

Resources

Safety matters

VOL. 4 NO. 1 FEBRUARY 2016

ISSN 2201-5604



Government of Western Australia
Department of Mines and Petroleum
Resources Safety

NEW WEBSITE WELCOMED

SPREADING THE MINES SAFETY
MESSAGE

REMINDER TO VENTILATE
DANGEROUS GOODS

SAFETY PERFORMANCE DATA
RELEASED



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



Simon Ridge (left) with MERC Committee member Jen Pearce and Chief Adjudicator (and mines inspector) Peter O'Loughlin

The Mining Emergency Rescue Competition (MERC) event held in Perth over the weekend of 28-29 November 2015 was a great success as evidenced by the enthusiastic participation of the nine participating teams, the dedicated volunteers and organising committee, and the significant interest shown by the media and general public. It was also good to see that the event catered for children as well as seasoned mining professionals.

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On a more serious note, there was a reduction in participating teams this year, a trend that we must all work to reverse. Times may be economically challenging but looking at emergency preparedness to achieve cost reductions is not a wise move. The operating budget for the MERC event was AUD300,000, which does not include in-kind support or volunteers' time. At an iron ore price of about AUD54 per tonne (at USD39/tonne), that is less than 5,600 tonnes of production. This is minute in the scheme of things.

There is nothing more important than safety for our resources operations, and a big part of that is preparedness to mitigate the impact of accident events. Without appropriate resourcing for

the mostly volunteer emergency response teams (including the provision of realistic training events), the industry can expect to be judged poorly by external commentators. Emergency response competitions that are open to the public also provide a unique opportunity to interact with the community and support the industry's social licence to operate.

I suggest that executive managers become champions for the various emergency response competitions and insist that their teams regularly participate. Their participation should be seen as part of the readiness training regime, without which excellence cannot be achieved and maintained.

Simon Ridge
Executive Director Resources Safety
 30 January 2016



NEW WEBSITE WELCOMED

The Department of Mines and Petroleum's new website has been praised for its improved user-friendly design and enhanced accessibility to information. It has been designed with dynamic resizing, so it works with both desktop and mobile platforms.

Mines and Petroleum Minister Bill Marmion said that the new site had brought a number of benefits to the Department's stakeholders since it was unveiled on 24 November 2015.

"The new site has been designed with its users in mind, and offers greater useability and intuitiveness," Mr Marmion said.

"The content of the new website has been completely revamped, meaning people are now able to access the information and resources they want with greater ease. It was shaped using feedback from stakeholders so it would accurately reflect their needs."

The launch of the new website was the culmination of three years of development and implementation.

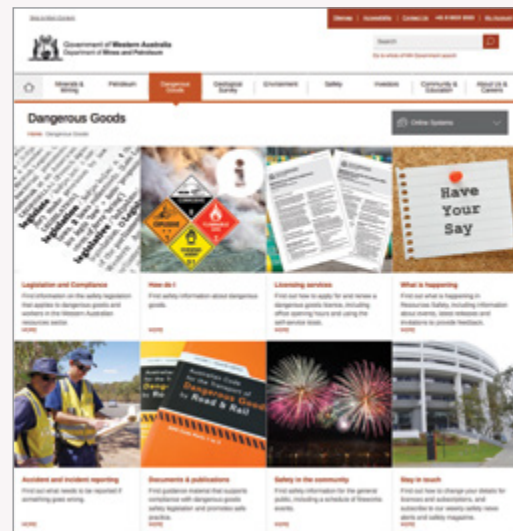
Final user testing was undertaken in September with a cross section of industry stakeholders and community representatives. Those involved said that they found the new site user-friendly, modern and easy to navigate.

"The way people access information has changed in recent years," Mr Marmion said. "The new website enhances the way stakeholders interact online with the Department and ensures an improved user experience."

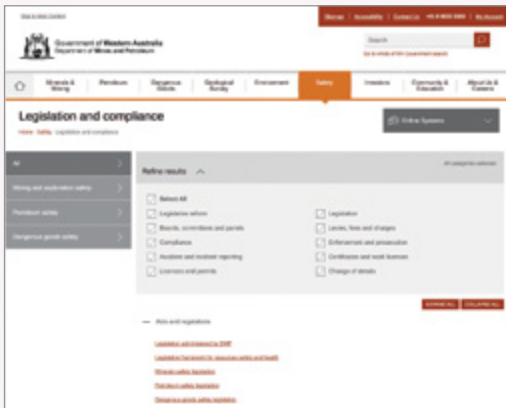
SAFETY TAB



DANGEROUS GOODS TAB



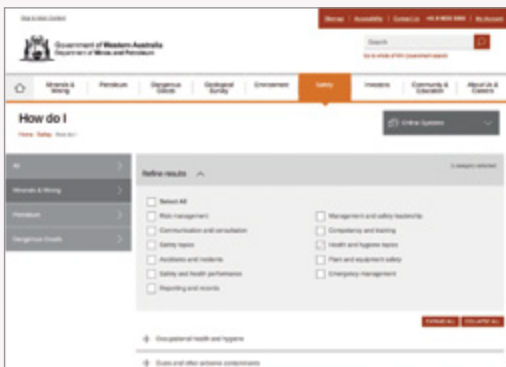
From the safety and health perspective, the two navigation tabs *Safety* and *Dangerous goods* enable users to access both compliance information and safety guidance directly from the Department's home page. The tabs' home page content has been organised into clearly defined areas, and the use of images makes finding information easier and quicker.



The *Legislation and compliance* section on these pages allows users to filter through key areas to find content that is suited to their needs, such as links to relevant legislation.

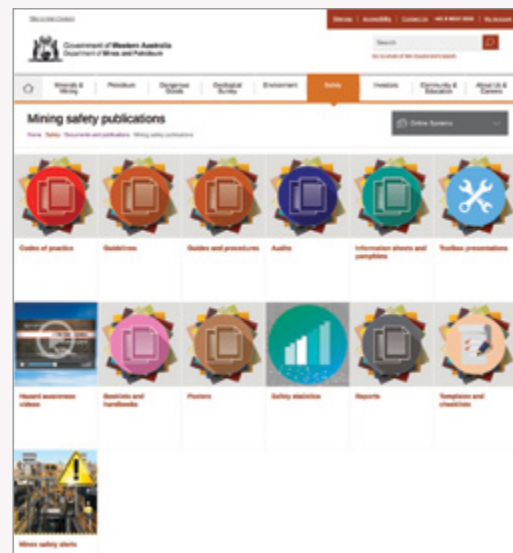


Dangerous goods users will find their guidance has been divided into steps in the lifecycle of a dangerous good – manufacturing, storage and handling, transport, use and disposal. This approach has been taken so users can quickly find all the information they need and go back to the task at hand. For example, a user wanting information to transport a security risk substance would not only find out how to apply for the appropriate licence, but also documents that may be used in the application process.

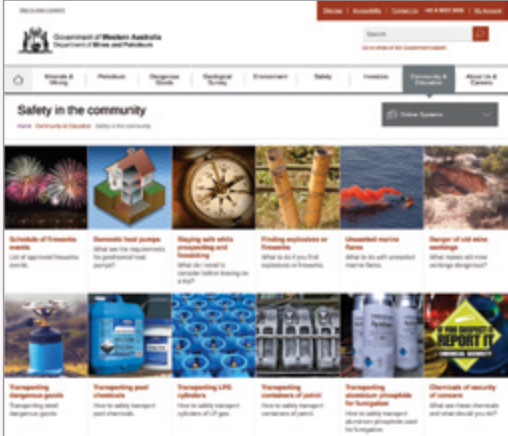


The new *How do I* section contains safety guidance. After selecting a regulatory area, users can filter by key areas, such as subject matter (e.g. risk management, accidents and incidents) or by part of the life cycle for dangerous goods (e.g. manufacturing). Use the *Expand all* function to see all the pages available in your selected area.

For those users who wish to access the mining one-stop shops that were on the old website, the new versions are available in the *How do I* section in the *Safety* area. After selecting *Minerals & Mining*, choose the subjects of *Safety topics* or *Health and hygiene topics* to access the specially developed pages.



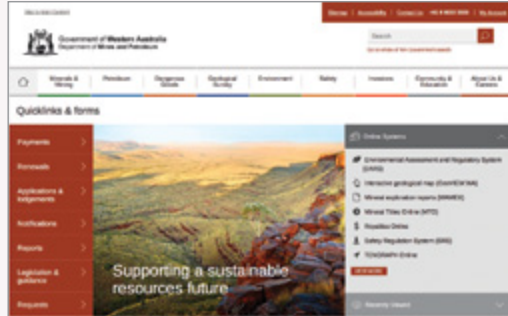
Resources Safety's suite of publications and other guidance is available under *Documents and publications* section, or alternatively from the navigation tab's drop-down menu or by using the website's new search function. The guidance categories are easily identified



The *Safety in the community* section contains useful information and safety guidance on a variety of topics to assist and inform members of the public. These include the transport and storage of dangerous goods used in their homes or at work (e.g. LP gas, pool chemicals), staying safe while prospecting, and the latest fireworks schedule. These can be accessed through the home page, navigation tab's drop-down menu or by using the *Community & Education* navigation tab.

Implementing a new-and-improved search function was an important component of the website redevelopment. Users are now able search for content within the webpages as well as documents. There is also the ability to filter results by section, subject, document type and date.

Planning for further improvements to the safety pages is already underway, with the proposed development of collections of content for particular mining activities (e.g. maintenance, autonomous mining) or work locations (e.g. process plants).

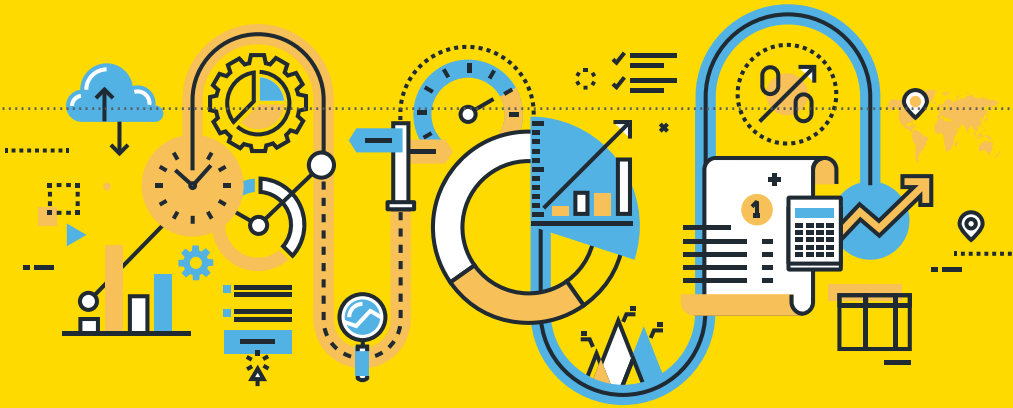


Another new feature on the website is the *Quicklinks and Forms* bar on the Departmental home page. Basically any task that involves a transaction with the Department is listed here, such as applications and lodgements, and notifications, simplifying the online search for the end-user.

Users will be able to access related guidance, publications and information in one place.

The Department will be conducting a user satisfaction survey in February 2016. Further information will be provided in the Resources Safety news alerts. Your feedback via the survey would be appreciated.

If you have any queries about the new website, please email Resources Safety at RSDComms@dmp.wa.gov.au



WHAT DO OUR STAKEHOLDERS THINK?

In 2010, the Department of Mines and Petroleum started implementing the State Government's Reform and Development at Resources Safety (RADARS) strategy. For Resources Safety, this initiative addressed issues of legislation, staff capacity and competency at the safety regulator, and introduced cost recovery to fund safety regulation of the Western Australian resources industry.

The RADARS initiative has now been running for six years, with major changes implemented across three regulatory areas covering mining, dangerous goods safety, and petroleum and geothermal energy. A survey is conducted every two years for stakeholders to provide feedback on their perceptions of safety reform progress.

The survey specifically addresses:

- the importance of the roles of a safety regulator and how well Resources Safety performed those roles
- perceptions of Resources Safety's performance when working with industry to reduce the likelihood and consequences of serious incidents
- perceptions of the value that various initiatives could add to stakeholders' safety outcomes.

The survey also seeks industry's view of its own performance in achieving a proactive, consultative safety culture.

The results are compared with those from the previous survey to determine whether, and how, industry perceptions of Resources Safety's regulatory activities are changing. The results help identify those compliance and awareness-raising activities that stakeholders consider are being performed well; where there has been a significant improvement in perception ratings; and areas of concern where industry perceptions are less favourable or ratings have decreased.

In effect, the biennial survey provides a qualitative external assessment of regulatory performance that can be combined with a range of internal measures to inform Departmental planning processes.

The first survey was conducted in 2010 to establish a baseline against which to measure progress, with follow-up surveys in 2012 and 2014. The reports for these surveys are available at www.dmp.wa.gov.au/Safety/Resource-Safety-publications-16440.aspx

The next survey will be conducted in March and April 2016. The validity and usefulness of the results depends on a good representation of stakeholder groups. If you receive an invitation to participate, please do so!

REPORTING SAFETY REGULATION ACTIVITIES IN 2014-15

Resources Safety Division is the State's specialist regulator for occupational health and safety in the minerals and petroleum sectors, and administers legislation for the safe use of dangerous goods. The annual report outlining the activities of the Division is now available.

Resources Safety achievements and performance 2014-15 summarises the:

- progress of the Reform and Development at Resources Safety (RADARS) strategy
- achievements in mine, petroleum and dangerous goods safety regulation
- safety inspectorate performance across the mining, petroleum and dangerous goods sectors
- expenditure of the mines safety and inspection levy and petroleum and geothermal energy safety levies
- achievements, activities and developments from the Division.

View the report at www.dmp.wa.gov.au/SafetyDocs

FINAL FIFO REPORT RELEASED

On 18 June 2015, State Parliament released the final report outlining the findings and recommendations of a parliamentary inquiry into the impact of fly-in fly-out (FIFO) work practices on mental health.

