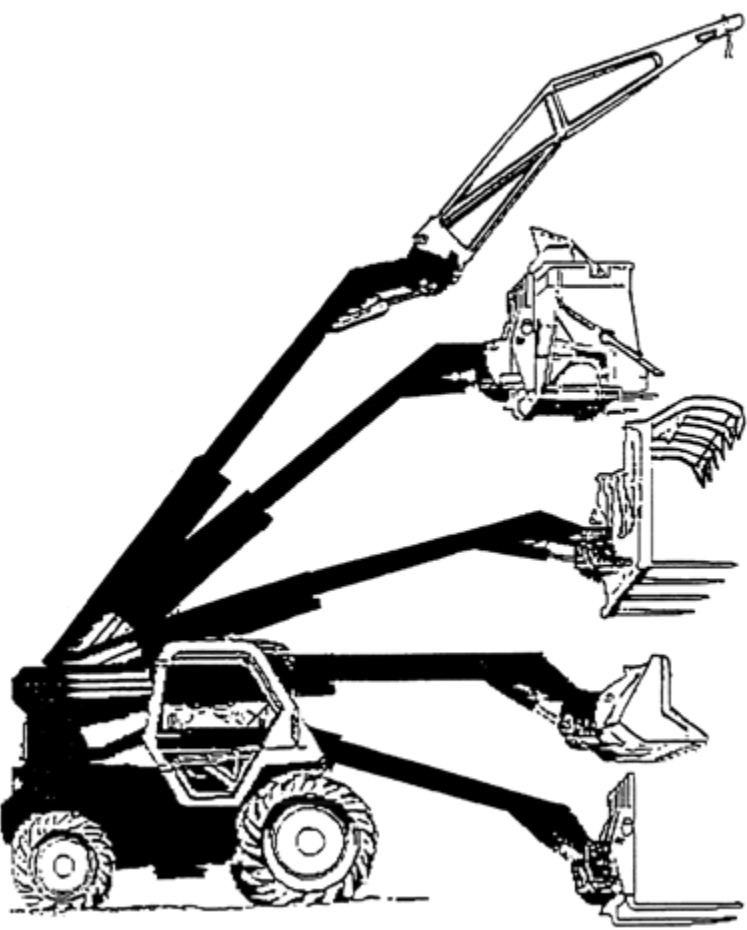
Any multi-purpose machine, when configured with a jib or boom attachment capable of lifting a suspended load, is functionally equivalent to a purpose-designed mobile pick-and-carry type crane and is consistent with the definition of a mobile crane in regulation 6.1. This means:

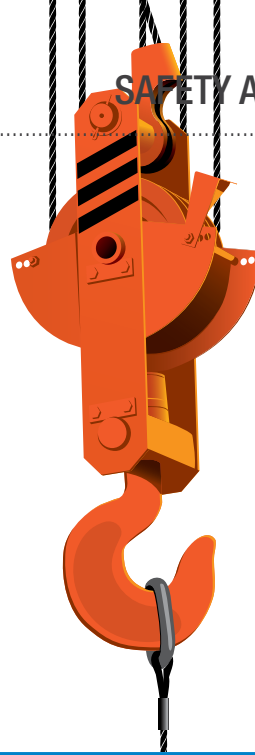
- it falls under the definition of classified plant in the regulations, and Part 6 Division 3 applies
- compliance with AS 1418.5 is enforceable under regulation 6.33 and, under regulation 6.2(2)(a), AS 2550.5 regarding the safe use of mobile cranes may also apply
- regulation 6.37 regarding high risk work (HRW) licences is enforceable, so if the rated lifting capacity is greater than 3 tonnes, a CN class HRW licence is required under the National Licensing Standard
- under regulations 6.34(1) and 6.34(5)(m), plant registration is required if the rated lifting capacity is greater than 10 tonnes

Note: It is not just the jib attachment that is registered — the complete assembled machine (when configured as a crane) should comply with AS 1418.5 and be registered as a complete functional unit. There have been issues with the stability of such machines when tramming around with suspended loads.

- even when the capacity is 10 tonnes or less, the machine should still comply with AS 1418.5 as unregistered classified plant, as covered in regulations 6.33 and 6.2(2)(a).

The same reasoning can be extended to any forklift truck temporarily configured with a jib attachment for lifting suspended loads.





MULTIPURPOSE MACHINE CONFIGURED AS A MOBILE EWP

When configured with a work platform or work basket intended for raising, lowering and positioning personnel to and from workplaces located above the support surface, any multi-purpose machine is functionally equivalent to an EWP and consistent with the EWP definition in regulation 6.1. This means:

- it falls under the definition of classified plant in the regulations, and Part 6 Division 3 applies
- compliance with AS 1418.10 is enforceable under regulation 6.33, and AS 2550.10 regarding the safe use of mobile EWPs may also apply under regulation 6.2(2)(a)
- regulation 6.37 regarding HRW licences is enforceable, and if the boom length is 11 metres or more then a WP class HRW licence is required
- under regulations 6.34(5)(f) and (i), plant registration is required for any scissor lift designed to lift people more than 2.4 metres or for any boom-type EWP. In this instance, the complete assembled machine, configured as an EWP, should comply with AS 1418.10 and be registered as a complete functional unit.

Note: It should not just be the work platform that is registered — the complete assembled machine (when configured as an EWP) should comply with AS 1418.10 and be registered as a complete functional unit.

The same reasoning applies to underground charging trucks with hydraulic booms (e.g. Hiab arms) fitted with work platforms.

AUSTRALIAN STANDARDS

- AS 1418.5 *Cranes, hoists and winches – Mobile cranes*
- AS 1418.10 *Cranes, hoists and winches – Mobile elevating work platforms*
- AS 2550.5 *Cranes, hoists and winches – Safe use – Mobile cranes*
- AS 2550.10 *Cranes, hoists and winches – Safe use – Mobile elevating work platforms*

DEPARTMENT'S POSITION

Machines should be compliant and suitable for their function. This means:

- only using a multi-purpose machine, such as a telescopic handler or IT tool carriers, as a crane or EWP in place of other more appropriate, purpose-designed mobile plant if it fully complies with classified plant requirements for design, manufacture, inspection, testing, safe use and operator competencies
- applying plant registration requirements to multi-purpose machines configured as cranes or EWPs, unless they are already design registered by another authority
- applying the National Licencing Standard for HRW licences to multi-purpose machines configured as cranes (>3 tonne) or EWP (with boom length \geq 11 metres)
- duty holders using multi-purpose machines with quick-hitch attachments, particularly for attaching work platforms or man baskets, have implemented appropriate maintenance and inspection regimes, and other controls as necessary to ensure the security and integrity of such attachment points.

FAQS ABOUT DOGGING AND RIGGING

1. What legislation is applicable to dogging and rigging work at a mine site?

Regulation 6.37 of the Mines Safety and Inspection Regulations 1995 refers to regulation 6.1 and schedule 6.3 of the Occupational Safety and Health Regulations 1996, which define dogging and rigging, and the licences applicable to this type of high risk work.

Further guidance is available from the Safe Work Australia publication National Standard for Licensing Persons Performing High Risk Work, available at www.safeworkaustralia.gov.au

2. What is dogging?

Dogging is defined as:

- applying slinging techniques for the purposes of lifting a load, including selecting the method of lifting (by consideration of the nature of the load, its mass and its centre of gravity) and inspecting lifting gear (for suitability and condition), or
- directing the operator of a crane or hoist in the movement of a load when the load is out of the view of the operator.

3. Who needs a dogger's licence?

A high risk work licence for dogging (class DG) is required by anyone who applies slinging techniques to a load, which includes:

- calculating the safe angle for sling or chain
- selecting the type of sling or chain to be used
- selecting the correct method to secure the load
- selecting the safe method to lift or turn the load
- checking the conditions of lifting gear for wear and tear.

A DG licence is also required by anyone directing the operator of a crane or hoist in the movement of a load when the load is out of the view of the operator.

4. What is rigging?

Rigging is defined as:

- moving, placing or securing a load (such as plant, equipment or members of a building or structure) using mechanical load shifting equipment but does not include operation of the mechanical load shifting equipment, or
- erecting or dismantling cranes or hoists.

5. Who needs a rigger's licence?

A high risk work licence for rigging (class RB, RI and RA) is required by anyone undertaking work such as:

- erecting structural steel and precast, tilt up concrete panels
- moving loads with chain blocks (e.g. come-alongs, tirlfors)
- installing static lines and safety nets
- erecting cranes, conveyors, dredges or excavators
- demolishing a building or structure
- operating a multi-crane lift
- erecting suspended or fabricated hung scaffolding.

There are three classes of rigging licences, each with its own description of the type of rigging work that can be performed. The classes are Basic (RB), Intermediate (RI) and Advanced (RA).

6. Do I need to be assessed as competent even if I already have a high risk work licence?

Yes. Regulation 4.13 of the Mines Safety and Inspection Regulations 1995 has specific requirements dealing with competency assessment at a mine site.

The competency assessment, or verification of competency (VOC), must be completed for each type of plant and equipment operated at the mine site – not only where high risk work licences are required. Employees and contractors must be assessed as competent before operating equipment or plant at a mining operation, including construction projects, even if they have a high risk work licence.

The assessment level is not prescribed by regulation but both theoretical and practical assessment components should be included. A simple checklist confirming an operator has a licence is not sufficient.

7. Do I need to carry my high risk work licence with me at all times?

Yes. You should have your high risk work licence on you for the type of high risk work you are undertaking. If your licence is not on hand, it must be produced at the first safe opportunity.

Note: Verification of competency (VOC) protocols (e.g. registers, photocopies) are company specific and are not evidence of a licence being held in that class of high risk work.

8. Under what circumstances may a dogger or rigger ride on a load?

None. No-one should ever ride a load.

9. Where can I find out more about obtaining a high risk work licence?

Visit WorkSafe's website at www.worksafe.wa.gov.au for more information on the licensing process.

WHAT IS HIGH RISK WORK?

High risk work is exactly that — high risk. This is why adequate controls must be implemented at sites where these activities are being undertaken.

Such controls include:

- ensuring the worker holds the correct high risk work licence
- verifying workers competency, including identification, assessment and controlling site hazards
- verifying workers competency for each attachment to be used on multipurpose machines and high risk work licence where required
- a system allowing supervisors to be aware of their worker's competencies before assigning tasks
- ensuring the worker who is conducting high risk work on site is given adequate information, instruction, training and supervision.



STOPPING TO THINK ABOUT BRAKES

Mines Safety Bulletin No. 106 discussed the issue of service vehicles losing control on declines in underground mines. Here the mechanics of braking are explored in more detail, with some important messages for those operators driving such vehicles in underground settings.

During a descent, trucks designed for public roads or highways should be using as much engine braking as possible, rather than service brakes. Ideally, engine braking that is augmented with exhaust brake features (automatic exhaust throttling) or compression braking (known as “Jake” braking, or Jacobs braking) should be used. Jacobs braking is present on 95 per cent of large highway trucks made in North America, but only 20 per cent of Japanese trucks.

A vehicle with Jacobs braking uses the engine as a full-blown compressor and can absorb much more power on a decline than a vehicle fitted with a simple exhaust brake system, as found on most trucks.

The descent speed under engine braking can be more rapid in complete safety because the engine has no thermal limitations on absorbing the braking power required at the selected vehicle descent speed. Service brakes have thermal limitations that only become apparent quite suddenly. However, there is always a limit to the peak braking torque that can be absorbed by the engine, so there is no choice but to select the correct low gear during a descent.

FIRST KEY MESSAGE

A driver without a safe work procedure for descending an incline must avoid engine over-speeding by selecting the appropriate low gear (based on the truck’s verified characteristics) early in the descent.