The *impact of FIFO work practices on mental health: final report* concludes the work of the Education and Health Standing Committee who were tasked in August 2014 with inquiring into:

- contributing factors that may lead to mental illness and suicide amongst FIFO workers
- current legislation, regulations, policies and practices for workplace mental health in Western Australia
- current initiatives by government, industry and community, and recommend improvements.

The committee heard 133 submissions from individuals, experts and bodies representing workers, the resources sector and government. The inquiry's research found that FIFO resource workers typically come from the highest risk demographic for mental illness and suicide (male, aged 18 to 44). A FIFO lifestyle takes such an individual regularly away from home, placing that person in an isolated position, away from family and other social supports.

Independent research on mental distress in the FIFO community was found to indicate the incidence rate is higher amongst FIFO workers than in the general population.

The inquiry also found there was a scarcity of reliable, comprehensive data on suicides within the FIFO work system with no one central source of data.



From the inquiry, 30 recommendations and 42 findings were made. Several of the recommendations were in relation to the establishment of a proposed Code of Practice to address FIFO work arrangements and its impact on workers' mental health. The government response found that the aims and objectives of those recommendations could instead be met by reviewing and strengthening existing codes of practice.

In addition, the remaining recommendations from the inquiry could be progressed through the mechanism of the proposed Work Health and Safety (Resources) Bill, the Mental Health Commission, the Mining Industry Advisory Committee (MIAC), scheduled changes to the case management system of the Office of the State Coroner, and stakeholder consultation by the Department of State Development.

The Education and Health Standing Committee's reports (and Government's response to the final report) can be accessed through the committee tab at www.parliament.wa.gov.au/parliament/commit.nsf/all/F6A320708AA5D75D48257B6C001E7D74?opendocument&tab=tab3

DOES YOUR SITE'S MENTAL HEALTH STRATEGY CHECK OUT?

One way to reduce work-related injuries and illness is by raising awareness of the issues and contributory factors, and implementing proactive programs to address these.

Sites can access their preparedness to support mental health and wellbeing by reviewing their systems using the checklist available at www.dmp.wa.gov.au/Safety/Templates-and-checklists-16200.aspx

The mental health checklist complements the site checklist for the prevention of bullying.

PROVIDING A BLUEPRINT FOR INDUSTRY MENTAL HEALTH AND WELLBEING

The Chamber of Minerals and Energy (CME) of Western Australia has recently published a *Blueprint for mental health and wellbeing* to assist the resources sector in promoting the wellbeing of the workforce.

The potential benefits for industry in creating a mentally healthy workplace include improved productivity, return on investment, staff attraction and retention for companies. The document identifies key directions for industry and recommends evidence-based strategies that can be used

at many levels of the organisation. This tool can be used to identify the specific needs and priorities of the organisation over time.

Visit CME's website at www.cmewa.com/images/files/policy/people-and-communities/Mental-Health-Blueprint.pdf to find out more. Other mental health links and resources can be found for employers and workplaces on the Department's website at www.dmp.wa.gov.au/Safety/Guidance-about-mental-health-and-7076.aspx



TUNNEL TRAINING TESTS EMERGENCY RESPONSE

In November 2015, a van transporting dangerous goods was involved in a three-car crash that shut down Perth's Northbridge Tunnel for seven hours.

Luckily for road users, the incident was just part of a multi-agency training exercise designed to test the capacity of first responders and government agencies.

The mock emergency training exercise involved Main Roads, the Department of Fire and Emergency Services, Department of Environment Regulation, WA Police and the Department of Mines and Petroleum.

Principal Dangerous Goods Officer Peter Xanthis said that a van involved in the crash scenario was transporting methyl bromide, a toxic gas, which started leaking.

"There was no placarding on the vehicle so emergency responders had no idea that there could be toxic gas involved," Mr Xanthis said.

Even though it was just a training exercise, Mr Xanthis said that it highlights the importance of placarding vehicles when they are transporting dangerous goods

"It just gives emergency responders a heads up that dangerous goods may be involved, and they can take the appropriate precautions such as using breathing apparatus or chemical spill suits," he said.

Mr Xanthis said that the dangerous goods officers observed the scenario on the day and provided feedback during the debrief.

"We were impressed with their professionalism and skills on the day," he said. "They're on the frontline dealing with incidents every day, and they did a very good job in the enclosed environment of the tunnel."

Mr Xanthis said that training operations were absolutely essential to prepare emergency services for real-life incidents.

"It allows multiple agencies to look at areas that can be improved, and put plans in place before a real-life incident occurs," he said. "It is also an opportunity to learn from the experience in a safe environment."



DRIVERS INVITED TO STOP AND CHAT ABOUT SAFETY

The inaugural "Stop and Chat about Safety" activity, run jointly by the Department of Mines and Petroleum and Main Roads, was held on Friday 4 December 2015.

It was a great opportunity for truck drivers to park up and chat about safety with government inspectors.

Truck drivers received free safety information, and a drink and snack.

Manager Dangerous Goods Iain Dainty said that the event was a huge success, with many truck drivers taking the time to directly ask inspectors questions about safety and the laws applying to dangerous goods.

Tyre safety experts conducted numerous free inspections on truck tyres and offered safety information to drivers.

A number of drivers wanted to confirm that their current operations and procedures were safe and lawful.



Preparing for the training exercise in September 2015 EJ

TRAINING HIGHLIGHTS ROAD SAFETY COLLABORATION

The Department of Mines and Petroleum, Western Australia (WA) Police, Main Roads and the Department of Transport all played a role in joint training exercises held between 14 and 17 September 2015.

Dangerous Goods Team Leaders Erin James and Eric Gruber joined six WA Police traffic officers at a four-day training course.

“Information about dangerous goods was an important focus of the training,” Miss James said.

“In regards to transporting dangerous goods on the State’s roads, WA police officers have the same powers as a dangerous goods officer.

“By providing this training to WA Police, it means there are more eyes on the road looking for safety issues related to transporting dangerous goods.”

The training included an exercise where a range of heavy vehicles, including those transporting dangerous goods, were intercepted and assessed for non-compliance by the trainees.

“Several vehicles were intercepted on the day. One dangerous goods vehicle was taken off the road for significant non-compliances regarding roadworthiness and poor segregation of dangerous goods,” Miss James said.

“This training equips participants with the skills to enforce the Dangerous Goods Safety Act and associated transport regulations, and is an important part of ensuring safety on Western Australian roads.”

CONTRIBUTION OF DANGEROUS GOODS OFFICERS RECOGNISED

Principal Dangerous Goods Officers Kristin Priest and Peter Xanthis have been recognised by WA Police for their ongoing contribution to road safety. They were awarded Certificates of Appreciation from WA Police State Traffic Operations, Acting Divisional Superintendent Ian Clarke.

Resources Safety’s Ross Stidolph said that Kristin and Peter were making an important contribution to road safety in Western Australia in their role as dangerous goods officers.

“Every day there are thousands of vehicles transporting dangerous goods on the State’s roads,” Mr Stidolph said. “The work of Kristin, Peter and the entire Dangerous Goods Branch in education and enforcement has a significant impact on road safety in Western Australia.

“Their recognition also highlights the multi-agency approach that is so vital to road safety in this State.”

Ms Priest said that it was a thrill to be recognised and it meant a lot coming from such a respected agency.

“However, such recognition would not be possible without the support we receive from our colleagues,” she said.

Mr Xanthis said that he was also grateful for the recognition, which reflected on the good work by dangerous goods staff.

“Not only has internal support been critical, but also the support of organisations such as WA Police,” Mr Xanthis said.



TYC

*Standing (L-R): Andrew Chaplyn, Simon Bennison, Stephen Price, Martin Ralph, Gary Wood, Simon Ridge, Doug Brown (MIAC Secretariat)
Sitting (L-R): Chris Davis, Peta Libby, Adrienne LaBombard, Rob Watson
Absent: Greg Stagbouer and Glenn McLaren*

MIAC UPDATE

The Mining Industry Advisory Committee (MIAC) has met once since the last issue of *Resources Safety Matters*. Some matters considered at the November 2015 meeting were:

- *Isolation of hazardous energies associated with plant in Western Australian mining operations – guideline*

MIAC endorsed this guideline, which aims to assist mining operations to develop safe systems of work for fixed and mobile plant. It is structured to support a risk management approach to the isolation of hazardous energies.

- *Working in remote or isolated areas – guideline*

An outline of the proposed guideline was presented to the committee for comment. The Department will also invite comments from industry stakeholders, which will be incorporated into a final draft of the outline of the document.

- *Parliamentary inquiry into impact of fly-in fly-out (FIFO) work on mental health*

Views will be sought by the Mental Health Commission (MHC) on what research should be undertaken. A representative of the MHC will be invited to the MIAC meeting in late February to discuss issues arising from the inquiry's recommendations

- *Other discussions*

- Mental health strategy template
- There was a presentation on the hazards of nano diesel particulate matter (nDPM) in underground mining operations
- Mine safety statistics
- Amendments to the mine safety levy regulations

For more details on topics discussed and to view the action register, see the minutes of the meeting available at www.dmp.wa.gov.au/Safety/What-is-the-Mining-Industry-8578.aspx

INTRODUCING THE MINING INDUSTRY ADVISORY COMMITTEE

MIAC was reconstituted on 31 July 2015, with committee members appointed for a three-year term.

Simon Bennison – Industry member

Simon is Chief Executive Officer of the Association of Mining and Exploration Companies (AMEC) and has over 17 years' experience in the Australian mining and exploration sector. He has been a director on a number of companies and statutory authorities in Australia over the past 20 years.

Andrew Chaplyn – Government member

Andrew is the State Mining Engineer at the Department of Mines and Petroleum, which he joined in 2009. He brings over 26 years of professional experience in the mining industry.

Christopher Davis – Expert member

Chris has been in the mining industry for 48 years, working as a miner, mining engineer, and mine manager before taking corporate roles based in Perth.

He has been a Director of The Australasian Institute of Mining and Metallurgy (2012–2015), and is a Councillor of AMEC. He served on the Board of Examiners for 20 years.

Adrienne LaBombard – Industry member

Adrienne is a representative from the Chamber of Minerals and Energy of Western Australia and was appointed to manage its Workplace Health and Safety portfolio in December 2013.

Adrienne previously worked with the strategic policy team at the Department of the Premier and Cabinet. Prior to relocating to Perth, she worked in Human Resources at Dartmouth College, USA.

Peta Libby – Expert member

Peta is Managing Director of Digirock and is a geologist with 25 years' experience, mainly in mineral exploration in Western Australia. She is vice-chair of Earth Science WA which supports earth science teaching and engagement in schools, Chair of the AMEC safety committee, and a member of Geoconferences.

Glenn McLaren – Union member

Glenn has worked for the trade union movement for the last 18 years and is currently the Mining and Construction

team leader for WA Branch of the Australian Manufacturing Workers Union. He represents Unions WA and the AMWU on several committees, including the Construction Industry Safety Advisory Committee, the Resource Safety Training Council, and the Ministerial Advisory Panel on Safety Legislation Reform.

Stephen Price – Union member

Stephen is State Secretary of the Australian Workers' Union.

Martin Ralph – Expert member

Martin has been Managing Director of the Industrial Foundation for Accident Prevention (IFAP) since August 2001. Prior to joining IFAP, Martin had been a Special Inspector of Mines with the Western Australian Department of Minerals and Energy. He also spent several years with Western Mining Corporation (WMC).

Simon Ridge – Government representative and MIAC Chair

Simon is the Executive Director of the Resources Safety Division in the Department of Mines and Petroleum. He is a qualified geologist and mining engineer with over 40 years' experience in the resources sector. He has held various positions including supervisor, registered manager, consultant and regulator.

Greg Stagbouer – Expert member

Greg has over 25 years in the mining industry, including the last 15 in senior and corporate HSE roles, most recently with Anglo Gold Ashanti. He is a member of the Executive for the Safety Institute of Australia College of Fellows.

Rob Watson – Industry member

Rob is an industry member representing the Chamber of Minerals and Energy. His career in health and safety spans over 25 years in a number of industries and commodities, and includes senior corporate health and safety roles in mining companies over the last 15 years.

Gary Wood – Union member

Gary has been Secretary of the CFMEU (Mining & Energy Division WA District) since 1987. He was an original member of the Mining Occupational Safety and Health Advisory Board (MOSHAB) and has been a member of MIAC since its inception. Gary is also a member of the Ministerial Advisory Panel to the Minister for Mines and Petroleum.

SIGNIFICANT SRS ENHANCEMENTS COMING SOON

Significant enhancements to the Safety Regulation System (SRS) and updates to audit documents will be rolled out for the mining industry in the next few months. These reflect the Department of Mines and Petroleum's commitment to continual development.

To support these important changes, there will be a range of communication approaches to keep industry informed. These include:

- webinars, which will be made available on the Department's website
- flyers on specific subjects
- web help in SRS
- face-to face interaction with inspectors on site visits and at events (e.g. industry forums, Mines Safety Roadshow).
- updates through Resources Safety's weekly email news alerts and in *Resources Safety Matters* magazine.

Note: To sign up for email alerts or to subscribe to a hardcopy of the magazine go to www.dmp.wa.gov.au/Safety/Stay-in-touch-2402.aspx

Developments being rolled-out over the coming months include:

- **Audits update – scheduled February and March 2016**
A recent review of mining audit templates and associated guides has resulted in updated documents and additional new audits. Audits have also been renamed to make their purpose clearer. The updated templates and guidelines will be available on the Department website at www.dmp.wa.gov.au/Safety/Audits-16148.aspx

Also, the layout of the audit reports (provided to a mining operator after an audit) will change. The audit report will consist of two documents – an audit summary and the audit details. This change was implemented to improve the content and more clearly outline the key findings and recommendations.

- **'Site visit records' for inspections and audits – scheduled March 2016**

At present a record book entry is produced after inspecting a mine or exploration site to record the findings from the visit. It lists aspects such as the parts of the mine inspected, the nature of the inspection, defects observed, actions taken and any further actions that are required to be taken.

SRS is being upgraded so that it can act as the platform for raising and issuing these records of an inspection. These records will be named 'site visit records' (SVRs) and their purpose broadened to include:

- inspections
- audits
- investigation activities
- presentations and meetings that are conducted by inspectors on mine sites.

For consistency, the SVR will be based on a standard template, and may include hyperlinks, photographs and other attachments to add value and aid in communication.

The SVRs will be accessible in SRS, as are improvement and prohibition notices. Records can be issued via email to multiple people (e.g. registered, quarry, underground and exploration managers; safety and health representatives).

Registered industry users (who have the relevant security for the site) will be able to review defects and matters for actions arising from a visit to their site. The interface will also allow the user to view and update the status of these in SRS (e.g. advise when defects have been addressed and actions have been completed).

This change supports the vision of an integrated system approach where records, processes and communications are centralised and more readily accessible. Also, by making records of inspections and audits available electronically, the sole reliance on the hard copy versions of these important mine records is reduced.

- **Site name updates and restructuring in SRS – scheduled May 2016**

Site names used in SRS (i.e. each operation with an SG number) will be reviewed and information added. The SG number, however, will remain unchanged. This action will aid in the collection and analysis of data, facilitating data comparison across similar operation types.

The updated site name will indicate the primary operation type – open pit, underground, processing, construction, port or services (e.g. accommodation camp). Where applicable, the identifying company name (principal employer) will be removed.

The majority of users will only see an updated site name for their SG number. However, for some of the larger mines – for example, where there are significant underground, open pit and processing facilities – there will be a restructure in SRS and more than one SG number allocated. Any site likely to be allocated more than one SG number will be separately advised.

- **Business intelligence reports – future development**

The Department is working towards making information for each site accessible via a dashboard. The intent is to make available comparative (or benchmarking) safety information and performance trends over time. This will enable sites to compare their safety performance with industry averages, similar types of operations (e.g. all open pit operations), or operations mining the same commodity.



Freddie (left) and Alex (right) at the Jigalong community

At the entrance to the Jigalong Aboriginal Community



DANGEROUS GOODS OFFICERS VISIT JIGALONG

In July 2015, Resources Safety welcomed its latest dangerous goods officer, recruited through the Department's Aboriginal Employment Strategy (AES). After an initial three-month induction period, Alex Blackman began his dangerous goods officer training. Here Alex tells us about one of his first inspections.

On the 28 October 2015, I visited the Jigalong Aboriginal Community, 100 km east of Newman. The visit was part of a week-long trip to the area with Senior Dangerous Goods Officer Dean Cunningham, which was used as a combined inspection and training opportunity for myself as a new dangerous goods officer.

Owing to the spectacular lightning storm around Newman the night before, we were a little concerned we wouldn't be able to access the gravel roads that lead to Jigalong. Fortunately, the rain didn't reach the area and the drive turned out to be a relatively smooth two hours through some quintessential Pilbara landscapes.

Upon arriving in the community we were greeted by the CEO, John Machado, as well as community member Freddie. Also at the community, at our request, were representatives from the organisations responsible for the new power station that had recently been built – Graham McCafferty from the Housing Authority and Mick Burnett from Kimberley Regional Service Providers (KRSP).

The power station was an impressive addition to the community, and by all accounts, is making lives easier. With scarcely an issue with the power station, we then inspected the chlorine storage used for water treatment. Again, the storage was to standard with only a few minor issues to be followed up. Similarly, the dangerous goods stores were in line with Jigalong's overall approach – a developing and forward-thinking example of how a remote community can function.

We were well received by the community once the initial fear of officials visiting had subsided. Our visit was on a typically hot Pilbara day and most of the community members were indoors. Those who were out and about were friendly, accommodating and more than happy to assist us.

As part of my role through the AES program, I will be visiting Aboriginal communities throughout Western Australia and inspecting their dangerous goods stores.

My training will continue and I should be gazetted as a Dangerous Goods Officer in early 2016, at which point I will be qualified to inspect remote communities unescorted.



LICENSING AND REGULATION

INTRODUCING THE NEW BRANCH

As of December 2015, the licensing and regulatory support areas of Resources Safety are being restructured with the aims of improving customer service and increasing efficiency and effectiveness.

Philip Hine has been appointed for 12 months to the newly created position of Director Licensing and Regulation.

The driver for the restructure is the need to meet the ever-changing needs for administrative, regulatory and business support. This sits in the context of technological advances and opportunities, industry requirements, legislative reforms, and wider government policies (such as red tape reduction).

The new Licensing and Regulation Branch, which replaces the previous Support Services and Business Development Branches, comprises two sections. The Licensing and Data Section will provide dangerous goods licensing, incident and injury data, and levy auditing services. The Support and Development Section will provide stakeholder engagement, policy, business improvement, training and administrative services.

The main functions will include:

- dangerous goods licensing
- mines and petroleum safety incident data services
- safety communications
- legislative reform
- safety levy administration and auditing.

Ongoing monitoring and review of activities will identify whether additional functions are required, and how ongoing functions can be enhanced.

Consistent with the overall reform agenda at Resources Safety, the goal is to create a more flexible and innovative group while maintaining a focus on customers and results.

The detailed structure and resource allocations within the Branch will be developed over the next 12 months based on consultation with both internal and external stakeholders. Please keep an eye out for opportunities to contribute to this process.

Philip Hine
Director Licensing and Regulation



DANGEROUS GOODS AND PETROLEUM SAFETY

As we close out one year and move into another, there is an opportunity to reflect both on where we have come from and where we are heading.

For the petroleum sector, the continuing low oil price is not only impacting on exploration activities. As a regulator, we are always concerned if operating budgets are cut as this could affect the maintenance of safety-critical systems. Operators are reminded of their responsibility to effectively manage the critical safety aspects of their operations. Business conditions are not an excuse for practices that potentially put workers at risk, and history is littered with poor business decisions made in this area. We would challenge anyone that the normal variation in business cycle should take this into account.

To support this agenda, we will be continuing our focus on process safety management and safety management systems – leadership and accountability, training and competence, engineering controls and management of change.

With major new projects coming online during 2016 – and other sites looking toward significant life cycle extensions for aging assets – it is pertinent to refocus on the safety issues that historically have been impediments to the effectiveness of these projects. We should all take a moment to stop and step back, look at the errors of the past, and ask ‘How can we be better?’

Regulatory reform is also a hot topic at the moment with the first draft of the proposed bill being presented to Cabinet. To facilitate the development and implementation of the new

regulations, we will maintain our commitment to stakeholder engagement and continuous improvement.

For dangerous goods, a key focus for 2015 was the large inventories of chlorine and ammonia now located near residential areas. Several incidents involving the storage of chlorine (used for water treatment) saw emergency management response from the Department of Fire and Emergency Services (DFES) and Resources Safety. Inspectors have been concentrating on this area to ensure businesses are prepared for any eventuality and to minimise risk to both the business and public.

Particularly concerning are inventories of ammonia, mainly used for refrigeration. This has also been a focus to ensure incidents can be well managed and potential impacts minimised. It is in the interest of industry overall to manage this appropriately to prevent the loss of reputation, a move by clients towards a less hazardous product, and any potential for business relocation.

The Department welcomes interaction with industry. If businesses or workers have any concerns, please contact us. We would rather hear about issues now than have to potentially manage them after an incident.

Ross Stidolph

*Director Dangerous Goods and Petroleum Safety
and Chief Dangerous Goods Officer*

MINES SAFETY

MESSAGE FOR THE NEW YEAR

The costs of not building safety into the way a company does business are counted not just in dollars and cents, but in lives lost and changed forever.

In 2015, six people died while working at a mining or exploration operation in Western Australia. It is unacceptable for even one person to be killed while working, let alone six. We can and should do better. The highest priority on mining operations should be safe systems of work and applying appropriate risk management.

While the Department of Mines and Petroleum is committed to promoting and advocating workplace safety and health, as well as continuing its program of inspections and investigating incidents, the reality is the regulator cannot provide a 24/7 presence on the hundreds of operations in Western Australia. However, we do provide important, timely safety information.

In 2015, the Department released an analysis of serious injuries, which followed a similar analysis of fatalities. The key objective of these reports was to develop a better understanding of the injury risk profile of the State's mining industry. The aim is to work with industry to reduce the number and severity of injuries.

Both reports list three main hazards that if they were eliminated or adequately controlled, should see a reduction in the incidence of fatal and serious injuries:

- falling while working at height
- being in the line of fire for objects or suspended loads
- being struck or crushed by machines and heavy components.

Another risk identified in both reports involves low-frequency high-consequence events associated with mobile plant that typically result in either near-miss situations or serious injuries. Three of the top ten critical activities listed in the fatalities report involved:

- run-away vehicles
- vehicles over edges
- vehicle collisions.

Identifying and understanding hazards is paramount in the workplace. Applying appropriate risk management strategies and moving up the hierarchy of control is critical to improve safety outcomes. Job and task safety analyses should concentrate on critical tasks and activities where the risks are heightened.

Unfortunately, the industry appears not to be learning from past tragedies. To draw attention to what the data is telling us, the Department is using a variety of ways to communicate with the State's diverse mining operations. Three areas are being targeted:

- improving hazard awareness and control selection
- promoting the adoption of appropriate risk management strategies
- supporting effective leadership and positive cultural change.

Activities over the past year have included roadshows, a forum for registered managers, safety alerts, site presentations and toolbox presentations.

We have also presented targeted forums on structural integrity, exploration safety and responsibilities, radiation management plans and risk-based hygiene management.

The focus of the 2015 Mines Safety Roadshow was height – falling from height, working at height, rock falls, fall of ground – and recurrent incidents, and what can be done about them.

We also released two new hazard videos on the consequences of falling from height to coincide with the roadshows. One of the videos looks at the physics involved in falling. The other presents the human side of the equation, including the personal story of Natalie Bell, who lost her father Rene Ponce in a mining accident the day before his 60th birthday.

We are also committed to releasing the learnings from investigations as quickly as we can through Significant Incident Reports and Mines Safety Bulletins.

The Department launched its new website in November 2015. The content has been completely revamped so people can more easily access the information they need to know and the resources they can use to raise awareness of issues.

As a regulator, we try to raise awareness and seek compliance. However, the only way we can all make a difference and improve safety by ensuring each and every person involved in the mining industry takes their safety responsibilities seriously – whether they are an executive, manager, supervisor, worker or regulator.

Andrew Chaplyn

Director Mines Safety and State Mining Engineer

MARK YOUR DIARY

APRIL

12

**FORUM FOR ACCOMMODATION PROVIDERS
IN THE MINERALS INDUSTRY**
12 April, Perth

28

**CRITICAL RISKS: HUMAN FACTORS
INFORMATION SESSION***
28 April, Perth

MAY

13

**SURFACE MINE EMERGENCY RESPONSE
COMPETITION**
13-15 May, Kalgoorlie

www.cmewa.com

JUNE

08

AMEC CONVENTION 2016
8-9 June, Perth

www.amec.org.au/events

JULY

27

CME SAFETY AND HEALTH CONFERENCE
27-28 July, Perth

www.cmewa.com

AUGUST

09

CENSUS OF POPULATION AND HOUSING
9 August, Australia wide, including remote
mining sites

www.abs.gov.au

OCTOBER

01

SAFE WORK AUSTRALIA MONTH 2016
All of October

www.safeworkaustralia.gov.au

10

**13TH AUSIMM MILL OPERATORS'
CONFERENCE 2016**
10-11 October, Perth

www.ausimm.com.au

04

2016 MINES SAFETY ROADSHOW*
4 October, Kalgoorlie
5 October, Leonora
11 or 12 October, Newman (two sessions)
13 October, Tom Price
18 October, Karratha
19 October, Port Hedland
25 October, Bunbury
27 October, Mandurah

NOVEMBER

01

2016 MINES SAFETY ROADSHOW*
1 November, Geraldton
3 or 4 November, Perth (two sessions)

15

**9TH AUSIMM OPEN PIT OPERATORS'
CONFERENCE 2016**
15-16 November, Kalgoorlie

www.ausimm.com.au

**UNDERGROUND MINE EMERGENCY
RESPONSE COMPETITION***
TBA, Kalgoorlie

THE MERC
26-27 November, Perth

www.themerc.com.au

**Provisional – event to be confirmed*

The events listed are either presented by the Department of Mines and Petroleum or involve Resources Safety as presenters or exhibitors.

Departmental events are provisional until registration details are released. For the latest information, visit www.dmp.wa.gov.au/Safety/What-is-happening-16167.aspx or use the QR link.



Forum for accommodation providers in the minerals industry

A free information session

Perth

Tuesday, 12 April 2016

Hyatt Regency Hotel
99 Adelaide Terrace,
East Perth

Who should attend?

Owner operators and contractors providing accommodation facilities and/or personnel are encouraged to attend this information session organised by Department of Mines and Petroleum's Resources Safety Division.

What is it about?

This free session will:

- overview the new mining infrastructure checklist for auditing villages
- describe how to apply the hierarchy of control when addressing risks
- discuss health and safety obligations for accommodation villages and exploration camps.

It is also an opportunity to network and a chance to meet with mines inspectors.

Program

Time	Topic
7.30 am	Registration
8.00 am	Why are we here? <i>Data analysis, complaints, new legislation</i>
8.40 am	Camp OSH <i>Office, management (including traffic), training and competency</i>
9.20 am	Camp OSH <i>Store/cool rooms, kitchen, workshops, general</i>
10.00 am	MORNING TEA
10.30 am	Infrastructure
11.10 am	Electrical
11.50 am	Mechanical
12.30 pm	Closing remarks
12.45 pm	Close

How do you register?

- Although there is no registration fee, pre-registration is required to reserve a place.
- Registration must be completed by emailing RSDComms@dmp.wa.gov.au indicating your name, company, contact details and any special requirements (e.g. dietary or other).
- Early registration is recommended. Late registrations (i.e. less than one week before the event) are subject to availability and a place is not guaranteed.
- If you register and subsequently are not able to attend, please advise us as soon as possible at RSDComms@dmp.wa.gov.au
- Morning tea will be provided.