The correct gear has to be selected before descending — unless the driver has the skill to change to a lower gear as the engine speed increases beyond two-thirds of the maximum allowable engine revolutions per minute (RPM) as the descent proceeds. Once the implied engine RPM goes above 100 per cent for a given gear selection, the driver is likely to be in a precarious situation.



Using engine braking is quite distinct from using the service brakes, which quickly reach their thermal limit and “fade”, allowing the vehicle speed to increase quite quickly while the operator attempts to select a lower gear. However, engine braking cannot provide the peak braking power of the service brakes in an emergency, which is why the operator must preserve them by keeping them cool during a descent through not using them excessively, or at all.

Note: Specifying a common descent speed for all vehicles is unlikely to be a blanket solution.

SECOND KEY MESSAGE

Service brakes should be reserved for stopping and emergencies during a descent, and not used for slowing the descent appreciably on a continuous basis.

Most mine operators know the importance of engine braking on declines and provide training accordingly, but some do not always manage to promote full awareness. This can lead to breaches of safety systems, such as drivers missing a lower gear during a change or selecting the wrong gear in the first place, or driving vehicles for which they have not been assessed as competent.

A driver may rapidly lose the ability to select a gear due to a transmission lock-out as the vehicle or engine speed increases down a decline. Where the mismatch of engine and vehicle speeds becomes excessive, the transmission cannot or will not engage. Lock-outs can arise from:

- excessive resistance to meshing unsynchronised gears in older “crash” gearboxes
- significant resistance to the gear selection arising from the baulk rings in a modern synchromesh gearbox
- an engine over-speed lock-out in some automatic electronically-controlled transmissions
- an engine over-speed protection system where the valves of the engine may be damaged due to valve float if the implied engine RPM is too high for a given gear selection.

Incorrect gear selection can lead to the service brakes being “ridden” on declines because engine braking is no longer available. The vehicle can quickly reach a speed from which recovery is not possible due to brake fade at the implied continuous braking power required at that higher speed.

THIRD KEY MESSAGE

Training and competency is the key in this scenario, backed up by regular awareness updates.

Transmission retarders can change the equation, but operators need to be certain that a given retarder design can maintain continuous braking at the required average dissipation levels implied. Some are not capable in this respect.

FOURTH KEY MESSAGE

Vehicle selection at mine sites is significant in all of the above scenarios.

Service brakes should not be relied upon for continuous dissipation of the braking energy and power during a descent down a given decline with a given vehicle mass. This is particularly important for road and highway vehicles, which typically have dry brakes susceptible to brake fade.

In summary, the only safe way to go down a decline in a highway vehicle is in a low enough gear whereby the engine braking mechanisms absorb most of the braking power implied by going down a decline in a loaded vehicle. If the operator makes a mistake by not selecting the correct gear in the first place at the head of a decline, it can be all over very quickly. Sometimes the service brakes take the abuse, however, and nobody is any the wiser during “near misses”. Operators may not realise how close they were to a runaway condition.

FIFTH KEY MESSAGE

Rote rules of thumb may not be a suitable basis for determining gear selection.

The adage of being able to safely use the same gear during a descent as for the ascent may only hold true for a vehicle fitted with a Jacobs brake or a capable retarder system.

However, practical trials should be used at a mine site to verify the required gear before commissioning the vehicle and training the operators.



IGNORANCE OF AMMONIUM NITRATE HAZARDS LEADS TO TEXAS EXPLOSION

At 7:50 pm on 17 April 2013, 30 tonnes of ammonium nitrate exploded at the West Fertilizer Company storage in Texas. The explosion killed 12 fire fighters and two members of the public residing in a nearby apartment block, and injured more than 200 people.

If this explosion had occurred earlier in the day, many more people might have been killed or injured — two large schools were damaged beyond repair, but fortunately were unoccupied at the time.

The US Chemical Safety Board has now released its preliminary investigation findings.

The major cause of almost all uncontrolled ammonium nitrate explosions is an external fire. Ammonium nitrate does not burn and is a very stable substance unless heated above its melting point, when it can mix with fuels and contaminants and become explosion-sensitive, especially under confinement.

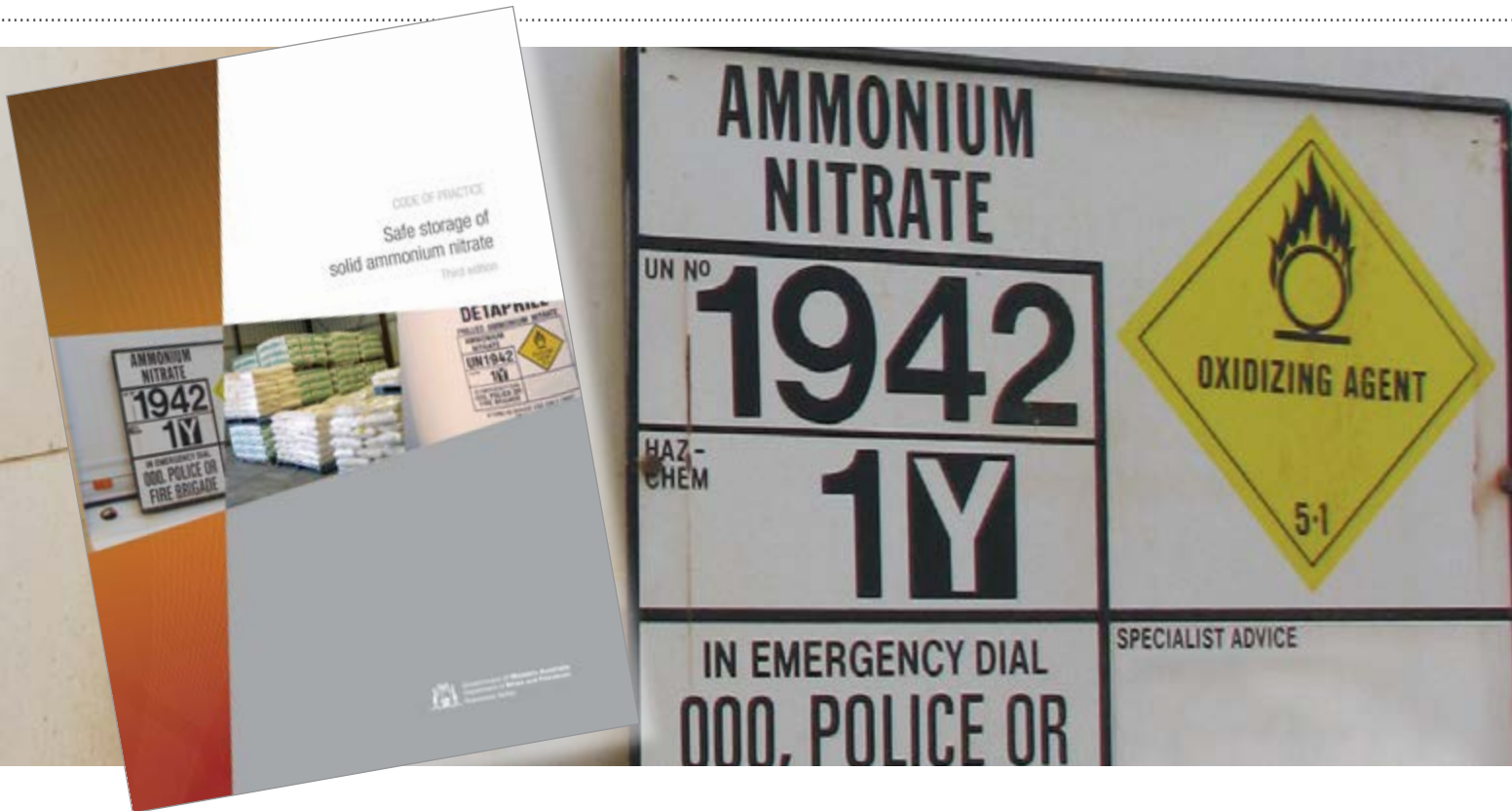
The West Fertilizer explosion, like similar fertiliser explosions elsewhere in the world, was caused by an external fire in the immediate vicinity of the ammonium nitrate. Fuel for the fire was provided by the wooden bins storing the ammonium

nitrate, the wooden building housing the stores, and significant amounts of combustible seeds. There were no fire detection or automatic sprinkler systems. In essence, basic precautions for the safe storage of ammonium nitrate were not in place.

The fire, of undetermined origin, broke out at the facility when the storage building was unoccupied and quickly developed into an intense fire — the time between the alarm being raised and the explosion was only 20 minutes, just enough time for the emergency responders to extend hoses and get into position to fight the fire. The volunteer fire fighters were not aware of the explosion hazard from the ammonium nitrate — they would not have died if appropriate storage precautions had been taken, or if they had received appropriate training.

The main thrust of safety precautions for ammonium nitrate is to make every effort to store it away from combustible materials, which can catch fire and be the source of heat for decomposition of the ammonium nitrate. It sounds simple, but this single-most effective precaution was not taken at the West Fertilizer storage.

Another lesson from this and past calamities is that, as far as possible, adequate safety distances need to be established between ammonium nitrate storage and community buildings.



The operators of the West Fertilizer facility cannot be totally blamed for the lack of adequate safety distance precautions. Ignorance of the explosion hazard of ammonium nitrate is common to not only the numerous similar fertiliser distribution centres in the US, but also the various government agencies that are supposed to control hazardous chemicals in that country. None of their regulations address the explosion hazard of fertiliser ammonium nitrate.

The high level of ignorance is compounded by the poor technical guidance on ammonium nitrate contained in the leading US Standard *NFPA 400 – The Hazardous Material Code*. The standard allows storage in wooden buildings and wooden bins, and is generally out-of-date, confusing and contradictory.

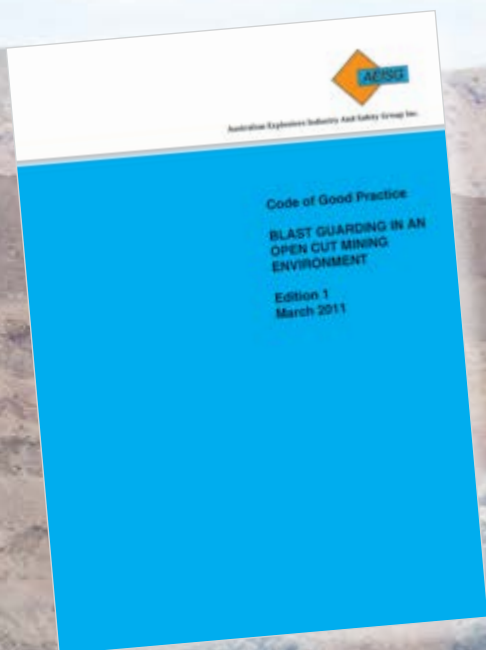
The Department of Mines and Petroleum recently published the third edition of its code of practice for the safe storage of solid ammonium nitrate, which is Australia's most comprehensive and up-to-date safety code on ammonium nitrate storage. It applies innovative thinking in the setting of adequate safety distances to community buildings. The code's approach has recently been communicated to the national Hazmat conference held in May, other dangerous goods regulators, and publicised in the international SAFEX explosives industry newsletter and the August issue of *Chemistry in Australia*.

The code gives complete safety management guidance and contains rigorous requirements for:

- separating ammonium nitrate from combustible and incompatible materials
- separating large quantities of ammonium nitrate into smaller stacks
- constructing buildings of non-combustible materials.

There has never been an accidental storage explosion in Australia despite the steeply increasing use of ammonium nitrate in the mining industry, which now consumes more than 2 million tonnes a year. There are many reasons for this fortunate record, including industry adherence to safety standards, greater awareness of the hazards of ammonium nitrate, and more rigorous regulatory oversight.