Find the latest event information at
www.dmp.wa.gov.au/events



TW

Geraldton

SPREADING THE MINES SAFETY MESSAGE

Resources Safety is committed to communicating key safety messages to industry. For eleven years, the Mines Safety Roadshow has been one of the Department of Mines and Petroleum's most important events to raise industry awareness of safety issues and mines inspectorate concerns.

The theme of the 2015 roadshow was height, specifically falling from height (the number one cause of injuries and fatalities in the mining industry), working at height, rock falls, and fall of ground. The event narrowed in on the risks associated with height and the selection of appropriate controls.

In all, 550 industry stakeholders attended 11 sessions in eight locations across the State – Bunbury, Geraldton, Kalgoorlie, Karratha, Mandurah, Newman, Perth and Port Hedland. The number of sessions at some locations was increased to better accommodate industry interest while allowing improved interaction between participants.

Survey feedback indicated that sessions were well received by most participants, and they came away from the event with an increased knowledge and understanding of the topics discussed.

The program commenced with the Minister's recorded welcome followed by the state-of-the-State address and an update on proposed legislative changes.

Two additions to the *Know Your Hazards* awareness video series were debuted during the event. The *Down to Earth* videos aim to raise awareness of the hazards associated with height. The technical video *Falling from height* explained why a fall can harm the human body. *Impacts of falling* explored the personal costs to Western Australian miners and families of falls from height. This was communicated through the honest accounts of people who have experienced such an incident,

or suffered the wider repercussions. We thank Rob Jenkins, Lance Priestly and Natalie Bell for sharing their stories.

The interactive workshops were an integral feature of the program, aimed at stimulating discussion and promoting audience communication.

Four workshops were held. One guided participants through the process of incident investigation. The other three sought input on:

- strategies likely to improve safety outcomes
- falling from heights and the concerns and limitations of current controls
- how industry and the Department could work collaboratively to share with frontline workers the learnings from previous incidents.

The findings from these workshops have been collated and analysed, and the findings are presented here for industry to use when developing safety systems and strategies to improve outcomes. The openness of those who participated in these sessions is appreciated, and the feedback will also help inform the Department's future strategies. Some common themes of concern have emerged in regards to the workplace in general. These are:

- safety culture – poor consultation, communication and involvement
- lack of investment in safety
- competency of workers at all levels
- ineffective management and supervision
- application of the hierarchy of control.

Issues identified specifically relating to falls from height were mainly about the design of fixed and mobile plant, quality of fit-for-purpose equipment, and the working environment.



Bunbury



Port Hedland

TW



WHAT NEXT?

Planning for the next Mines Safety Roadshow has commenced. It will tackle incidents where people are crushed, or caught between or against. The 2016 event will include the release of new videos addressing this theme. There will be the usual state-of-the-State address and an update on proposed legislative changes.

The 2016 Mines Safety Roadshow will travel to ten locations, with Tom Price and Leonora added to the itinerary. We hope this initiative is supported by increased industry participation.



DOWNLOAD THE VIDEOS NOW

The hazard awareness videos, shown at the 2015 Mines Safety Roadshow have been released.

The videos *Down to Earth: Falling from height* and *Down to Earth: Impacts of falling* are the latest in the Department of Mines and Petroleum's *Know Your Hazards* video series. Developed for the Western Australian resources industry, the series aims to help workers and supervisors identify potential hazards in the workplace.

The videos are available for sharing or download from vimeo.com and may be distributed for educational purposes.

To download your free copy, visit the Department's website at www.dmp.wa.gov.au/HazardVideos

WORKSHOP ON CONTROLLING RISKS ASSOCIATED WITH WORKING AT HEIGHT

While the investigation of accidents is generally seen as a reactive process, an appropriate accident investigation can be a proactive and effective way to prevent work-related injury. This can be achieved by understanding the lessons learnt and implementing effective controls.

Workshop participants were given the opportunity to carry out an investigation into a fictional incident. The aim was to help improve the investigative process within industry.

Participants were presented with the accident scenario and guided through a simple investigative process. Photographs of the accident scene were provided along with a matrix for gathering evidence, identifying the causal factors, and determining the actions and controls required to prevent recurrence.

To assist companies with internal investigations, the matrix can be download from the mining templates section at www.dmp.wa.gov.au/SafetyDocs



Newman



Karratha

“WHY AREN’T WE LEARNING?” WORKSHOP

Participants at the 2015 Mines Safety Roadshow were asked to consider strategies likely to be successful in improving safety outcomes. The themes identified in all the sessions are listed below in order of frequency.

Q. What strategies will produce the best safety results?

- Cultural change to build mutual trust and promote team-building and a positive safety culture
- Consultation between management, safety and health representatives and the workforce in developing and implementing safety solutions
- Improved competence through:
 - appropriate, ongoing and relevant site and job specific training
 - using competent training providers (not online systems)
 - training in hazard awareness and risk management
 - frequent review, re-training, and reassessment of competencies, including verification of competency (VOC)
 - a recruitment strategy based on knowledge and competence
- Effective, clear, open and honest communication at all levels
- Active and positive leadership where supervisors and management:
 - lead by example, demonstrating strong values towards safety and health (i.e. ‘walk the talk’)
 - provide visible and effective ‘boots-on-ground’ supervision
- Prioritising safety over production
- Developing frontline leaders through adequate and appropriate training (and mentoring) in leadership and competency
- Hierarchy of control – investing in higher-order controls (i.e. elimination, substitution and engineering)
- Promote safety ownership and accountability, empowering all levels of the workforce
- Sharing the lessons learnt from previous incidents
- Strong (no blame) reporting and consultative and effective incident investigations to determine root causes
- Investing in safety by providing sufficient and appropriate resources (e.g. time, financial resources, equipment and tools, people, training)
- Recognise safety improvements
- Improve fitness, strength and wellbeing of workers, including redesign of work rosters and fatigue management
- Keep safety simple
- Corrective actions that are implemented and monitored to determine their effectiveness

The same question was asked at the inaugural Registered Managers’ Forum held in August 2015. A comparison of the results suggests that workers and health and safety representatives share the safety concerns of registered managers. Common themes are:

- Involvement of the workforce in developing and implementing safety solutions
- Competence – training and education of workers
- Developing frontline leaders
- Visible leadership and supervision (‘boots-on-ground’)
- Promote accountability for all
- Recognise ‘good culture’
- Communication
- Sharing the lessons
- Building trust
- Corrective actions implemented and monitored



Kalgoorlie



Mandurah

TW

WORKSHOP ON RECURRING EVENTS

This open-microphone session posed the question of how to get safety messages to frontline workers. Participants were asked to consider ways to ensure that shared learnings were passed on. They expressed concerns for the current situation and made suggestions for improvement by both industry and the Department of Mines and Petroleum. The discussions are summarised below.

Q. How do we share the learnings from previous incidents with frontline workers?

Some attendees expressed concern for the safety culture at their workplace, with a perception that management was unaware of the actual culture at the frontline. After initially promoting safety, supervisors would then make comments such as 'go hard or go home' or 'production comes first then we will worry about safety'.

It is important for management to support a positive safety culture and be aware of how, and if, the information is being passed on. Often, if information is not thought to be relevant, management and supervisors do not pass it on.

There were concerns that, due to challenging economic times, safety can be negatively affected. While companies are cutting back on costs and personnel, the same level of productivity (or greater) is expected from workers. It was felt that re-iterating the personal costs (linking safety to family) would help to remind workers about working safely so that they go home unharmed.

A need for increased engagement between industry and the Department was identified. In particular, an increased management presence at the Mines Safety Roadshows, and site visits by Departmental personnel were identified as actions to pursue.

Concerns were raised regarding current induction and training processes, which appear to be more about reading and signing off on procedures rather than

demonstration, instruction and reinforcement. New workers to the industry and sites are not receiving information about previous incidents, the reasons why policies and procedures are in place, and what the potential consequences of non-compliance are. It was suggested that videos to show the consequences of incidents could be included in inductions, and pre-starts should be more informative.

There was a concern about the timing of safety meetings where toolbox presentations, safety, and pre-start meetings are generally held at the start of the shift when workers are, perhaps, not at their most receptive. Audiences felt that the message at these meetings could be lost. It was suggested that the timing of meetings, presentations and shared learnings could be scheduled for when the workers are more likely to be alert and responsive.

Suggestions for reaching a wider demographic of the workforce included using social media, email alerts and information packs to distribute to sites. Some workers may not have access to electronic media in the course of their work. It is important that learnings are shared through supervisors, safety and health representatives and management, and in a variety of formats (e.g. hardcopy posters, alerts and toolbox presentations).

Participants requested that when the Department releases a significant incident report or safety bulletin, these are accompanied by a presentation package. Suggestions for the package contents included:

- a slideshow presentation
- why the incident could be related to workers in other areas
- a single-page flyer with photo
- a video
- other presentation information to help transfer safety information to workers.



Perth



Geraldton

TW

WORKSHOP ON CONTROLS (FALLING FROM HEIGHT)

This workshop looked at controls to prevent falls from height. Two questions were posed to workshop participants – “What concerns do you have on your site?” and “What are the limitations to the existing controls?” Feedback indicated an overlap in themes, and for this reason responses were combined.

Six broad categories were identified and have been listed reflecting the volume of response, from highest to lowest – investment in safety, competency, inadequate plant and equipment, safety culture, transparency consistency and quality, and work environment.

The categories of inadequate plant and equipment and work environment tend to be more specific to the workshop theme. The other categories mostly reflect broader concerns in the workplace.

Investment in safety ('The low-cost option')

- Lack of resources (e.g. financial, planning, time) allocated for high-level controls, training, fit-for-purpose equipment and tools, and maintenance
- Inadequate staffing levels (including emergency response teams and qualified spotters)
- Insufficient time allocated for planning, tasks, and implementation of change
- Supervision – inexperienced supervisors with a lack of understanding of risks, hazards and legislative obligations
- Limited 'boots-on-ground' supervision
- Hierarchy of control – implementation of an inadequate level of controls with a reliance on low-level controls (administrative and personal protective equipment)
- Production prioritised over safety
- Communication and consultation – inadequate time and financial resources devoted to the development of clear procedures and guidelines.

Competency across the entire workforce

- Inadequate, infrequent and poor-quality training and induction of workers at all levels
- Inconsistent verifications of competency (VOCs) and a lack of currency
- Lack of experience resulting from a high turnover of skilled workers
- Poor familiarity with machinery due to inconsistent use
- Hazard and risk awareness – poor understanding of risk assessment, release of energy and the consequences (e.g. low-level heights are not recognised as high risk)
- Complacency around routine tasks
- Management:
 - lacking knowledge, experience, training and accountability
 - complacency and managers not leading by example
 - being reactive rather than proactive
 - poor understanding of legislative obligations and incident under-reporting
 - unwillingness to discipline safety breaches

Inadequate plant and equipment

- Plant not designed to Australian Standards
- A lack of initiative and innovation in the design of fixed and mobile plant (engineering controls), including insufficient or inadequate anchor points, ladder access, barricades and guarding
- Inconsistent design of mobile plant and the accessibility of isolation points
- Fit-for-purpose equipment – unavailable, not used when available, not properly maintained
- Suitability and practicality of fall arrest equipment, and absence of short-fall equipment



SH

Perth



Newman

TW

Safety culture

- Collective behaviours:
 - a persistence of the 'old' safety culture and a 'she'll be right' attitude, including peer pressure and resistance to change
 - taking shortcuts and risks not taken seriously
 - a lack of consistency and accountability
 - under-reporting of incidents
- Individual behaviours:
 - workers not following procedures, making poor decisions and taking shortcuts
 - poor housekeeping
 - workers being distracted and inattentive
 - workers not maintaining three points of contact

Transparency, consistency and quality

- Inconsistent and poor quality policies, processes and procedures between sites. This includes generic JHAs, JSAs and SWIs that are not standardised, reviewed or updated.
- A lack of availability, understanding or implementation of policies, processes
- Overcomplicated procedures that are inadequate to ensure the workers' safety, particularly with respect to change management
- Non-compliance with procedures and inadequate tagging of equipment (e.g. out-of-service)
- Inadequate and infrequent inspections and audits, with undetected failures and lack of compliance of equipment
- Lack of competence of those inspecting the equipment

Work environment

- Ground conditions, rock falls and unrecorded voids
- Objects above
- Working on rills
- Working over water
- Ladders and structures

Respondents also expressed concerns about:

- seismic events, weather conditions and unusual and unpredictable circumstances
- working in special circumstances (e.g. remote locations, wet surfaces)
- lack of maintenance
- poor lighting



DC

Mines Inspectors Stuart Erskine (left) and Chris Gamble (right) at the Department's booth at DrillFest 2015

DRILLING DOWN TO GREATER SAFETY

The evolution of safety in the drilling industry has been highlighted in a presentation to industry by the Department of Mines and Petroleum.

Mines Inspectors Chris Gamble, Stuart Erskine and Dean Crouch were invited by the Australian Drilling Industry Association (ADIA) to deliver a joint presentation at DrillFest 2015, an event held in Perth on 21 and 22 October.

“Safety standards in the drilling industry have lifted immensely in recent years,” Mr Erskine said.

“From the use of personal protective equipment and dust suppression, to automatic drill rod handlers and drill rod guards, there has been a considerable focus on raising safety standards in the drilling industry.”

Part of the presentation looked at previously accepted standards and the contrast when compared to standards today.

“The safety standards back in the 1980s and 1990s are so very far removed from what is acceptable today,” Mr Erskine said.

“In one slide there is a photo of a couple of drillers working under a suspended load at height with no personal protective equipment other than boots. This was seen as acceptable in the 1980s and, unfortunately, a number of workers paid the price for the low safety standards.

“Thankfully, this is a thing of the past. There are now many proactive safety initiatives around the drilling industry. Almost every month something new is being developed to improve safety and protect workers.”

Mr Erskine said that a continued commitment to climbing the hierarchy of control has also been embraced by the drilling industry.

“Enormous progress has been made over the past five years,” he said. “It is important to remain vigilant, continue to build on this work, and make further progress towards the aspirational goal of zero harm.”

DrillFest 2015 included more than 50 exhibiting companies, a live demonstration area, product launches and workshops.