Western Australia is the only Australian jurisdiction with such a comprehensive licensing system to help manage ammonium nitrate storage, and this is supported by an active enforcement strategy under the *Dangerous Goods Safety Act 2004* and supporting regulations. However, there is no place for complacency. Regulatory systems set the scene for safe ammonium nitrate storage, but only industry can ensure the desired safety outcomes through the rigorous application of appropriate controls.



GUARDING AGAINST BEZ BREACHES

More than a dozen breaches of blast exclusion zones are reported to the Department of Mines and Petroleum every year — typically they are the more serious ones where people's safety was put at risk.

WHY IS A CODE NECESSARY?

Unfortunately, these statistics are not unique to Western Australia, and this problem is common in other States. In response to the high number of incidents, the Australian Explosives Industries Safety Group (AEISG) has produced a code of good practice on blast guarding in open-cut mining. The first edition, released in March 2011, is available from both the Department and AEISG's websites.

The code was gazetted by the Department on 14 September 2012 as an approved code of practice following approval by the Minister under section 20 of the *Dangerous Goods Safety Act 2004*. Under section 8 of the Act, there is a duty of care on licence holders to minimise risk to people, property and the environment. Compliance with this code demonstrates that reasonable precautions are being taken to minimise risk.

Where an investigation or audit indicates the code has not been complied with or there are deviations from its requirements, the onus is on the licence holder to demonstrate that the changes have not led to a decrease in the level of safety and security as defined in the code.

It may appear a relatively simple task to clear all personnel (and possibly equipment) from within the blast exclusion zone, fire the shot, let the flyrock settle, check whether it is safe for people to re-enter the blast area and, if so, give the "all clear" for workers to recommence their operations. However, the number of incidents suggests that this is not the case, possibly due to:

- poor or non-existent communication between the parties involved
- lack of robust systems such as a standard operating procedure (SOP) to secure the blast exclusion zone
- lack of or inadequate training.

PEOPLE INVOLVED IN THE PROCESS

The roles of those involved in the blasting process are described in the code, including:

- the shotfirer who initiates the shot
- the blast controller who organises the logistics and provides support so the shotfirer can concentrate on firing the shot
- the blast guard who is the sentry and provides a barrier to prevent people from entering the blast exclusion zone.

The code also contains information on the roles of the blast designers, drill and blast supervisors, and mine managers.

BLAST GUARDING PROCESS

The code describes in detail the mechanics of establishing and securing a blast exclusion zone so it is safe to execute the blast, including:

- the equipment required to properly perform the operation
- the preparation of a scaled plan of the blast exclusion zone based on a risk assessment showing where the shotfirer will fire the shot, and where the blast guards will take up position, taking into account wind directions and fume production
- requirements to notify people on the mine, at least one day before the intended blast
- conducting a pre-blast meeting for the shotfirer, blast controller and blast guards at the blast site an hour before the blast to ensure that everyone is aware of their duties and the equipment is operational
- the blast guards clearing the blast exclusion zone and setting up position at their nominated locations
- the blast controller conducting a final sweep of the area before handing control of the blast back to the shotfirer
- the calls the shotfirer must make, including making contact with the blast guards
- how to deal with breaches of the blast exclusion zone and other emergencies
- firing the shot, waiting until it is safe to enter and checking that it is safe before the “all clear” is given

- the protocol for dismissing the blast guards when it is safe to re-enter the site
- how to deal with misfires when the “all clear” cannot be given.

Although Australian Standard *AS 2187.2 Explosives – Storage and use – Use of explosives* allows the shotfirer to enter the blast exclusion zone if it is safe to do so, the code indicates that the shotfirer must fire the shot from outside the blast exclusion zone. The Department recommends that the shotfirer remains outside the zone but within the area under the blast guards’ control. Too many incidents have occurred where the zone has been cleared and the shotfirer re-enters it to have direct line-of-sight to the blast.

SOPS AND TRAINING

The Department recommends that companies have an SOP based on the code for blasting. Where companies already have an SOP for blasting, it is recommended that it be reviewed against the code, a gap analysis conducted and the SOP updated to reflect the requirements of the code.

Another reason for having a comprehensive SOP for blast guarding is for training purposes. The code requires people involved in these roles to be properly trained and the SOP can form the basis of this training. Once trained, a register should be kept of all blast controllers and blast guards, including when refresher training is required. Training should also cover:

- the use of site radios, including channels to be used and call signs
- how to deal with breaches of the blast exclusion zone, emphasising that guards cannot leave their posts under any circumstances
- how to deal with emergencies
- ensuring the personnel can operate all equipment involved in the process, including light vehicles.

WHAT NEXT?

Effective communication between all those involved in the intended blast as well as the general mine workforce is the key to ensuring lives are not put at risk. The AEISG code provides practical, easy-to-follow information on effective blast guarding so blasts can be fired safely.

Anyone involved in blasting is encouraged to download a free copy and become familiar with its content and how to use it.

RESPONDING TO DANGEROUS GOODS EMERGENCIES

Regulation 185 of the Dangerous Goods Safety (Road and Rail Transport of Non-explosives) Regulations 2007 makes it an offence for a person who is a prime contractor or rail operator to transport a placard load of dangerous goods without being an approved responder, or having a contract with a person who is an approved responder.

DO YOU TRANSPORT PLACARD LOADS OF DANGEROUS GOODS BY ROAD OR RAIL?

If you do, you must either:

- be an approved emergency responder
- or
- have a contract with an approved emergency responder

to control the clean-up that may result from an incident involving the transport of your dangerous goods.

Prime contractors or rail operators must be aware that their contract with an approved responder is not compliant if the responder is not approved for the type of dangerous goods being transported.

Currently, there are 29 approved emergency responders for Western Australia. Twenty of them are listed on Resources Safety's website and may be available on a contract basis.

ARE YOU AN APPROVED EMERGENCY RESPONDER TO DANGEROUS GOODS INCIDENTS?

In 2013-14, Dangerous Goods Officers will be auditing all emergency responders to confirm that they have the appropriate resources and equipment to respond to an emergency.

Responders need to consider the type of incident they are likely to encounter and whether their response will be adequate.

WHAT IS ADG7?

It is the 7th edition of the Australian Dangerous Goods Code, which sets out the requirements for transporting dangerous goods by road or rail.

The audit will cover:

- instruction and training
 - staff interviews
 - confirmation of qualifications and training certificates
- standard operating procedures
 - turnout
 - site, layout, setup, liaison
 - recovery, transfer, transport (must comply with ADG7)
 - decontamination
 - handover
 - reporting, records, investigation
- scope of response
- response localities
- response capabilities
- access to specialist advice
- response equipment
 - containment and clean-up of spills relevant to class or division category of dangerous goods
 - access to response equipment
 - suitability of response equipment
 - maintenance records for all equipment
 - personal protective equipment (PPE)
- dangerous goods licensing – vehicle, driver
 - confirmation of dangerous goods security card
- emergency response records
 - safe work procedures
 - transport documents and emergency procedure guide
- method of packing and disposal of hazardous material.

WANT MORE INFORMATION? EMAIL US

Placard loads packages@dmp.wa.gov.au

Approved emergency responders er@dmp.wa.gov.au

Dangerous goods transport dgsb@dmp.wa.gov.au

HOW CAN I GET A COPY?

It can be downloaded from the safety and compliance section of the National Transport Commission's website at www.ntc.gov.au



Simulated road accident to test emergency response to a dangerous goods incident

HONOUR BOARD

| | |
|--------------------------------------|-------------------------------------------|
| 1st best team | Barrick Kanowna |
| 2nd best team | KCGM |
| 3rd best team | Norton Gold Fields |
| Confined space rescue | Barrick Kanowna |
| Fire fighting | Norton Gold Fields |
| First aid | Barrick Kanowna |
| Hazardous chemicals (HazChem) | Norton Gold Fields |
| Incident management | Justin De Meillon (Barrick Kanowna) |
| Rope Rescue | Barrick Kanowna |
| Team skills | KCGM |
| Vehicle extrication | KCGM |
| Theory | Yilgarn One |
| Theory individual | Steve D'Souza (Norton Gold Fields) |
| Team safety | KCGM |
| Overall BA skills | Barrick Kanowna |
| Overall first aid | Barrick Kanowna |
| Best scenario | Fire fighting |
| Best captain | Donny Rice (Barrick Kanowna) |
| Best new captain | Tim Boake (Focus Minerals) |
| Best new team | BHP Billiton Nickel West Combined Team |

COMPETING TEAMS

Agnew Gold [Gold Fields Australia]
 Alacer Gold Combined Team [Alacer Gold]
 Barrick Kanowna [Barrick Gold of Australia]
 BHP Billiton Nickel West Combined Team [BHP Billiton]
 Focus Minerals [Focus Minerals]
 KCGM [Kalgoorlie Consolidated Gold Mine]
 Paddington Gold [Norton Gold Fields]
 Saracen Gold [Saracen Mineral Holdings Limited]
 St Barbara [St Barbara Limited]
 Yilgarn One [Barrick Gold of Australia]
 Yilgarn Two [Barrick Gold of Australia]



Barrick Kanowna

CD

COMPANIES KEEP UP COMPETITION SUPPORT

The Chamber of Mineral and Energy's 2013 Eastern Region Surface Mine Emergency Response Competition was held in Kalgoorlie over the first weekend of May. Eleven teams representing resources companies from across the Goldfields competed in eight challenging events, as well as a theory assessment, putting their emergency response skills to the test in simulated high-pressure emergency situations.

While the number of teams competing was down this year, Chairman of the Chamber's Eastern Regional Council Mine Rescue Committee, Tim Campbell, praised the companies that sent teams, saying "Credit must go to the companies that supported their teams and sent them along in these tough economic times."

The emergency response team from Barrick Kanowna was the overall winner for 2013, coming in ahead of KCGM and Norton Gold Fields.

Barrick Kanowna was very successful, taking out first place in three events (confined space rescue, first aid and rope rescue), and winning the overall breathing apparatus skills and overall first aid categories. Justin De Meillon won the incident management scenario, and team captain Donny Rice won best captain, backing up his best captain title from the 2012 MERC held at Burswood Park.

Events were held over a number of locations this year. Opening the competition on Friday 3 May, the theory event took place at the WA School of Mines auditorium. Hannan's North Tourist Mine, managed by KCGM, was both the competition headquarters and location for the first aid, rope rescue and incident management scenarios. The vehicle extrication scenario was located at the bottom of KCGM's Mount Percy Pit, with the team skills scenario held next to Mount Percy pit and confined space rescue on public land along Goldfields Highway. The Janet Ivy open pit and Navajo Chief pit, both managed by Norton Gold Fields, were the venues for the fire fighting and HazChem scenarios.

"Although presented as a competition, the weekend is actually a very important training event, with most teams training together for a week or two leading up to the weekend," Tim Campbell explained.

"The intensive time together over this period, culminating in very realistic scenarios over the weekend, consolidates the various training disciplines that the teams are exposed to throughout the year. Each member goes away from the weekend a far more proficient rescuer."

The Mine Rescue Committee is now looking ahead to the underground competition, to be held in the first weekend of November at the Mt Charlotte mine. The venue host is KCGM, a long-time supporter of the emergency response competitions.



Event teams

TYC

PREPARING THE COMPETITION SCENARIOS

It is not just the competing emergency response teams that put substantial time and energy into preparing for emergency response competitions. Behind the scenes, many dedicated people organise and prepare each scenario to ensure they are realistic, challenging and represent the types of real-life emergencies that teams could face on a mine site.

What were some of the challenges at the 2013 Surface Mine Emergency Response Competition? In the vehicle extrication scenario, teams had to rescue two passengers from a half-submerged and precariously balanced car that had reversed over a wall and into a mine sump. Rescuing a teenager who had lost consciousness in a culvert under Goldfields Highway was the scenario for the confined space rescue – with the teenager stuck behind a dead goat, making the task somewhat more interesting for the rescuers.

Sue Steele, event manager for the first aid event, said that the scenarios are usually based on real-life incidents, either actual accidents or near misses. They are written by the event managers and, once accepted by the Mine Rescue Committee, the event team has to build the props and send out requests for volunteer staff and any equipment required. The realism of the scenarios comes from the many years of experience that most of the event managers have in rescue.

In the first aid scenario this year, teams were required to respond to a bus accident after the driver suffered a heart attack and lost control of the vehicle, steering it into a rock. As many mine sites bus their staff to and from site, either from town or a mining camp, this is a scenario that could easily occur in real life.

In this scenario, the bus was not equipped with seatbelts and the passengers had been thrown around the bus on collision. The competing teams had to battle with a lack of space, hysterical passengers, passengers wandering away from the scene, and casualties resisting treatment, as well as identify and treat numerous types and degrees of injury. Clever make-up and strong acting performances from the numerous volunteers in this event made it a very realistic scenario that really tested the competing teams.

“The teams did well; some of the more experienced teams were quick to get the patients out of the bus and to a manageable treating area,” said Sue.

“Overall all teams treated most of the patients and I’m glad to report all would have survived had it been real life.”

Best scenario this year was won by Team Mongrel, the event team behind the fire-fighting scenario. In this scenario, teams had to extinguish a fire that had broken out in an old hydrocarbon treatment area on a mine site that was in care and maintenance.

The fire was started by a spark from a faulty pump motor that hadn’t been isolated. The spark ignited hydrocarbons in the sump, causing a large pool fire and exploding six 44-gallon drums. Two contractors working in the area were injured. One casualty suffered a fractured femur while the other had severe head injuries. Teams had to safely retrieve and treat both casualties, cool down the drums and extinguish the fire. The added catch was that there was no water on site so the teams had to wait about 15 minutes for a fire tender to arrive.

2013 SURFACE MINE EMERGENCY RESPONSE COMPETITION

CONFINED SPACE RESCUE



FIRE FIGHTING



FIRST AID



HAZCHEM



INCIDENT MANAGEMENT SCENARIO



Yilgarn One

TYC

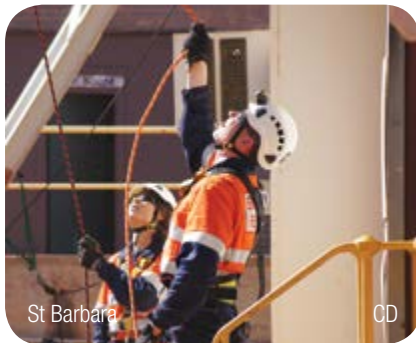


KCGM

TYC



ROPE RESCUE



St Barbara

CD



TEAM SKILLS



Barrick Karowina

CD



Paddington Gold

TYC



THEORY



2013 SURFACE MINE EMERGENCY RESPONSE COMPETITION

VEHICLE EXTRICATION



ADJUDICATORS AND VOLUNTEERS



TEAM PHOTOS





KNOW YOUR LOAD!

The Department of Mines and Petroleum joined Main Roads WA's Heavy Vehicle Operation to set up a stand at the 2013 Perth Truck and Trailer Show. The dangerous goods safety regulator's theme was "Know your load!", with a focus on the transport of packaged dangerous goods.

More than 10,000 people passed through the show, which was held over three days from 26 to 28 July. Visitors included those working in the transport industry, prospective buyers of trucks and trailers, and interested members of the general public.

Main Roads WA and the Department work closely to conduct dangerous goods transport checks across the State, and many visitors to the stand had questions for both agencies.

The show provided a unique opportunity for Dangerous Goods Officers to speak face-to-face with people working in the transport industry about the safe transport of dangerous goods, as well as address some community concerns. Topics of discussion included the segregation of loads, correct transport documentation, and how to obtain a dangerous goods licence.

A variety of Resources Safety's guidance material was available, as well as some exercises to test people's knowledge of dangerous goods placarding.

ARE THINGS CHANGING?



Henry Zuidersma, Principal Dangerous Goods Officer, looks back on two decades of dangerous goods transport.

I recently participated in an Austrans roadblock at Northam and was surprised that, after twenty years, there are still some drivers who are not aware of what they are transporting.

Drivers must know their loads. Not only is it a legislative requirement to know what is being transported, but it is important for the driver's own safety and that of the community. If involved in an incident, they need to know what they are transporting so that they and the emergency services can respond appropriately. Decisions made without knowing the full story can put people's lives at risk. Not to mention that hefty fines may apply.

On a more positive note, it was encouraging to see some drivers wanting more information on how to transport dangerous goods safely. The Department has a really informative online one-stop shop where information on the transport of packaged dangerous goods can be easily accessed.

Email packages@dmp.wa.gov.au to get an automatic reply with a list of links to information about:

- determining placard loads, licensed loads and exempt quantities for dangerous goods transport
- dangerous goods transport documents
- safety equipment and personal protective equipment for road vehicles
- road transport in receptacles.

GET INTO MINING

The Department of Mines and Petroleum was pleased to support GIM2013, an interactive mining careers exposition for high school students held over two days in June 2013. As the home of “The CUT Mine”, a simulated underground mine, the Central Institute of Technology in Northbridge was eminently suited to host 300 students from Perth, Bunbury and Geraldton.

Get into Mining (GIM) is an annual event started in 2012 by Meryl Jones, a mother of two and a geologist at St Barbara Ltd, who wanted to provide an opportunity for high school students to realise what jobs are available in mining and help them make the right choices for their future education.

GIM2013 drew on volunteer mining industry professionals and trades people to showcase what they do for a living, with practical hands-on activities as well as opportunities to ask questions. Topics covered included geology, underground mining, metallurgy, environmental science, safety and health, various trades and even how to write a job application.

Two of Western Australia’s most inspirational mining leaders, Julie Shuttleworth (metallurgist and Mine General Manager, Barrick) and Alastair Croll (Chief Operating Officer, St Barbara Ltd) started the days with talks highlighting the positive aspects of a career in mining.

In addition, there were information booths for a variety of tertiary institutions and organisations, including Resources Safety.





INVITATION TO INNOVATE

The Safety and Health Innovation Awards presented by the Chamber of Minerals and Energy recognise individuals, teams and companies who have developed original solutions to specific safety and health problems in the workplace.

Award nomination categories include People, Systems and Engineering. Submissions must address the judging criteria to be considered.

Entry is open to all Western Australian minerals and resource companies and sites, including contractors associated with the resources sector. There is no limit on the number of entries that may be submitted.

Finalists in the Safety and Health Innovation Awards will be invited to attend the Chamber's annual Safety and Health Conference, where they will exhibit their innovation for conference delegates and present an overview of the initiative's outcomes. This sharing of information is essential to support continuous improvement in safety and health performance across the minerals sector.

An Industry Choice Award is also presented at the conference based on delegate votes.

Entries for the 2014 awards can be submitted via an online portal. For further information, visit www.cmewa.com/Portfolios/Occupational_Safety_and_Health or contact Richard Wilson (08 9220 8520; r.wilson@cmewa.com) or Mandy Stewart (08 9220 8512; m.stewart@cmewa.com).



HOW IS PETROLEUM PERFORMING?

The overall safety performance across the petroleum industry in 2011-12 continued a positive trend, with lost time injury (LTI), alternative duties injury (ADI) and medical treatment injury (MTI) frequency rates reduced, on average, by around 35 per cent when compared to the previous year's rates.

In general, the petroleum industry in Western Australia has an enviable track record compared to other industries that may be high risk, such as mining and construction. Although the size and nature of the workplaces differ, petroleum's good record may also be largely attributable to the implementation and maintenance of effective safety management regimes to satisfy the duty of care requirements.

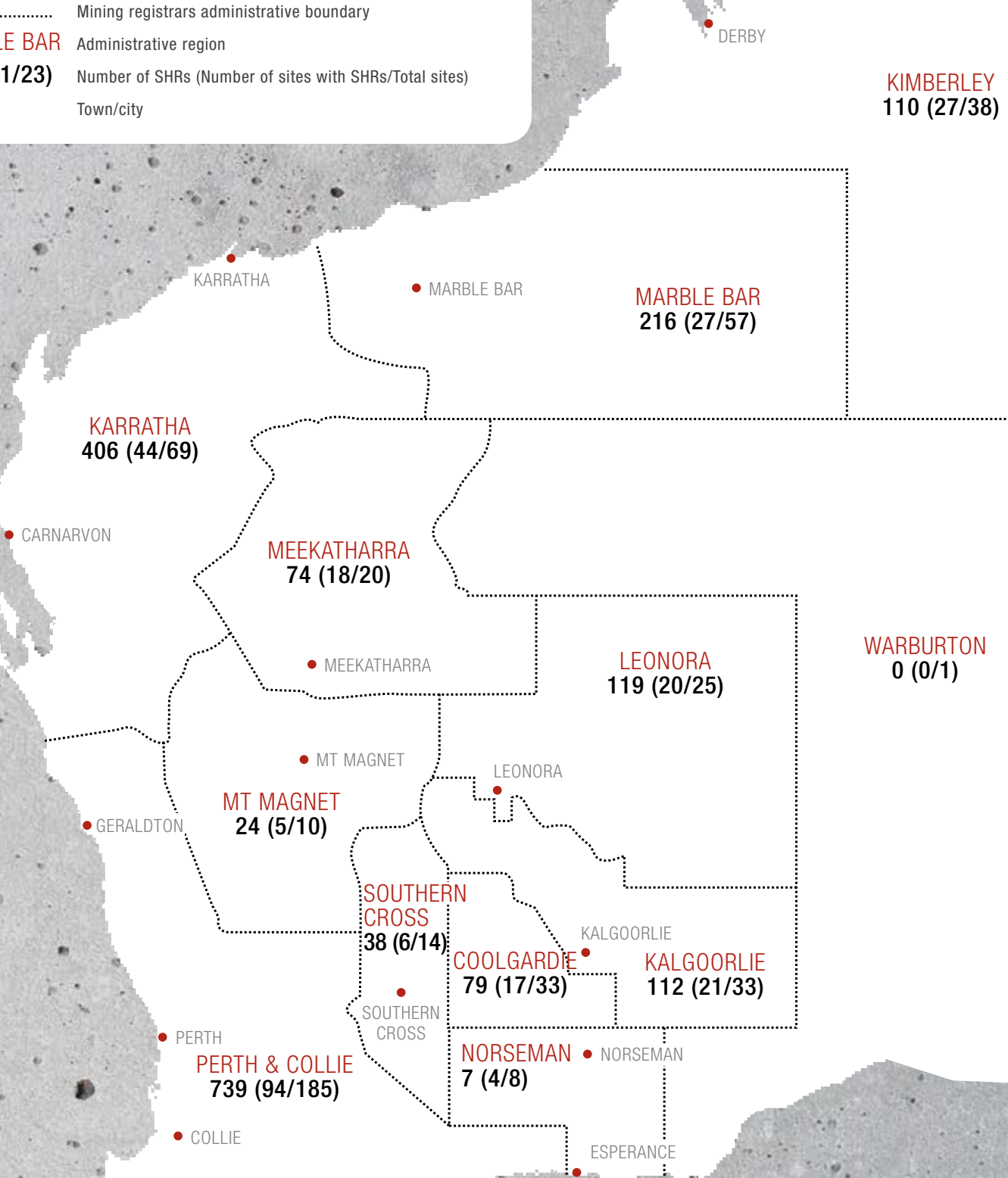
The latest statistics also include reportable incidents from offshore petroleum operations as the responsibility for safety regulation in coastal waters was transferred from the National Offshore Petroleum Safety and Environmental Management Authority (NOPSEMA) to the Department of Mines and Petroleum on 1 January 2012. Given the major projects currently being undertaken, and the significantly increased activities in coastal waters, the results are very pleasing.