WHAT DID THEY SAY?

The drilling industry is a cornerstone of mining. Safety in the drilling industry has progressed significantly compared to the practices of the 1980s and 1990s. As the mining industry evolves towards a resilient workplace culture, how can the regulator, drilling and mining industries work together towards the aspirational goal of zero harm?

To move towards a safer working environment, it is vital to understand the legal responsibilities that a company has under the Western Australian mines safety and inspection legislation. This includes understanding obligations towards:

- accident and incident reporting
- training, competency and provision of equipment
- plant
- provision of information regarding earth disturbing operations.

Another facet is the development of safe systems of work to manage risk. This should consider four aspects of the workplace – competency of workers, safe work practices, use of fit-for-purpose equipment, and a controlled work environment.

Risk management is an integral component of good management and governance. This iterative process enables continual improvement in decision making.

The risk management approach can be supported by:

- undertaking risk assessments
- analysing previous incidents – company and industry as a whole
- using resources and information (e.g. codes of practices, technical standards)
- consulting with workers and others in industry.

By developing a regular communication plan for both workers and clients, a safer work culture can be fostered across as well as within businesses, achieving safety awareness as well as compliance.

Three toolboxes based on the DrillFest 2015 presentation can be downloaded from the Department's website www.dmp.wa.gov.au/MSToolboxes

THE BAD OLD DAYS



FLUORO – SEARCHING FOR A BRIGHTER FUTURE

Over two days in November IFAP (Industrial Foundation for Accident Prevention) hosted the Fluoro Conference 2015 in Perth. The conference on occupational safety and health was held in conjunction with the annual gathering of International Network of Safety and Health Practitioners Organisation (INSHPO). This was the first time that Western Australia has hosted the annual gathering of INSHPO.

With fellow member organisations, the Safety Institute of Australia (SIA) and the New Zealand Institute of Safety Management (NZISM), key international safety leaders from all sectors were invited to contribute to the proceedings of the conference. This provided a rare opportunity for Australian business and safety leaders to exchange experiences and views with some of the leading safety thinkers in the world. Attendees gained significant insights into how to accomplish international best practice in occupational safety and health performance.

The conference focussed on the key themes of harmonisation and competency. Presenters from the Department of Mines and Petroleum spoke on the results from the recent review of fatalities and serious injuries in Western Australian mining, and the overview of the State's proposed new safety legislation and what it will mean for industry.

Alan Holmes, a lead technical investigator at the Department, presented the findings of the fatalities and serious injuries reviews. He commented that the conference had confirmed for him that people in different sectors and around the world face similar issues in making the next step-change in safety outcomes.

"We are further down the road in understanding the issues and working on solutions," said Mr Holmes. "New approaches to regulation, will be supported by the new legislation which enhances the general duty concept with safety systems and risk-based processes."

Andrew Chaplyn, Director Mines Safety, discussed the innovative approaches to safety regulation being used by the mines inspectorate to improve outcomes. The changes in approach towards safety were echoed by the keynote speaker who followed, Judith Hackitt, Chair of the Health and Safety Executive (HSE), United Kingdom.

Judith Hackitt spoke on how to improve an existing and effective health and safety framework for businesses through motivation, help and communication. Key areas of importance are an effective regulatory framework and regulator, proportionate regulation, effective communication including different modes of communication (e.g. using different media and targeted campaigns based on research), and, above all, making things as straightforward as possible.



Department of Mines and Petroleum's Director Mines Safety, Andrew Chaplyn, and HSE Chair Judith Hackitt

AIOH PERTH



iGiene inspire · integrate · inform



Principal Dangerous Goods Officer Lawry Lim leading a continuing education seminar

OCCUPATIONAL HYGIENISTS GATHER IN PERTH

The Australian Institute of Occupational Hygienists (AIOH) held its 33rd annual conference and exhibition in Perth over five days in December 2015. Over 500 professionals from around the globe were brought together to discuss the science and practice of protecting the health of workers. The theme of AIOH2015 was set around three key principles – inspire, integrate, inform.

The program comprised a number of keynote international and domestic speakers and was supported by site visits and continuing education seminars catering for all levels of professional experience.

Representatives from the Department of Mines and Petroleum spoke at the conference. Director Mines Safety Andrew Chaplyn presented a plenary session on the consolidation and modernisation of the safety and health legislation for mining, petroleum and major hazard facilities in Western Australia.

“As the adoption of a risk-based approach to health and safety increases and new technology is introduced, legislation for the minerals sector needs to be less prescriptive and more adaptable to change,” Mr Chaplyn said.

“While some safety and health risks are unique to each industry sector, there are common elements. With this in mind, the Department identified an opportunity to streamline and simplify the legislative structure.”

Principal Dangerous Goods Officers Lawry Lim and Peter Xanthis hosted a continuing education seminar on dangerous goods. Their session highlighted some of the risks when transporting dangerous goods, as well as basic principles for safe storage and handling. Case studies were discussed and activities undertaken, such as inspecting a vehicle transporting dangerous goods.

“The seminar was well received by participants. A number commented on the relevance of the session to their immediate roles and responsibilities within their organisations,” said Peter Xanthis.

“There was particular interest in the dangerous goods incidents and investigations that Lawry Lim and I have been involved in during our careers at the Department.

“The incidents provided an important reminder about some of the potential consequences when working, transporting or storing dangerous goods. It also highlighted the importance of dangerous goods safety and the safety lessons such incidents can provide,” said Mr Xanthis.

The presence of the Resources Safety booth provided an opportunity for attendees to meet dangerous goods and mines safety staff.

“Inspectors were there to answer technical questions from attendees. The television display showing dangerous goods incidents was a hit and so were the complimentary USB sticks with the safety acts, regulations and codes on,” said Mr Xanthis.



IMPROVING EMPLOYEE ENGAGEMENT

YOUR SAFETY AFFECTS MORE PEOPLE THAN YOU REALISE

Many companies are working hard to provide an environment that supports positive workplace cultural change in the workplace. Mines inspector Aaron Graham has seen such an example at Newmont's Boddington mine site, where leadership is listening and responding to the concerns of their safety and health representatives (SHRs) regarding communication. This has seen positive safety outcomes on site.

A simple change in the frequency of the regular site safety committee meetings to accommodate work rosters, and an increase in accessibility to the registered manager through more frequent meetings has allowed SHRs to better represent the safety and health interests of workers. Regular feedback can now be provided to work groups on corrective action progress.

The registered manager meetings have opened the lines of communication between managers and employees, providing an open forum to promote quicker action and feedback mechanisms. This has enabled the group to identify the underlying concerns of the workforce, and allowed some

larger outstanding safety concerns to be tackled through better transparency.

"Such initiatives demonstrate to the SHRs and workforce that the registered manager is serious about improving safety on site," says mines inspector Aaron Graham.

"It makes people more accountable for ensuring actions are completed. When workgroups see that change is possible, their mindset moves towards finding other ways to improve safety on site."

One of the outcomes of Newmont Boddington Gold's commitment to promoting a positive safety culture has been the continual improvement in the site's injuries statistics over time. Aaron said that while this could not be attributed to one single factor, the weekly meeting "has definitely helped to empower the SHRs and improve the safety culture. The registered manager mentioned that instead of being in a reactive cycle, more time was now available to check the robustness of controls and work behaviours."

"All workplaces should aspire to have a resilient safety culture. Consultation, communication and participation are critical to make the changes required to achieve this."



Photo courtesy Newmont Boddington Gold

Left to right: Safety and health representatives Rachel Waters (Technical services), Casey Dawson (Engineering) and David Woods (Dry plant mechanical) with Melissa Walters (Safety superintendent) and Chris Start (Processing manager)

Here Chris Start, Newmont Boddington Gold's Processing Manager, describes some of the initiatives implemented to better engage with employees and improve communication and consultation.

Newmont Boddington Gold, the owner of Australia's largest gold mine (>700,000 ounces of gold and 70 million pounds of copper per year), is striving towards the goal of a workplace that is free of injuries and occupational illness. To achieve this, leadership is focusing on the areas of:

- fatality risk management
- health and safety leadership
- workplace safety behaviours
- employee engagement.

The success of this approach has been seen in a significant reduction in the number of injuries as well as a decrease in their severity.

In the Boddington processing plant – which has a workforce of around 350 people and up to 1,200 contractors during a shutdown – we are endeavouring to improve employee engagement. This is being achieved by empowering health and safety representatives, providing leadership

accountability, and creating a direct 'line of sight' between safety and health representatives, and key department and health and safety leaders.

One initiative employed to support these goals has been to increase the frequency of our department's safety and health representative and leadership meetings from monthly to weekly. In the past, the monthly meetings only allowed the safety representatives on shift work to attend these meetings every four months, but now every safety representative is able to attend at least once per month.

The increase in contact has resulted in a more timely response to health and safety concerns, improved follow-up of these concerns, and greater engagement. This approach has also increased the interaction between safety and health representatives from various teams (e.g. process operations, electrical, dry and wet plant mechanical and contractors) and multiple departments (e.g. processing operations and asset management).

In addition to the department meeting, a site-wide health and safety committee meeting is held, which is led by the site's general manager. This too allows interaction between representatives and leaders from other areas of the operation, and the sharing of ideas and learnings.

DEPARTMENT RELEASES COMPLIANCE POLICY FOR MINES SAFETY LEVY AUDITS

At the November 2015 meeting of the Mining Industry Advisory Committee (MIAC), members were briefed on a new Departmental policy allowing for a measure of tolerance in the number of hours worked reported by operators. The meeting was told the single biggest issue encountered by many operators is how to deal correctly with travelling hours in fly-in, fly-out (FIFO) working arrangements.

Options were explored and legal advice sought when developing the administrative instrument, which allows for a tolerance not exceeding 2 per cent, or \$100 (whichever is the greater). The tolerance level applies to both under- and over-reporting of levy hours.

The margin was established using other legislative frameworks as a guide, and modelling (based on a number of sites considered to be indicative for industry).

The tolerance for over-reporting does not prevent a principal employer from seeking a refund, if so desired. Refunds will be provided if the principal employer resubmits the relevant hours for the period using the reporting system provided by the Department.

The tolerance policy does not however dispense with the option of prosecuting instances of under- or over-reporting. Non-compliance will be treated on a case-by-case basis. Auditors will assess whether records provide complete information or there are gaps in the reporting process. Gaps in the reporting process will generally be considered a breach of the regulations. Gaps may include:

- travel time for workers
- hours averaged (instead of actual)
- not reporting working visitors.

The auditing approach is firstly to seek and foster voluntary compliance, and encourage and assist mine sites to comply with their obligations.

AUDIT

LEVY AUDITORS APPOINTED AS SPECIAL INSPECTORS

The scope of work for levy auditors has expanded with their appointment as special inspectors under the *Mine Safety and Inspection Act 1994*. This allows auditors to check the completeness and accuracy of data and information reported by industry participants under the Act and Mine Safety and Inspection Regulations 1995.

The appointments are a proactive step to improve the quality of information reported across the sector – such data is used in decision making, reviewing and reporting safety performance and safety issues.

SMALL OPERATOR INNOVATION IN COLLECTING LEVY HOURS

A recent levy audit revealed how technology can assist small operators in collecting and maintaining levy hours that comply with the Mines Safety and Inspection Levy Regulations 2010.

A principal employer decided to utilise the tablet on their mobile plant, normally used to record production information, to also record levy data.

The plant operator keys in the required information (e.g. date, time spent on site, name of operator) and, at the end of the shift, the information is sent electronically to the company's head office.

A report is then generated displaying all the information provided by each site. This can be transferred to a summary report and the levy hours easily reported to the Department.

PROVISION OF SUPPORTING DOCUMENTATION

A recent levy audit highlighted the need to remind operators that auditors must be able to verify any data used to support levy hours. For example, if payroll reports are used to complete a site's monthly returns then these reports must be made available for audit.

In this instance, the auditors were provided with a copy of a spreadsheet where supporting details had been blanked out. This left only the total hours worked for the month. Confidentiality was cited as the reason for the deletion of information.

Duty holders are reminded that under r. 37 of the Mines Safety and Inspection Levy Regulations 2010, auditors may do the following for investigation purposes:

- enter, inspect and examine any place
- inspect, examine, copy and take possession of any document or thing
- require a person to answer questions and provide information
- require a person to give reasonable assistance.

REMINDER TO MINING OPERATIONS – ARE YOUR SRS RECORDS UP TO DATE?

The SRS System records information about your mine site. If there are any changes made at your side, SRS should reflect these changes.

So keep your records up to date and make sure that information in SRS is updated whenever any change is made. These includes: when a statutory appointment changes or ceases; when your street address or postal address changes and when the contact details change.



COMPLIANCE ISSUES WITH SERVICE PLATFORMS FOR FIXED CRANES

The Department of Mines and Petroleum has identified a trend of non-compliance in the mining industry regarding service platforms. Some crane manufacturers are giving clients the option of fixed service platforms, or no service platforms on bridge and gantry cranes, with an associated cost saving.

Where no service platforms are provided, Section 7 *Access from mobile platforms* of Australian Standard AS 1418.1 *Cranes, hoists and winches – General requirements* is cited as being complied with. This is despite numerous other notes in the Standard, one of which states:

“Mobile platforms are generally more suitable for servicing of single girder cranes or double girder cranes with underslung crab than other types of cranes.”

When parts of a crane are serviced, the use of an elevated work platform (EWP) can introduce the risk of damage to equipment by clashing with fixed structures, as well as injuring workers. In recent times, EWPs have become the 'solve it all solution' on many mine sites. More suitable means are possible, but with an added short-term costs.

An example of the inappropriate use of an EWP is in the servicing and maintenance of most top-mounted crabs on double bridge cranes. The parts to be worked on are often inboard of the bridge beams, or from the sides of the crab between the beams.

When inspecting a winch drum, for example, the rope is usually run out to check the drum and rope for wear and damage. If this area is inspected using an EWP, the operator would be in the direct line of the crab should it move. Further, to observe these parts or make adjustments, personnel would need to lean out of the EWP's platform. These are both unacceptable risks, making the use of an EWP to service such areas and parts inappropriate.