Despite the good performance data, there is no room for complacency and it is always incumbent upon operators to be mindful of their responsibilities for safety. Their management systems and procedures must be robust, well maintained and subject to regular monitoring and improvement. The Department is working with industry to continue this positive performance trend.



DISTRIBUTION OF SAFETY AND HEALTH REPRESENTATIVES (30 JUNE 2013)

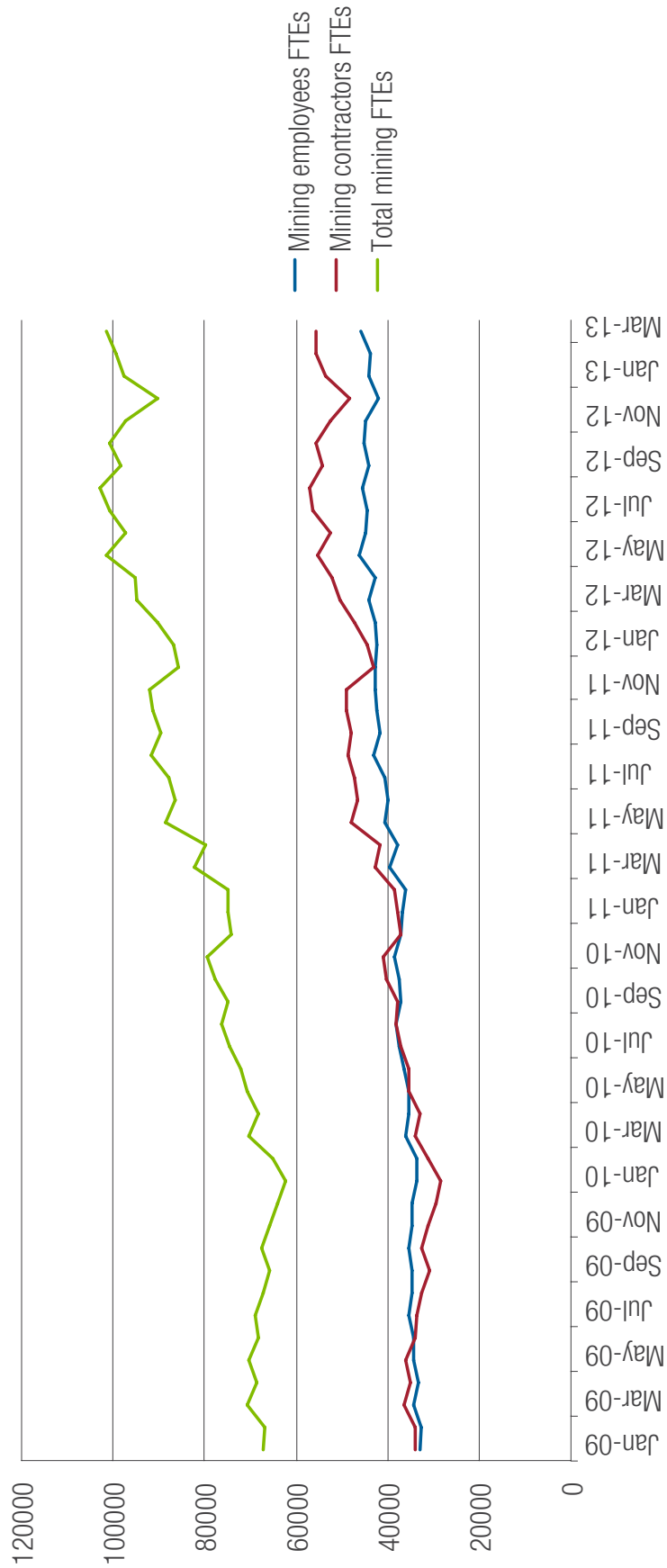
..... Mining registrars administrative boundary
MARBLE BAR Administrative region
153 (11/23) Number of SHRs (Number of sites with SHRs/Total sites)
 ● Town/city



Total active (incl. C&M) mine sites = 493
 Mine sites with SHRs = 283
 Total SHRs = 2,395
 SHRs attached to mine sites = 1,924
 Others (e.g. exploration) = 471

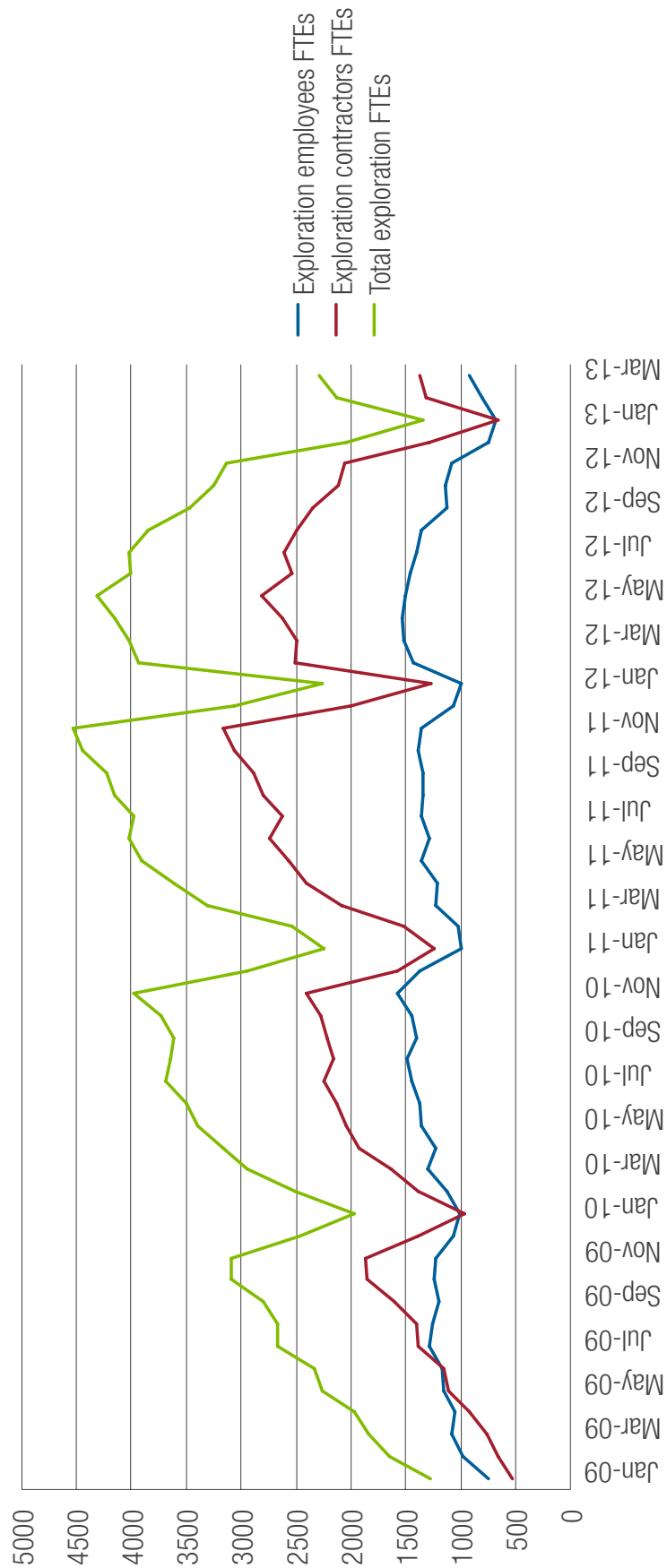
WA'S MONTHLY MINING WORKFORCE

NOTE: From 1 July 2009, monthly mining workforce figures are plotted as full-time equivalent (FTE), where 1 FTE = 2,000 hours worked per year



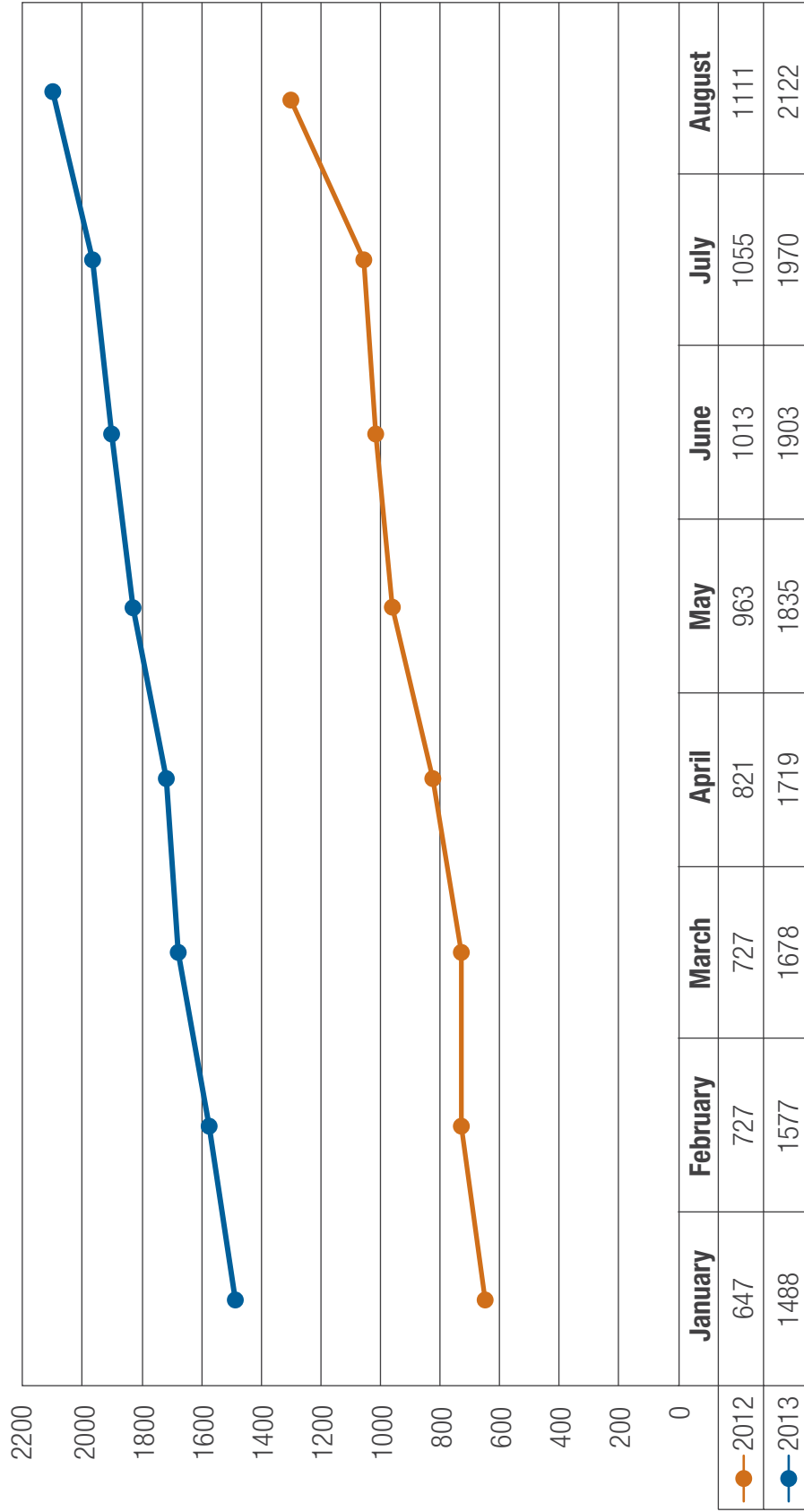
WA'S MONTHLY MINERAL EXPLORATION WORKFORCE

NOTE: From 1 July 2009, monthly mining workforce figures are plotted as full-time equivalent (FTE), where 1 FTE = 2,000 hours worked per year



RESOURCES SAFETY NEWS ALERT SUBSCRIBERS

Are you receiving Resources Safety's news alerts?
Subscribe now!



PETROLEUM SAFETY SIGNIFICANT INCIDENT REPORT NO. **02/2013**

DIVER'S UMBILICAL FOULED DURING MAST RAISING

ISSUED: 8 MAY 2013

Incident

During repetitive diving operations, using equipment specially designed and built for pipeline construction, a diver's umbilical was pinched after tangling with an equipment masthead being raised.

The diver followed procedure by bailing out and leaving the water, with the assistance of another diver engaged in the activity.

Neither diver was injured, and damage was limited to the specialised equipment umbilicals.

Contributory factors

- The diver was too close to the mast to avoid umbilical entanglement.
- The risk assessment for the mast-raising operation did not identify adequate safe diver positions to avoid the hazard of umbilical entanglement.
- Specialised purpose-built equipment was being used, with limited time in service to establish "tried and tested" procedures and familiarity with its field usage.

Preventative actions

When undertaking an operation with new or unfamiliar equipment or circumstances:

- revisit the risk assessment to ensure control measures remain adequate, or are reviewed and revised as necessary
- review equipment processes and checklists, and update if necessary
- exercise additional caution (e.g. extend safe diver positions) until confident that all hazards and risks have been identified and controlled
- communicate changes to all personnel involved and provide additional training as required
- provide regular reminders of the additional risks, particularly when engaged in repetitive tasks.

PETROLEUM SAFETY SIGNIFICANT INCIDENT REPORT NO. **03/2013**

TRAVELLING BLOCK ON WORK-OVER RIG STRIKES DERRICK CROWN WHEN DERRICKMAN IN BASKET

ISSUED: 8 MAY 2013

Incident

The travelling block of a work-over rig struck the crown of the derrick. After the block hit the crown, the derrick tilted slightly away from the rig floor towards draw works, resulting in failure of the lock-down T-bar bolts for the derrick front supports. The derrick then returned to its original position.

The derrickman, who was in the rod basket (about 15 metres high at the time of incident), remained in position and braced himself as the travelling block passed the basket before colliding with the crown. Although the crown saver (a safety device) did not stop the block hitting the crown, it functioned to a level that prevented more significant damage.

No-one was injured.

Contributory factors

- The rig floor had been raised to increase access below, and this had decreased the derrick space.
- A risk assessment had not been conducted to assess the consequences of this operational change.

- Standard operating procedures (SOPs) were not rig-specific and failed to identify the requirement to consider stack-up height variances and travelling block tolerances.
- The rod-handling SOP, which required the driller and derrickman to establish hand signal communication during rod-pulling operations, was not followed.
- The driller deviated from the SOP by:
 - not pulling the rod out of the hole at a controlled speed
 - using a safety device as a work control device.

Preventative actions

- Conduct a risk assessment to evaluate the adequacy of existing controls, including procedures, when there are operational changes. For example, raising a rig floor may affect stack-up heights, rod set-back capabilities, rig floor positioning and travelling block tolerances.
- Rather than relying on a generic rig SOP, develop rig-specific SOPs. For changes that may have repercussions for other activities, ensure the consequences of those changes are considered and addressed in other SOPs as necessary. Alert affected personnel regarding any revisions.
- When undertaking an operation with changed circumstances, even where tasks are familiar and repetitive, provide regular reminders of the need to follow SOPs, particularly if recently amended.

PETROLEUM SAFETY SIGNIFICANT INCIDENT REPORT NO. **04/2013**

OVERUSED AND POORLY MAINTAINED GENERATOR CATCHES FIRE

ISSUED: 16 MAY 2013

Incident

An electrical supervisor conducting a walkabout after a pre-start noticed smoke and heard a strange noise coming from a generator. Assuming it could be running out of fuel, he lifted the access cover and discovered a small fire had started around the crankcase of the engine. He immediately shut it down and deployed a near-by fire extinguisher. When the fire was out and the appliance had cooled down, he disconnected the battery terminals to prevent accidental start-up, and fitted an out-of-service tag to the generator. An out-of-service tag was also fitted to the spent fire extinguisher to prevent re-use.

This incident had the potential to escalate had it remained undetected.

Contributory factors

- The service and maintenance history for this generator was inadequate, although it was one of the oldest on site.
- The generator had been used overnight to run a freezer. This extended running period caused the engine block to fail, releasing oil which ignited. The pre-start checks for mobilised equipment were inadequate.

Preventative actions

- Maintain and service equipment to keep it in good condition.
- Regularly inspect equipment. Implement and review pre-mobilisation policies and procedures, and ensure all equipment has a fit-for-purpose pre-start checklist.
- Prior to mobilisation, check that equipment is fit for purpose.

MINES SAFETY SIGNIFICANT INCIDENT REPORT NO. **183**

LOSS OF BRAKES ON DUMP TRUCK

ISSUED: 14 MAY 2013

Summary of incident

A dump truck experienced a brake failure on a slight slope. The operator attempted to use the retarder to decrease the speed of the truck but the retarder failed to apply. The operator then applied the foot brake, initially with no response. After about ten seconds, with continuous foot brake application, the truck brakes applied heavily and the operator was able to bring the truck to a controlled stop.

A subsequent investigation by the site-based original equipment manufacturer (OEM) support staff and site fitter identified a leaking brake relay valve.

Probable causes

Direct

- The brake relay valve failed.

Contributory

- The brake relay valve had exceeded the OEM's recommended change-out interval of either every 6,000 hours in service or yearly.
- The site fitter was unaware of the change-out recommendation so this part had not been changed out in line with the OEM's recommendation.
- The change-out information was not in the OEM operation and maintenance manual, although it had been published in the OEM's service magazine in November 2005.
- The OEM recommendation was not captured in the site's maintenance planning system.

Actions required

- Changes to OEM or supplier operation and maintenance manuals, and other instructions, should be identified by OEM staff and communicated clearly to all customers.
- Refer to OEM or supplier instructions, specifications and guidance materials for information on component life, change-out periods and maintenance inspections relating to safety-critical areas of mobile plant such as steering and braking systems.
- Ensure site maintenance staff are aware of OEM support structures, service magazines, service bulletins and customer alerts for machine component updates.
- Regularly review the site's compliance to OEM specifications, maintenance instructions and guidelines, safety alerts, and other material providing advice on the safe use and care of mobile equipment onsite.

Further information

Visit the publication section of the Resources Safety website at www.dmp.wa.gov.au/ResourcesSafety for the following safety alerts.

- Mines Safety Bulletin No. 73 *Loss of control on highway-type vehicles*
- Mines Safety Bulletin No. 72 *Loss of control LME on gradients*
- Mines Safety Bulletin No. 52 *Operation of water trucks in open pit mines (quarries)*
- Significant Incident Report No. 178 *Water cart loss of control at portal – inadvertent access to underground*
- Significant Incident Report No. 139 *Loss of control of service vehicles*
- Significant Incident Report No. 84 *Loss of control of water cart – fatal accident*

MINES SAFETY SIGNIFICANT INCIDENT REPORT NO. **184**

SHIPLOADER RAIL CLAMPS FAIL AFTER ORIGINAL PARTS MODIFIED IN UNSUCCESSFUL ATTEMPT TO OVERCOME PROBLEM OF RAIL MISALIGNMENT

ISSUED: 1 JULY 2013

Summary of incident

A 4.5 kg rail clamp fell about 10 metres to the ground from a shiploader rail system after the nut-and-bolt assembly had loosened, allowing the clamp to vibrate free. Fortunately, no-one was injured. Rail clamps had fallen previously.

Many of the clamps had been modified from the original equipment manufacturer (OEM) design by cutting open-ended slots to the bolt holes to overcome what was believed to be a rail misalignment issue.



Photographs showing rail clamp as designed by OEM (top) and modified rail clamp (bottom) with open-ended slots and welded nuts and bolts

Probable causes

Direct

- The rails were misaligned.

Contributory

- No remedial action was taken to address the underlying issue of misaligned rails, although the misalignment had been identified in reports following previous incidents and during site structural audits.
- Modified rail clamps were used in repairs.
- The clashing of bolt heads with wheels is often an indicator of misaligned or worn rails — a potential underlying cause that the repairs did not address.
- To prevent bolt head clashing, some bolts had been shorted and beads of weld used to ensure the nuts did not come loose, making them susceptible to cracking.
- The structure showed signs of wear and corrosion.

Actions required

Before making repairs, a competent person should determine the root cause of the failure and how to address the underlying problem. This may involve a review of past incidents and repairs.

A structural integrity audit may be required for large structures. For shiploader rail systems, such an audit should include:

- a survey of the alignment of rails and shape of the structure, and comparison with design parameters (see Australian Standard AS 1418:18 *Cranes, hoists and winches – Crane runways and monorails* for guidance on rail alignment criteria)
- an assessment of the condition of parts such as rails, wheels, guides, clamps, spacers, shims and bearing pads under rails
- an assessment of the adequacy of rail end stops and rail joints.

When installing, servicing or maintaining parts, particularly for safety critical systems on machinery, follow OEM maintenance guidance, fitting instructions, recommendations and specifications.

Do not use alternate or modified parts unless they have been assessed by a competent person as meeting the OEM's performance specifications.

MINES SAFETY SIGNIFICANT INCIDENT REPORT NO. **185**

SERIOUS ENTANGLEMENT INJURY SUSTAINED DURING CALIBRATION OF CONVEYOR BELT WEIGHTOMETER

ISSUED: 8 JULY 2013

Summary of incident

A worker was cleaning a calibration weight, a routine task completed before calibrating the conveyor belt weightometer, a task that required the conveyor to be running. The broom being used to clean the weight, which was located about 30 cm beneath the conveyor, touched the running conveyor, causing the handle to “flick” the worker’s hand into the return roller, trapping his arm.

The worker received third-degree burns to his arm and fractures to his hand. Five months after the incident, he was still unable to return to work, had lost significant arm function and was in constant pain.



Photographs showing location of weightometer under conveyor belt



Photographs showing calibration weight requiring cleaning (top) and nearby return roller (bottom)

Probable causes

Direct

- The conveyor was not isolated during cleaning of the calibration weight.

Contributory

- There was no separation of the weight cleaning task from the weightometer calibration task.
- The guarding of moving and rotating parts near the conveyor weightometer was inadequate.
- There was no approved work instruction for this routine task.
- The site was overly reliant on "shop floor" low-level risk assessments.
- There was a lack of training and competency assessment for the task being performed.

Mines Safety Significant Incident Report No. 185 continued

Actions required

Conduct a team-based risk assessment for tasks where there is the risk of exposure to rotating and moving parts, and develop an approved safe work instruction where all practical measures have been taken to eliminate or mitigate the hazard. For the cleaning of conveyor belt weightometers, such measures might include:

- isolation of the conveyor belt to allow the weights to be cleaned manually without risk of entanglement
- installation of a hose point to facilitate cleaning of the weights without the need to use tools
- an audit of the conveyor where this task is undertaken, and implementation of a plan to replace, modify or install guarding to control the risks associated with rotating and moving parts.

Develop a safe system of work to allow calibration of the weightometer while the conveyor is running.

Implement competency-based training for work done on conveyors where there is the risk of exposure to rotating and moving parts.