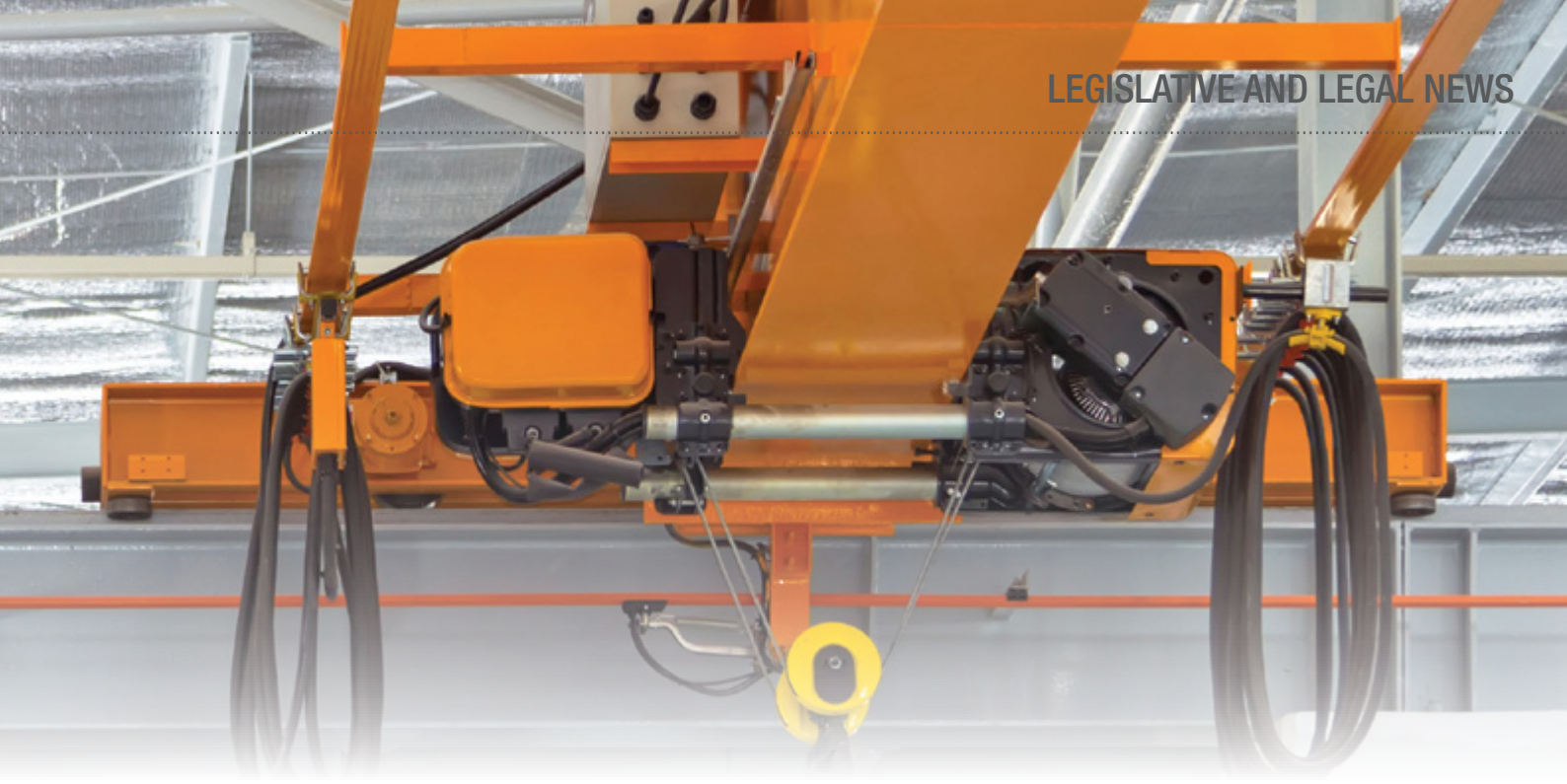
Another less known requirement is for fixed platforms to access and maintain switchboards. Clause 8.2 of AS 1418.1 requires:

“The electrical installation, including materials, equipment, wiring and their installation shall comply with AS/NZS 3000...”

AS/NZS 3000 *Electrical installations*, also known as the Australian New Zealand Wiring Rules, in turn requires access as defined by Clauses 2.1.2, and 1.4.2. A switchboard is defined in Clause 1.4.91 (see breakout box).

Due to the above, all fixed crane applications submitted to the Department for registration will receive additional review regarding service platforms. Inspectors will also be looking at cranes and switchboards in the field to identify areas of non-compliance and may issue notices of improvement.

Designers, manufacturers, suppliers, installers and maintainers of cranes are also reminded of their duties to minimise the risk of exposure to harm, as far as is practicable.



CLAUSES FROM AS/NZS 3000

2.1.2 Selection and installation

Switchgear and control gear shall be selected and installed to perform the following functions or have the following features associated with the proper design, correct construction and safe operation of the electrical installation:

- (a) Provide control or isolation of the electrical installation, circuits or individual items of apparatus as required for maintenance, testing, fault detection or repair.*
- (b) Enable automatic disconnection of supply in the event of an overload, short-circuit or excess earth leakage current in the protected part of the electrical installation.*
- (c) Provide protection of the electrical installation against failure from overvoltage or under voltage conditions.*
- (d) Provide for switchgear and control gear to be grouped and interconnected on switchboards, enclosed against external influences, and located in accessible positions.*

- (e) Separately control and protect the circuit arrangements without affecting the reliability of supply to, or failure of, other parts of the installation.*

1.4.2 Accessible, readily

Capable of being reached quickly and without climbing over or removing obstructions, mounting upon a chair, or using a movable ladder, and in any case not more than 2.0 m above the ground, floor or platform.

1.4.91 Switchboard

An assembly of circuit protective devices, with or without switchgear, instruments or connecting devices, suitably arranged and mounted for distribution to, and protection of, one or more submains or final sub-circuits or a combination of both.

PHASE 4 DANGEROUS GOODS SAFETY REGULATION AMENDMENTS

A number of amendments to the dangerous goods safety regulations came into force on 5 February 2016. The amendments aim to reduce red tape; update, clarify and streamline regulatory requirements; and support the Department's Digital DMP program.

Many of the changes were proposed in the statutory review of the *Dangerous Goods Safety Act 2004* that was conducted in 2014. Others have arisen as part of the Department's ongoing review of technical and administrative practices.

A detailed summary of these changes is available on the Department's website as a dangerous goods safety information sheet. The key changes are described below.

RED TAPE REDUCTION

The most significant change is the introduction of automatic recognition of interstate licences for:

- explosives drivers
- shotfirers
- fireworks operators
- pyrotechnics (special use) operators.

This removes the need for people who wish to operate in Western Australia with these types of licences to apply for a local licence by mutual recognition. It also reflects the approach taken for dangerous goods drivers.

Interstate licence holders will be able to operate in the State subject to the same restrictions that apply to their licence in the original jurisdiction – as long as that licence is supported by a security clearance.

This change is supported by removing the need to obtain a dangerous goods security card if the holder of an interstate equivalent moves to Western Australia. The interstate security clearance may now be used until it expires.

Other initiatives are listed below.

- The rules for ammunition and black powder have been changed to remove inconsistencies and better align with changes to firearms legislation. Ammunition is now entirely dealt with by the WA Police, while the Department deals with storage and security requirements for black powder and ammunition propellants.
- Specific permission from the Chief Officer to manufacture explosives on State land is no longer required as these activities are already subject to licence and lease approvals
- The ban on carrying of guns in explosives facilities has been removed as this complex matter is better addressed by more appropriate means, including the use of express powers (by police officers) and applicable explosives security management plans.
- For dangerous goods storage sites, the requirements for risk assessments have been simplified. Sites with less than manifest quantities of dangerous goods (i.e. not requiring a licence) are no longer required to prepare a written risk assessment, although they must still apply appropriate risk

management practices. For licenced sites, a compliance check against applicable approved codes of practice may be used as a risk assessment for relevant hazards instead of a first-principles risk assessment.

- Applicants for a fireworks contractor licence no longer need to provide proof that they hold a fireworks operator licence because the Department's new licensing database will already have that information.

DIGITAL DMP

To support paperless transactions and online payments, the regulations now allow licences to be issued electronically or in the form of a plastic card only. Similarly, the infringement notice form has been amended to allow for online payment of infringement penalties.

UPDATES

- References to the Australian Dangerous Goods (ADG) Code, the International Maritime Dangerous Goods (IMDG) Code, the UN Manual of Tests and Criteria, and Australian Standard AS 2106 have been updated to the latest versions.
- All references to the term 'security risk substances' have been replaced with 'security sensitive ammonium nitrate' (SSAN). This is to align terminology with that used in most other Australian jurisdictions.
- A WA Photo Card is now explicitly allowed as a valid form of identification for the supply of explosives or SSAN. This change removes the need for Exemption Notice no. 45, which was put in place on 27 June 2014 [*WA Government Gazette* July 2014].

CLARIFICATION AND STREAMLINING

- The definition of rural dangerous goods location has been modified to emphasise that the exemption from licensing only applies where the dangerous goods are for the site operator's own use, and not for supply to others.
- Spill containment requirements at dangerous goods storage sites have been clarified to explicitly require the provision of systems to enable containment and recovery of spilled or leaked dangerous goods.
- Temporary storage of fireworks at fireworks events is now limited to 48 hours (or as approved by the Chief Officer). Separation distances must be as set out in Australian Standard AS 2187.1 *Explosives – Storage, transport and use – Storage*.
- The age limits for various explosives and SSAN licences have been aligned. The limit is:
 - 18 years for shotfirer, fireworks operator or pyrotechnics special use licences
 - 21 years for qualified officers, fireworks driver, and fireworks contractor or any trading or SSAN licence.

HIGH PRIORITY GIVEN TO DRAFTING OF NEW LEGISLATION

The Western Australian Government has provided approval for the drafting of the Work Health and Safety (Resources) Bill.

The Bill modernises and consolidates the work health and safety (WHS) legislative provisions from six different Acts into a single Act. This will cover the areas of mining, petroleum pipelines, geothermal energy, greenhouse gas storage and major hazard facilities (MHFs). This is one of the most significant reforms to State resources safety legislation in decades.

The Department of Mines and Petroleum devoted considerable effort to stakeholder engagement, including undertaking a formal regulatory impact statement (RIS) process, consulting stakeholder groups through the Ministerial Advisory Panel on safety legislation reform, and holding workshops and meetings. This resulted in the Bill receiving strong support from stakeholders.

Approval to draft is a key milestone in the safety legislation reform program for the resources sector. The new legislation has been given high priority by the Parliamentary Counsel's Office as the intention is to introduce the Bill into Parliament in 2016.

While the new Bill is before Parliament the Department will continue to develop supporting regulations. This will involve stakeholder consultation through workshops and a further RIS process.

The WHS (Resources) legislation with supporting regulations is scheduled for implementation in 2017.

UPDATE ON WORKSAFE CONSULTATION

On the 16 December 2015, WorkSafe announced that the Western Australian version of the model WHS laws (known as the 'Green Bill') was being progressed. To find out more visit *WorkSafe* www.commerce.wa.gov.au/announcements/update-work-health-and-safety-laws-consultation



FALLING THEME STRIKES A CHORD

Being able to correctly identify hazards is the first step towards reducing the risk of accidents in the workplace. The Department of Mines and Petroleum is producing a *Know Your Hazards* video series for the Western Australian resources industry. The series aims to help supervisors and work teams recognise common workplace hazards that have injured or killed people.

The latest instalment comprises two *Down to Earth* videos that focus on falling from height.

The first video explains why falls from height – whether a stumble of a few centimetres or a fall of metres – can have serious outcomes. The perception of what heights are “safe” is challenged and the effect on the human body is explained.

The second video explores the potential social ramifications of a fall from height on a person’s career, relationships, hobbies and mental health, as well as their family and friends. Three people affected by the consequences of a fall from height at work generously share their stories to raise awareness of the impact of workplace accidents.

The videos may be shared or downloaded from vimeo.com and distributed for educational purposes. They are available at www.dmp.wa.gov.au/HazardVideos



PREVENTING WORKERS FALLING FROM TRUCKS

Workplace Health and Safety Queensland is running a campaign to reduce falls-related incidents within the transport industry and its associated supply chain. It aims to address the high rate of injuries and fatalities associated with transport workers.

Safe Work Australia’s study *Work-related injuries and fatalities involving a fall from height, Australia* identified that, for the period 2008 to 2011, there were 12 fatalities from falls from height in the transport industry. Falls from trucks also resulted in 3,100 serious injury claims from 2009 to 2011.

The areas associated with the highest risk were working on and around trailers, followed by the cab, then activities at ground level. The fall risk was commonly associated with

vehicle design, the equipment used, and work practices and behaviour.

A *Risk identification and action plan* tool has been prepared to assist operators to identify and manage falls risks through worker consultation and formation of a consultative safety group to develop solutions. Examples of how industry has used this tool to improve safety outcomes are outlined in the campaign report. Both the report and the action plan tool are available from Workplace Health and Safety Queensland website www.worksafe.qld.gov.au/laws-and-compliance/compliance-and-enforcement/industry-interventions-and-campaigns/transport-and-storage/preventing-workers-falling-from-trucks





REMINDER TO VENTILATE DANGEROUS GOODS

The court case relating to the death of a young tradesman in an explosion in Melbourne is a tragic reminder of the importance of ventilation for dangerous goods.

A refrigeration company pleaded guilty to three breaches of the Victorian *Occupational Health and Safety Act 2004* and was fined \$285,000 in the County Court of Victoria in November 2015. This follows an incident where a company employee (a refrigeration mechanic) was fatally injured when the work van he was using exploded.

On the morning of 12 December 2011, Joey Consentino was seen approaching the passenger side of the work van parked outside the home he shared with his parents. Moments later the vehicle exploded. Debris was projected into a number of adjoining houses causing extensive damage. Mr Consentino, who had been thrown 5 metres from the van, died later that morning from catastrophic injuries.