Further information

Visit the publication section of the Resources Safety website at www.dmp.wa.gov.au/ResourcesSafety for the following safety alerts and code of practice:

- Mines Safety Bulletin No. 96 *Conveyor guarding*
- Mines Safety Significant Incident Report No. 55 *Conveyor belt – fatal accident*
- Mines Safety Significant Incident Report No. 2 *Conveyor belt – fatal accident*
- *Safeguarding of machinery and plant – code of practice*

The industry standard practice for conveyor safety is captured within Australian Standard AS 1755 *Conveyors – Safety requirements*. Note, however, that an employer's duty of care obligations under the *Mines Safety and Inspection Act 1994* and Mines Safety and Inspection Regulations 1995 are paramount and, in some circumstances, compliance with AS 1755 alone may not be sufficient.

MINES SAFETY SIGNIFICANT INCIDENT REPORT NO. **186**

CRUSH INJURIES SUSTAINED AROUND MOVING MACHINERY – FATAL ACCIDENT

ISSUED: 27 AUGUST 2013

Summary of incident

A worker was fatally injured in an accident at an iron ore processing facility. The accident occurred on the tripper level of the processing facility. It appears that the deceased was greasing an electric motor at the time of the accident and the tripper conveyor was operating in automatic mode. Preliminary enquiries indicate that the worker was caught between the motor cable termination box and a moving component of the tripper unit.

Probable causes

The investigation is at an early stage and probable causes are yet to be confirmed. However, the injuries sustained do demonstrate the hazard posed to workers working in the vicinity of moving plant. In this case, an access ladder was fixed to the tripper unit and was moving in an open access area.

Actions required

This is a preliminary notification to remind managers and supervisors of the importance of conducting detailed risk assessments for work associated with or near moving plant. The risk assessment should carefully examine any potential contact points that could cause injury. Workers may be struck or caught in nip or crush points. These areas should be clearly identified in the risk assessment and dealt with using the hierarchy of control.

Regulations that apply to this activity include regulations 6.17, 6.18, 6.20(c) and 6.27 of the Mines Safety and Inspection Regulations 1995.

Regulation 6.27(1) states that an employer must ensure that:

- cleaning, maintenance and repair of plant with moving parts are not undertaken while the plant is operating unless there is no practicable alternative approach, and
- where guarding of moving parts does not completely eliminate the risk of entanglement, persons do not operate or pass in close proximity to the plant.

MINES SAFETY BULLETIN NO. 105

UNDER-DESIGN OF BRIDGE AND GANTRY CRANE END CONNECTIONS

ISSUED: 2 JULY 2013

Background

Various types of cranes are used on mine sites to lift and move loads, commonly plant requiring maintenance during a shut down. This bulletin relates to purpose designed and built cranes, including bridge and gantry cranes. These cranes

utilise bridge beams, which distribute the crab loads to the end carriages or support legs (Figure 1).

In the process of registering cranes on mine sites, Resources Safety has established that many designs do not accommodate all load effects on the end connection of the bridge beams. In an attempt to address this design deficiency, crane owners are exchanging crane end connection bolts as required by the designers for higher class (i.e. stronger) items, but this solution may not be adequate.

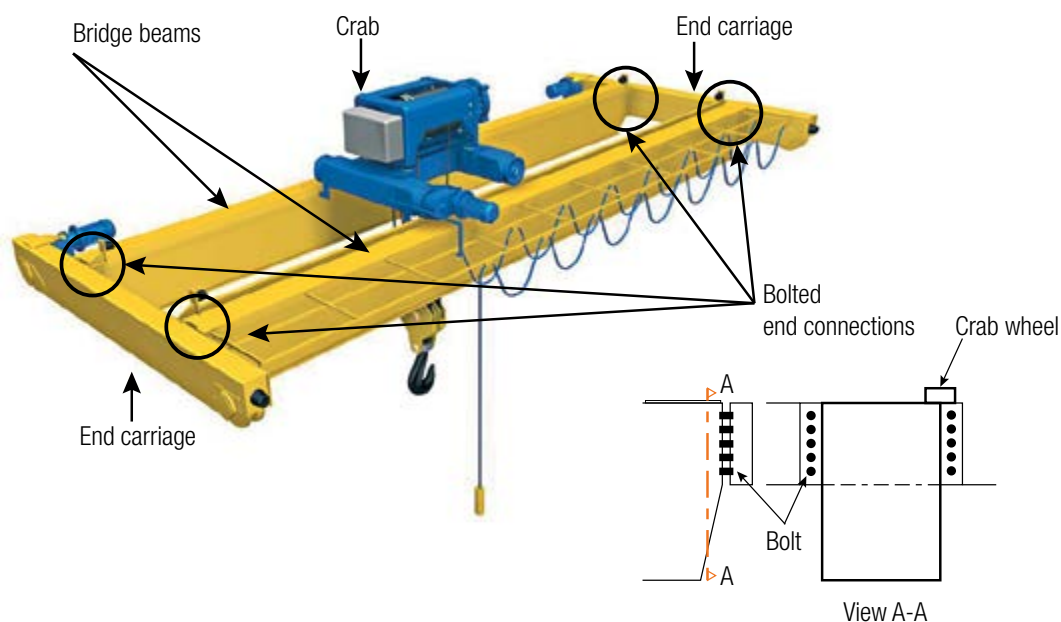


Figure 1 Typical layout of a double bridge crane, with schematic sections showing a bolted end connection (adapted from image at www.podemcrane.com/?p=15&l=2&id=3)

Summary of hazard

Investigations into a number of cranes have found the strength of some bridge beam to end carriage connections to be inadequate. When the loaded crab moves along its rails, these connections experience torsion loads that were not considered in the design checks. This torsion load exists because the crab wheels apply loads eccentrically on many bridge beams. With the torsion loads added, the end connection bolts experience combined forces that exceed the limits in the Australian Standards.

In these cases, the bolted end connections of the double bridge crane require review and possible strengthening due to the design oversight. Without this strengthening, there is the potential for the end connections to fail suddenly, resulting in a collapse.

All cranes with eccentrically loaded bridge beams and end connections with bolts in shear may be at risk.

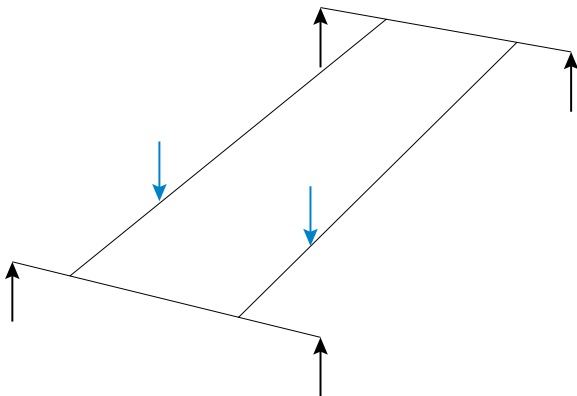


Figure 2 Schematic diagram showing simplistic modelling for bridge beams whereby simple model loads (blue arrows) are applied to the bridge beam centreline

Contributory factors

- Analysis of the crane structure designs being investigated indicates that computer modelling was simplistic (Figure 2), and there was no modelling of the eccentric loading of the trolley wheels relative to the centreline of the bridge beams (Figure 3).
- Rather than including eccentricity in the analysis model, it is possible to manually add a secondary effect to the calculations. However, this approach can be vulnerable to mistakes because it can be difficult to manage all secondary effects and combinations in complex structures.
- The omission of modelling or calculations accounting for eccentric loading was often not identified by the verifier of the designer's calculations.

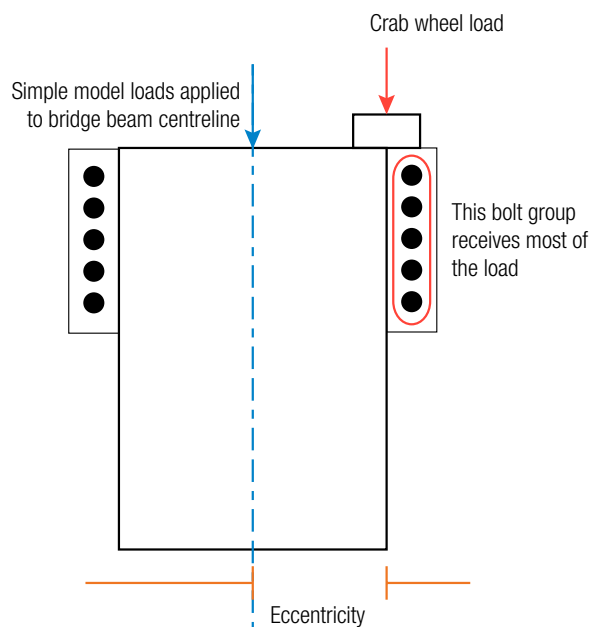


Figure 3 Schematic cross section of bridge beam end connection showing eccentricity resulting from loading of the crab wheel (red arrow) relative to that for a load at the bridge beam centreline (blue arrow)

Mines Safety Bulletin No. 105 continued

Recommendations

Mine management and crane owners

- Registered Managers should establish if any cranes on their sites have eccentrically loaded bridge beams with the potential end connection defect. If so, management should establish from the original equipment manufacturer (OEM) whether the design omission or error exists in the crane.
- If the design omission or error exists, consider an interim short-term operational down-rating. For example, operate the crane in a 75 per cent down-rated load-carrying capacity and limit the crab movement to the central third of the bridge (Figure 4) until the defect is adequately addressed. These load and movement restrictions will produce less force on the bolted end connections than that experienced during load testing.
- Manage the associated risks of using the down-rated crane through a combination of management systems such as the classified plant register, notices, risk assessments, verification of competency (VOC) programs and high risk work (HRW) protocols.
- A competent person should inspect the end connections without delay and arrange for them to be strengthened if required.

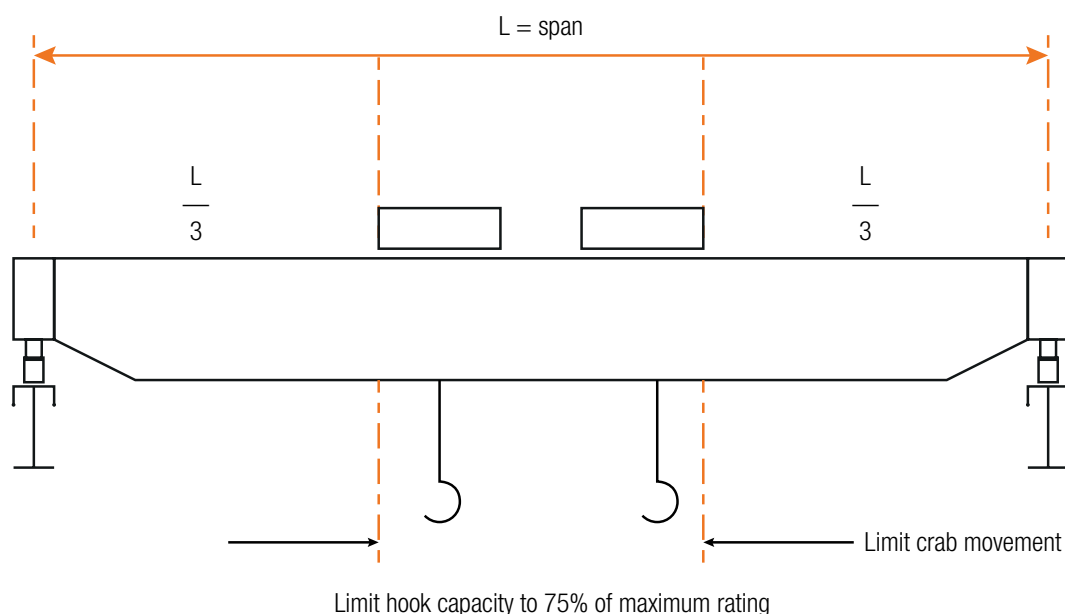


Figure 4 Schematic side view of bridge crane showing recommended short-term operating parameters when eccentricity has not been considered in the design

- Ensure all required strengthening is carried out, inspected by a competent person and recorded in the relevant plant registers.
- Be aware that if swapping out class 8.8 bolts with class 10.9 or higher class bolts, the higher class bolts can experience stress corrosion cracking (SCC) and hydrogen embrittlement (HE) failures. These failures occur most often where the bolts are subjected to tri-axial (or combined) stresses, as is the case with the end connections on the bridge beams, and the bolts have not undergone specialised manufacturing processes to counter this.

Designers and verifiers

- Crane designers and crane design verifiers must ensure compliance with relevant clauses in Australian Standards and use sound engineering practice. The analysis and design process must consider all possible load combinations, primary and secondary load effects, and the maximum combined cases.
- Crane designers should consider adopting analysis models that account for all eccentricities, and accurately model end connections to avoid missing secondary effects.

Additional information

Australian Standards, available at www.saiglobal.com

- AS 1418 *Cranes, hoists and winches – General requirements*
- AS 3990 *Mechanical equipment – Steelwork*
- AS 4100 *Steel structures*

MINES SAFETY BULLETIN NO. 106

LOSS OF CONTROL OF SERVICE VEHICLES ON DECLINES IN UNDERGROUND MINES

ISSUED: 8 JULY 2013

Summary of hazard

In recent years, there have been a number of serious accidents associated with the loss of control of service vehicles on declines in underground mines.

The vehicles involved have included concrete agitator trucks, light delivery trucks, diesel fuel transports, water carts and lubrication service trucks. Many of these vehicles are designed for surface applications on sealed public roads. Their loads, gear ratios and braking capability are configured for operating environments that are substantially different to the conditions found in underground mines.

Travelling down the decline with a full load can be particularly problematic. The initial loss of control is often associated with the vehicle being either in the wrong gear or out of gear. In many cases, the manual gear cannot be re-engaged by the operator, or the automatic transmission may prevent the gear from engaging to avoid gear damage. If the gear is not engaged, the truck can pick up speed very quickly.

Service and auxiliary brakes may not be capable of controlling the truck during the descent. They can overheat with continuous use if engine braking is not assisting and if the energy created during braking is not adequately absorbed. This can lead to a loss of service brake function.

Contributory factors

- Rather than using engine braking as a primary retarding mechanism on declines, service brakes are used in an attempt to control vehicle speed whereas they should only provide a trimming function. Excessive premature wear of brake linings is commonly an indicator of this braking practice.
- Passing problems on declines requiring drivers to change gear can result in incorrect gear selection or the disengagement of gears.
- Vehicle maintenance information from original equipment manufacturer (OEM) manuals typically relates to the designed surface application and the modifications required to operate in an underground mining environment are usually not detailed.
- Training courses are commonly not specific to the site and machine so some generic training modules miss important information on the safe operation and maintenance of vehicles.
- Operators panicking in emergency situations sometimes resort to using the side wall to slow their vehicle, which can result in serious injuries.

Recommendations

A more rigorous approach when assessing the safe operating conditions for service vehicles will help reduce the potential for loss of control of service vehicles on declines in underground mines.

Service and maintenance

- Carry out a detailed risk assessment whenever a new vehicle is specified for use at a mine. This is even more important when the machine is not specifically designed for underground applications. The risk assessment should address the operational and maintenance requirements specific to the site and machine.
- Check the maximum load-carrying capability of the vehicle against its operating and braking characteristics to determine its maximum capacity.
- Evaluate brake performance using diagnostic checks rather than simple drive-through tests on service and auxiliary brakes.
- Determine brake service intervals on the basis of the mine conditions. Weekly brake studies may be appropriate when operating on declines.
- Ensure service staff are familiar with the detailed braking requirements for operating in an underground mining environment.

Training

- Provide operators and maintenance staff with training that is specific to the site and machine.
- Emphasise the importance of setting and staying in gear when accessing declines.
- Explain the practical importance of engine braking and retarders, and discourage the practice of riding the brakes as this can significantly reduce braking capability.
- Consider using simulators for training purposes so that emergency measures can be practised in a safe environment, rather than in a real-life situation.

Additional information

Visit the publication section of the Resources Safety website at www.dmp.wa.gov.au/ResourcesSafety for the following safety alerts.

- Mines Safety Bulletin No. 73 *Loss of control on highway-type vehicles*
- Mines Safety Bulletin No. 72 *Loss of control LME on gradients*
- Mines Safety Bulletin No. 52 *Operation of water trucks in open pit mines (quarries)*
- Significant Incident Report No. 183 *Loss of brakes on dump truck*
- Significant Incident Report No. 178 *Water cart loss of control at portal – inadvertent access to underground*
- Significant Incident Report No. 139 *Loss of control of service vehicles*
- Significant Incident Report No. 84 *Loss of control of water cart – fatal accident*

HEAD OFFICE

RESOURCES SAFETY DIVISION, DEPARTMENT OF MINES AND PETROLEUM

Street address: Level 1, 303 Sevenoaks St, Cannington WA 6107

Postal address: Mineral House, 100 Plain St, East Perth WA 6004

Telephone: +61 8 9358 8002 (Monday-Friday, 8.30 am to 4.30 pm)

Facsimile: +61 8 9358 8000

Email: ResourcesSafety@dmp.wa.gov.au

NRS: 13 36 77 (the National Relay Service is an Australia-wide telephone access service available at no additional charge to people who are deaf or have a hearing or speech impairment)

DANGEROUS GOODS SAFETY AND LICENSING

including explosives, fireworks and major hazard facilities

Telephone: +61 8 9358 8002

Facsimile: +61 8 9358 8000

Email: ResourcesSafety@dmp.wa.gov.au (licensing enquiries)
dgsb@dmp.wa.gov.au (dangerous goods safety enquiries)
rdspsatial@dmp.wa.gov.au (dangerous goods pipelines enquiries)

Dial 000 for dangerous goods emergencies or accidents requiring attendance of emergency services

PETROLEUM SAFETY

including petroleum pipelines and operations, and geothermal energy

Telephone: +61 8 9358 8184

Facsimile: +61 8 9222 3383

Email: psb@dmp.wa.gov.au

SAFETY COMMUNICATIONS

including publications, events and *Resources Safety Matters* subscriptions

Telephone: +61 8 9358 8154

Facsimile: +61 8 9358 8000

Email: RSDComms@dmp.wa.gov.au

UPDATE YOUR CONTACT INFORMATION

If you have moved or changed jobs and are not receiving *Resources Safety Matters*, or wish to be added to the mailing list, please contact:

Safety Communications
Resources Safety Division
Department of Mines and Petroleum
100 Plain St, East Perth WA 6004

Telephone: +61 8 9358 8154

Facsimile: +61 8 9358 8000

Email: RSDComms@dmp.wa.gov.au

USING A SMARTPHONE OR TABLET?



Scan this QR code for Resources Safety contacts

MINES SAFETY

including exploration, mining and mineral processing

Telephone: +61 8 9358 8079 (general enquiries and safety and health representatives)
 +61 8 9358 8102 (mines safety reporting)
 +61 8 9358 8461 (health surveillance, biological monitoring and contaminant monitoring [CONTAM])

Facsimile: +61 8 9325 2280

Email: MinesSafety@dmp.wa.gov.au (general enquiries)
 SRSNotificationsManager@dmp.wa.gov.au (mines safety reporting forms and guidelines)
 minesreps@dmp.wa.gov.au (safety and health representatives)
 contammanager@dmp.wa.gov.au (contaminant monitoring and reporting)
 occhealth@dmp.wa.gov.au (health surveillance and biological monitoring)

For a serious mining accident or incident, the mine or exploration manager must advise their District Inspector as soon as practicable

NORTH INSPECTORATE

Street address: Level 1, 303 Sevenoaks Street, Cannington WA 6107
Postal address: Mineral House, 100 Plain St, East Perth WA 6004
Telephone: +61 8 9358 8079
Email: north.inspectorate@dmp.wa.gov.au

EAST INSPECTORATE

Street address: Cnr Broadwood and Hunter Sts, Kalgoorlie WA 6430
Postal address: Locked Bag 405, Kalgoorlie WA 6433
Telephone: +61 8 9021 9411
Email: east.inspectorate@dmp.wa.gov.au

WEST INSPECTORATE

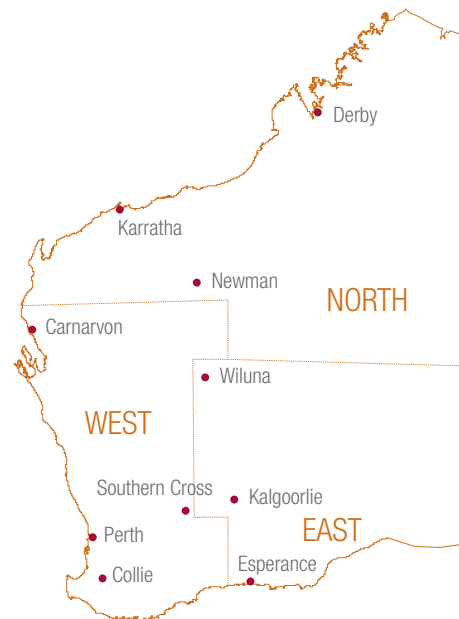
Street address: Level 1, 303 Sevenoaks Street, Cannington WA 6107
Postal address: Mineral House, 100 Plain St, East Perth WA 6004
Telephone: +61 8 9358 8079
Email: west.inspectorate@dmp.wa.gov.au

OR

Street address: 66 Wittenoom Street, Collie WA 6225
Postal address: PO Box 500, Collie WA 6225
Telephone: +61 8 9734 1222
Email: west.inspectorate@dmp.wa.gov.au

MINE PLANS

Telephone: +61 8 9358 8115
Facsimile: +61 8 9358 8000
Email: rsdmineplans@dmp.wa.gov.au



Resources Safety Matters is published by the Resources Safety Division of the Department of Mines and Petroleum (DMP). It is distributed free of charge to industry and interested members of the public.

Reproduction of material from *Resources Safety Matters* for wider distribution is encouraged and may be carried out subject to appropriate acknowledgement. Contact the editor for further information.

Mention of proprietary products does not imply endorsement by DMP.

Comments and contributions from readers are welcome, but the editor reserves the right to publish only those items that are considered to be constructive towards safety and health. Reader contributions and correspondence should be addressed to:

Resources Safety Matters Editor
Resources Safety, DMP
Mineral House, 100 Plain Street
East Perth WA 6004

Editor: Dr Susan Ho
Enquiries: 08 9358 8149
Email: RSDComms@dmp.wa.gov.au

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

LIST OF CONTRIBUTORS (FROM DMP UNLESS OTHERWISE INDICATED):

John Ahlin
Alex Atkins, Sustainability
Colin Boothroyd
Samantha Cairns
Tse Yin Chang
Andrew Chaplyn
Iain Dainty
Conor Doherty
Peter Drygala
Lucio Figueiredo
Jennifer Goh
Alan Gooch
David Harvey
Cristina Hatton
Barry Healy
Philip Hine
Su Ho
Alan Holmes
Jim Hueimmer, Shiftwork Solutions
Stephen Lane
Vun Leong
Daphne Lobo
Greg McCauley
Mike McKay
Russell Miners
George Minto
Bec Moore
Peter Payne
Gareth Pickering
Kristin Priest
Lew Pritchard
Simon Ridge
Mike Rowe
José Sanchez
Richard Shedlock
Terry Siefken
Chris Stublely
Tiffany Wertheimer
Ian Woodmansey
Neil Woodward
Peter Xanthis
Henry Zuidersma

PHOTO ATTRIBUTION:

CD = Conor Doherty
SH = Su Ho
TYC = Tse Yin Chang

COVER PHOTO:

Rio Tinto Iron Ore's John Giovanetti showing an example of RTIO's lifesaving commitments strategy SH