The Court heard that the explosion was caused by the ignition of flammable gas that had collected in the work van. The precise mode of ignition could not be identified.

The work van contained cylinders of flammable gases – acetylene and methylacetylene-propadiene (known as MAP or MAPP) – for use by refrigeration mechanics in the course of their work. In response to the known risk posed by the highly combustible acetylene gas, the employer had provided a cabinet for storage and transport of the gas. However, it was found that the company had failed to ensure the cabinet was vented to the outside of the van.

Go to the Australian Legal Information Institution website at www.austlii.edu.au/au/cases/vic/VCC/2015/1882.html to access County Court of Victoria decisions.

WHY IS THERE THE POTENTIAL FOR WELDING GASES TO BE DANGEROUS?

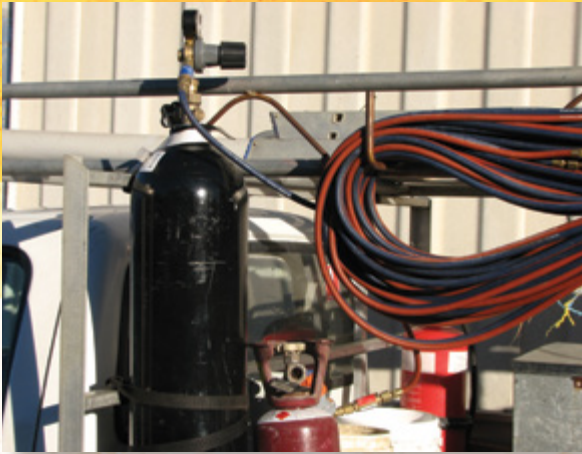
The widespread use of a diverse range of welding gases purchased through specialty gas suppliers, trade outlets and retail hardware stores has created potential dangerous goods transport safety issues.

Welding gases are predominantly compressed or dissolved:

- flammable gases (Division 2.1) [e.g. acetylene, propane]
- non-flammable, non-toxic gases (Division 2.2) [e.g. argon-nitrogen mixes]
- oxidising gases (Divisions 2.2/5.1), primarily oxygen

These gases have hazardous properties (e.g. flammability, asphyxiant, combustion enhancing) and are often transported inadvertently in enclosed vehicles unsuitable for this purpose.

To illustrate the increased risk of transporting flammable gases in an enclosed vehicle, consider the flammability range for three commonly used welding gases.



Example of correctly secured cylinders of flammable and oxidising gases on the back of an open-tray vehicle

Flammability range of gases

Gas	Volume/volume percent (%V/V) in air
Propane (LP gas)	2.4 – 9.6
Methylacetylene-propadiene or MAP gas (mainly propylene)	2.4 – 10.3
Acetylene	2.4 – 83

A leaking cylinder of any of these gases need only provide 2.4 litres of vapour per 100 litres of cabin volume to produce a potentially flammable hazardous zone.

Even with the advent of smaller, handy-sized gas canisters (e.g. MAP gas) there still remains the risk of a leaking torch-canister attachment, which could create a hazardous atmosphere.

The minimum ignition energy required for propagating these flammable gases is miniscule. For example, a propane-air mixture in the flammable range requires only 2.6 milliJoules to ignite. To put this in perspective, the energy generated by static discharge off human skin exceeds this threshold a hundred-fold. This means that a person moving into a vehicle could provide sufficient energy. Other potential ignition sources in vehicles include electrical connections, switches, lighters and light bulbs.

TRANSPORTING WELDING GASES – SEPARATE AND VENTILATE

While technically a load of flammable gases less than 250 litres is below the placard load threshold of the Dangerous Goods Transport Regulations, best practice for the commercial transport of placard quantities of flammable gases is addressed in the Australian Dangerous Goods (ADG) Code 7th Edition.

7.1.4 Special provisions applicable to the transport of Class 2 substances and articles

7.1.4.5 Ventilation

The following dangerous goods must not be transported in a placard load unless the cargo transport unit or compartment in which they are transported is ventilated to prevent the build-up of vapours that are likely to increase risk:

- dangerous goods [other than aerosols (UN 1950) and gas cartridges (UN 2037)] of Division 2.1 or 2.3, or subsidiary risk of 2.1; or
- liquefied oxygen.

The ventilation must produce a flow of air that circulates throughout the unit or compartment, in particular through the highest and lowest parts of the unit or compartment, and must provide for the air to be released from the unit or compartment after it has circulated.

The best practice when transporting any quantity of welding gases remains to 'separate and ventilate'.

- Separate your flammable gases from the cabin (e.g. external tray).
- Ventilate to the atmosphere (i.e. outside the vehicle's enclosed space).

To find out more about other aspects of safely transporting welding and cutting gases in enclosed vans or on open-tray vehicles, visit our website at www.dmp.wa.gov.au/Transporting-welding-and-cutting-3216.aspx



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

Sign up to Resources Safety's weekly news alerts to receive the safety alerts when they are issued.

GRID MESH FALLS FROM DRILL MAST

Mines Safety Significant Incident Report No. 227 was issued after failure of the fastening mechanisms holding a 41 kg section of grid mesh to a drill mast's walkway. The mesh fell 18 m to the drill deck below, next to the operator's cabin.

The importance of adequate inspection regimes (daily and scheduled) for plant is discussed, as well as the role of competent persons in all aspects of the process.

RUPTURED HOSE RELEASES PRESSURISED ANHYDROUS AMMONIA

During a purging operation at a process plant, pressurised anhydrous ammonia was released when a flexible rubber hose ruptured. A worker who was next to the hose when it failed was hospitalised for serious chemical burns.

Mines Safety Significant Incident Report No. 228 reminds responsible persons of the importance of monitoring and reviewing the safety and integrity of equipment over its life. This includes considerations for selection of hoses, defining inspection, testing and maintenance regimes, and training for workers.

INJURY FROM HIGH-PRESSURE WATER JETTING EQUIPMENT

A worker received a high-pressure injection wound to the foot while cleaning in a confined space with poor visibility.

Recommended actions to reduce the potential of injury when using high-pressure water jetting equipment are discussed in *Mines Safety Significant Incident Report No. 229*. These cover risk assessment, calculating the reaction force, personal protective equipment and associated Australian Standards, and environmental conditions.

FATAL ACCIDENT – TRUCK ROLL-OVER

An operating haul truck collided with and mounted a hard rock windrow, rolling over on to its side. Despite the efforts of work colleagues and the emergency services, the truck's driver died a short time later

Mines Safety Significant Incident Report No. 230 reminds employers, mine managers and workers of the actions required under the Mines Safety and Inspection Regulations 1995 to support safe driving practices on mine sites.

DAMAGE TO TELE-HANDLER RESULTS IN SERIOUS INJURIES

A worker received serious leg injuries when a falling rock damaged the check valve block on the front jack of a tele-handler, destabilising the machine.

Mines Safety Significant Incident Report No. 231 recommends a review of equipment fitted with check valves to determine if a risk of impact exists for the check valve and block. Scenarios for falling objects damaging critical components should also be considered, and the design of work baskets reviewed.



FATAL ACCIDENT – OPERATOR COLLAPSES AT WORK

A jumbo operator who was undertaking heavy physical work in hot and humid conditions underground collapsed and later died.

Mines Safety Significant Incident Report No. 232 makes recommendations for employers, managers and supervisors, and workers in regards to preventing and managing heat stress. A list of guidance material is also provided.

HOT CAUSTIC SOLUTION CAUSES SERIOUS INJURY

A process operator opened a drain valve to verify isolation before cleaning an inline filter. When a blockage upstream was dislodged, the operator was engulfed in hot caustic solution, receiving burns to his body and face. The main isolation valve was found to be open.

For work involving hazardous substances, *Mines Safety Significant Incident Report No. 233* recommends actions relating to plant design and modifications, safe systems of work and verifying isolation.

LIGHT VEHICLE DRIVEN PARTLY OVER EDGE OF OPEN STOPE

Mines Safety Significant Incident Report No. 234 outlines an incident where a surveyor was extracted from a light vehicle unharmed after reversing his light vehicle partly over the edge of an open stope.

The importance of concise and unambiguous standard operating procedures and work instructions to mitigate the risk associated with access to open voids is discussed, as well as recommendations for hard barriers. Supporting guidance and related safety alerts are also referenced to assist mine operators.

FATAL ACCIDENT – FALL FROM HEIGHT

A scaffolder inadvertently entered a manway into a digester from which scaffolding had already been removed, falling 12 metres to his death.

Mines Safety Significant Incident Report No. 235 reminds mine operators to conduct detailed risk assessments of areas or tasks where workers might be exposed to fall hazards and take preventative measures. Mine operators, employers and workers should ensure that safe work procedures are available, followed and enforced.

CRANE ROLL OVER

Mines Safety Significant Incident Report No. 236, outlines an incident where a pick-and-carry mobile crane positioning a load rolled over, narrowly missing the spotter.

Duty holders are reminded of competency requirements under the Mines Safety and Inspection Regulations 1995. There are also recommendations regarding the operation of pick-and-carry cranes and safe systems of work.

EXPLOSION OF CONDENSATE DRAIN LINE ON COMPRESSOR

An operator went to drain condensate from a knock-out drum (scrubber) in an air booster compressor system. On actuating the drain valve, the high-pressure condensate drain line ruptured and the operator received permanent and debilitating injuries.

Responsible persons are reminded of the importance of monitoring and reviewing the design, installation and use of plant to ensure workers can undertake tasks safely. *Petroleum Safety Significant Incident Report No. 01/2015* also looks at design, operational and maintenance considerations.

ALUMINIUM POWDER DUST EXPLOSION

Dangerous Goods Safety Significant Incident Report No. 01-15 was released in response to a dust explosion at an explosives manufacturing plant, when aluminium powder was being transferred to a hopper inside the plant.

The methods of obtaining product specification information were discussed, along with the need to apply appropriate change management measures before modifying plant. Recommendations for reducing the potential to generate static charge in plant and equipment were addressed, as well as aspects of worker training.

STRUCTURAL SAFETY

Structural failures, near misses and integrity issues identified on Western Australian mining operations over the last three years led to the issuing of *Mines Safety Bulletin No. 124*, an update of *Mines Safety Bulletin No. 43* released 13 August 1998.

Structural integrity and safety rely on good practice throughout a structure's life cycle. This bulletin looks at common causation factors effecting structural safety as well as recommended areas for action and a list of resources to assist responsible persons in asset integrity management.

BATCH-TYPE PNEUMATIC FILTER PRESSES

Batch-type pneumatic filter presses are common to mine sites and are used in laboratories and other metallurgical test facilities. Recent mine site inspections have identified issues and potential problems with this type of equipment.

There is a misconception by some duty holders that batch-type pneumatic filter presses are not pressure vessels (i.e. classified plant). *Mines Safety Bulletin No. 125* reminds duty holders of their regulatory requirements, and the need for training and assessment for operators and maintainers, and the development of safe systems of work.

ROLL-OVER OR FALLING-OBJECT PROTECTIVE STRUCTURE (ROPS OR FOPS)

Roll-over protective structure (ROPS) or falling-object protective structure (FOPS) are designed and destructively tested in accordance with international standards. However international standards do not provide guidance for ongoing periodic maintenance and inspection. There is also duty holder confusion regarding the application of some standards and regulatory requirements

Mines Safety Bulletin No. 126 outlines some of the common sources of misunderstanding and how duty holders can help maintain the structural integrity of this equipment through documentation, maintenance and inspection.

WATER-MIST FIRE SUPPRESSION SYSTEMS

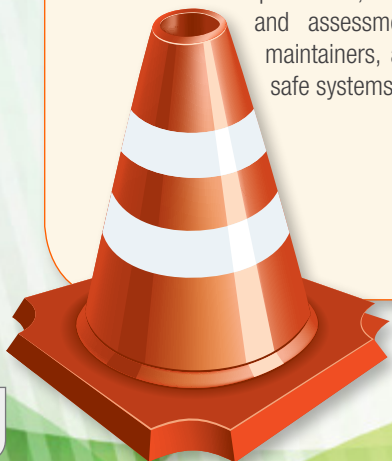
The Department has become aware of potential issues with some pre-engineered water-mist systems relating to system design and the competency and actions of the system installer, service providers and service personnel. The hazards this may present are discussed in *Mines Safety Bulletin No. 127*.

Duty holders are recommended to liaise with the original equipment manufacturer regarding system design, recommendations for installation, maintenance training (and competencies), in addition to reporting of faults.

ISOLATION AND RAIL-MOUNTED STACKERS

As well as general machinery hazards, rail-mounted stackers have unique hazards associated with their stability. *Mines Safety Bulletin No. 128* was prepared after two potentially serious incidents involving this machinery raised concerns about their operation and isolation.

To address the potential for unexpected and uncontrolled movement of counterweight and conveyor booms, the Bulletin has recommendations regarding isolation, maintenance and stability. Australian and international standards for mobile equipment used for continuous handling of bulk materials are referenced.



ISOLATING HAZARDOUS ENERGIES THE FOCUS OF NEW GUIDELINE

Worker exposure to hazardous energies associated with fixed and mobile plant continues to result in a significant number of fatal and serious injuries in Western Australia's minerals sector.

To this end a new guideline *Isolation of hazardous energies associated with plant in Western Australian mining operations* has been released by the Department of Mines and Petroleum.

State Mining Engineer Andrew Chaplyn said that the guideline was developed using input from attendees at the 2014 Mines Safety Roadshow.

"During roadshow workshops, we actively sought input from industry regarding the development of guidance on isolating hazardous energies in fixed and mobile plant," Mr Chaplyn said. "We also received constructive feedback from industry during the public comment period, which helped clarify and enhance the content."

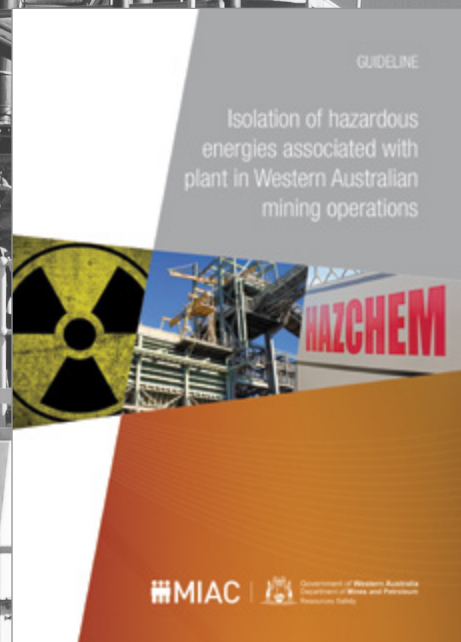
The guideline is structured to support a risk management approach to the isolation of hazardous energies.

"It aims to assist mining operations to develop safe systems of work for fixed and mobile plant," Mr Chaplyn said.

Under normal operating conditions, workers are generally protected from contact with hazardous energy through the implementation and monitoring of hazard controls. However, normal operating conditions can be interrupted when work is required to install, test, clean, decommission, or clear obstructions from plant.

"It is important to identify and control potential exposures to hazardous energies during this work, such as the movement or operation of plant and materials, and contact with sources of energy," said Mr Chaplyn

The guideline has been endorsed by the Mining Industry Advisory Committee. It can be downloaded at www.dmp.wa.gov.au/SafetyDocs or contact RSDComms@dmp.wa.gov.au to order free hard copies.



WHAT TO LOOK OUT FOR

USING CONCRETE

Concrete is a versatile building material used since Roman times which is regarded as having strength and integrity. However inappropriate additions using this material and poor build details (i.e. how things are built) can introduce hazards and increase risk to structures.

Mines inspectors visiting sites have observed situations where concrete added over steelwork, and steelwork buried under concrete slabs has introduced risks. If you have the following scenarios on site, raise the issue with management.

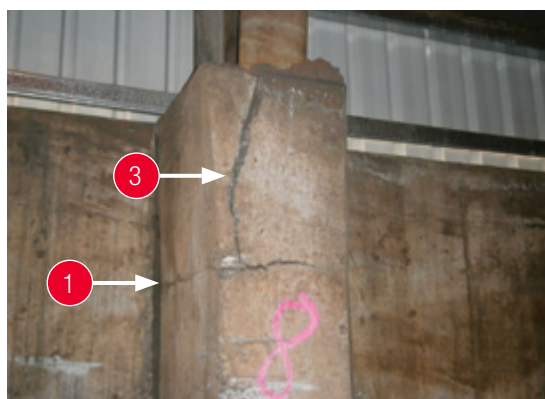
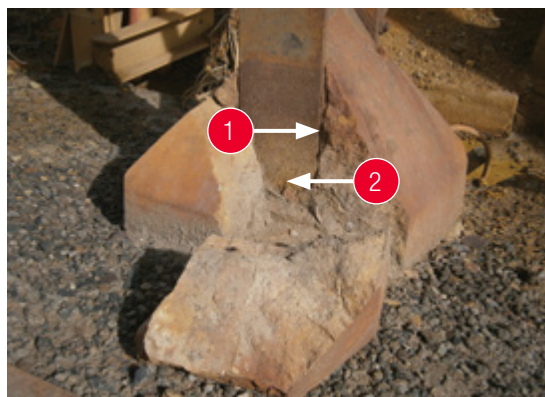
SITUATION 1 – ADDED MASS CONCRETE

Mass concrete or unreinforced concrete, is often added around columns believing this will increase vehicular impact resistance, add strength and assist in protecting the column from the effects of scouring by dozers.

The reality is that mass concrete added over steelwork cracks easily and does not automatically act together with the parent steel member. The added mass concrete can crack due to inadequate bond (adhesion) strength and integrity (i.e. inadequate reinforcement). It can also shrink during curing, resulting in small cracks. Often these cracks introduce a path for moisture ingress by capillary action.

Steelwork encased in mass concrete can corrode more rapidly than the non-encased steelwork, bursting the mass concrete. Resultant loose sections of concrete can dislodge, becoming an introduced hazard. Two examples of this practice have been provided here.

- 1 *Small cracks promote moisture ingress by capillary action.*
- 2 *Corrosion of steelwork results in expansion and spalling of concrete.*
- 3 *Cracked mass concrete can fall off.*



TOOLBOX RESOURCES AVAILABLE

Four toolbox presentations generated from the recent Structural Integrity Forum are available from our website www.dmp.wa.gov.au/MSToolboxes

Structural integrity: Legislative requirements

Structural integrity: What is your responsibility?

Structural integrity: Practical applications and survey

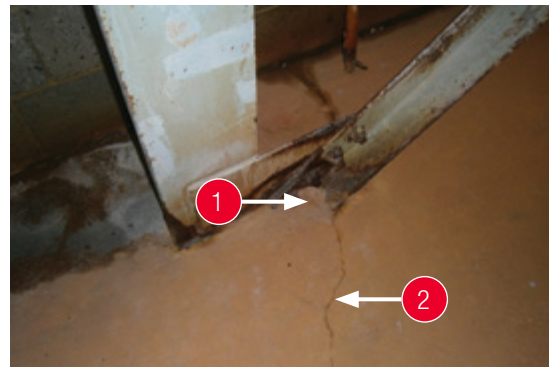
Structural integrity: The issues

SITUATION 2 – BURYING STEELWORK UNDER A SLAB

Steelwork, which is cast under a slab, can experience accelerated and hidden corrosion. Ideally, all steelwork should be built above wet and splash zones on suitable plinths.

Burying this type of detail is not recommended, however if this situation exists on site the steelwork should be monitored by frequent exposure and undertaking repairs (to the original design intent condition).

When surface corrosion is observed it often indicates that the sub-surface corrosion of buried or steelwork covered in concrete is worse. In some cases where this has been observed much of the cast in steelwork has been completely corroded away.



- 1 *Base of column where steelwork has been encased under a concrete slab.*
- 2 *Small cracks are visible in the concrete.*
- 3 *Steelwork corroded away.*

When the concrete around the column is removed it exposes the subsurface corrosion

FAQS ON THE ELECTRICAL LOG BOOK AND OTHER ELECTRICAL MATTERS

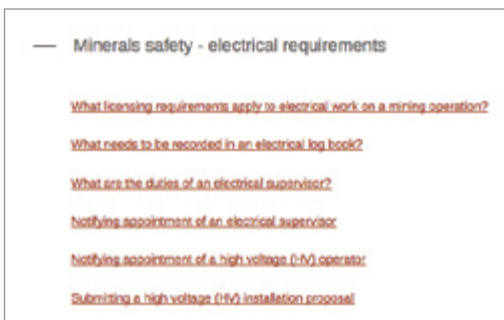
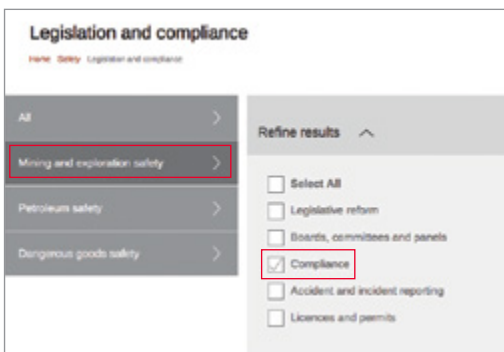
The Department of Mines and Petroleum's new website has a host of information on electrical requirements under the mines safety and inspection legislation. This includes updated FAQs on electrical log books and an example of a log book entry.

Queries generally fall into wanting to know how to comply with legislative requirement. Others will seek guidance on specific subjects. In either case useful links, guidance information and other resources are provided to assist the user.

COMPLIANCE INFORMATION

Want to know what to record in an electrical log book? What licensing requirements apply to electrical work on a mine site? How do you notify an electrical appointment or submit a high voltage proposal?

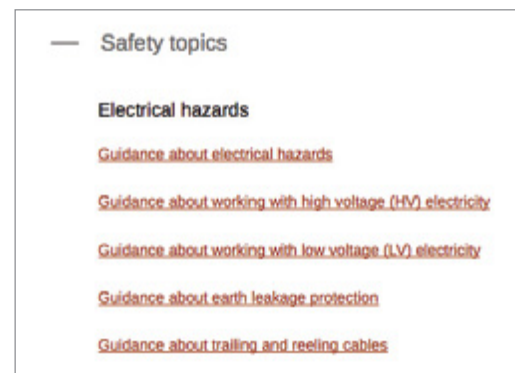
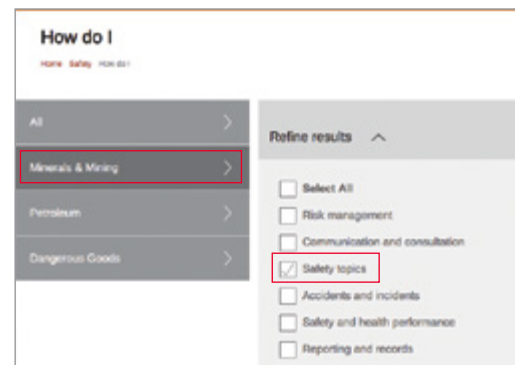
The *Compliance and Legislation* section in the Safety area of the website can answer your questions. To access these pages select *Mining and exploration safety* at www.dmp.wa.gov.au/Safety/Legislation-and-compliance-12714.aspx then choose *Compliance* and expand the heading for *Minerals safety – electrical requirements*.



GENERAL SAFETY INFORMATION

This is the home of the old website's electrical 'one-stop-shop'. Here the subjects are broken down into general electrical hazards, working with high- and low voltage electricity, earth leakage protection, and trailing and reeling cables.

To access these pages select *How Do I* in the Safety area at www.dmp.wa.gov.au/Safety/How-do-I-4154.aspx then select *Minerals & Mining*, then choose *Safety topics* and expand the heading for *Electrical hazards*.



Electrical Log Book



Example of electrical log book entry – available on the website

LICENSING OF OVERSEAS-TRAINED ELECTRICIANS

The pathway to gaining an Electrician's Licence for overseas-trained electricians has changed.

An overseas electrician is required to undertake Australian context training through a Western Australian registered training organisation (RTO) to obtain a Certificate III in Electrotechnology Electrician qualification.

The Certificate III in Electrotechnology Electrician will only be issued once the following are completed:

- off-the-job units of competency with an approved RTO
- on-the-job experience with a licensed electrical contractor
- theory and practical assessments.

To allow completion of the training, and on receipt of a completed application form, *EnergySafety* will issue an

Electrician's Provisional Licence. This enables the overseas electrician to gain up to 12 months on-the-job experience in electrical installing work under Australian conditions. It is not restricted to a particular employer or supervisor.

The supervising electrician must attend the workplace before the holder of an Electrician's Provisional Licence (EPL) commences any electrical work. They must also monitor the progress of the work being undertaken. The frequency of face-to-face contact between the supervisor and worker may gradually decrease as the supervisor becomes confident the worker is competent to perform the required tasks safely.

An overseas electrician will be issued an Electrician's Licence when the off-the-job and on-the-job experience with a licensed electrical contractor has been completed, and the Certificate III in Electrotechnology Electrician has been issued by an RTO.

Source: *EnergySafety*, *Energy Bulletin No. 72 (October 2015)*

HEAVY CONSTRUCTION MATERIALS INDUSTRY RECOGNISES BEST PRACTICE

The 9th Cement, Concrete and Aggregates Australia (CCAA) Western Australian Environment Health and Safety Awards were presented at the Construction Materials Industry Dinner on 14 August 2015. The awards recognise and reward innovation and excellence in the heavy construction materials industry.

Twenty-eight entries were submitted across the seven awards categories with three of these related specifically to safety. The new category of Community Engagement was introduced in Western Australia to acknowledge excellence in communication with the community on all activities, including environment and safety.

State Director of the CCAA in Western Australia, Harry Backes, said "The entries this year were of a high calibre. Hopefully, they will motivate the broader industry to investigate whether they too can make simple, cost effective changes within their businesses in order to improve environmental, health and safety community engagement outcomes."

The winner of the Health and Safety Innovation Award will be entered into the national award to be presented at the CCAA Institute of Quarrying (IQA) Construction Materials Industry Conference in October 2016.

HEALTH AND SAFETY BEST PERFORMANCE – CONCRETE AWARD

Winner

Hanson Canning Vale – concrete plant upgrade



Paul Miles MLA (Parliamentary Secretary to the Minister of Commerce and Member for Wanneroo) and Andrew Dodd

The concrete plant upgrade was designed to eliminate as many hazards as possible. Walkways were installed on either side of the inclined conveyor running material to the overhead bins. This reduces the working at heights risk allowing workers and contractors to inspect, maintain and repair any part of the conveyor without the need for an elevated work platform (EWP). The installation of the modular designed ground bin applies industry best practice.

HEALTH AND SAFETY BEST PERFORMANCE – EXTRACTIVE

Winner

Boral Orange Grove Quarry – site wide safety initiatives



Left to right: Paul Miles MLA, Philip Harris, Peter Male, Scott Langford and Matt Hardy

Boral Orange Grove Quarry won the Health and Safety Best Performance – Extractive award for its site wide safety initiatives. The quarry put up four quality entries:

- Community Reference Group
- Dust Monitoring and Data System
- Command Apex with Dual Weighbridge
- Lightning Detection.

COMMUNITY ENGAGEMENT

Winner

Holcim Bunbury Quarry – Telstra messaging integrated service



Phil Hope (left) and Dr Paul Vogel

The quarry's short message integrated service notifies the local community of blast days and times through a text messaging system. The system allows a direct line of communication to the quarry. Recipients may either respond via a text (which is sent directly to the quarry manager) or phone the number provided in the message, putting them in contact with the quarry office.

HEALTH AND SAFETY INNOVATION

Winner

Hanson Canningvale Concrete – removable ground bin



Paul Miles MLA (left) and Andrew Dodd

The ground bins have been designed in two separate parts, with a grizzly on top and bin on the bottom. The grizzly can be lifted out, and the bin and grizzly replaced. The bin can also be upturned and repaired at ground level, eliminating the need for working in a confined space or workers being exposed to the risk of engulfment. The grizzly can then go back in and the plant is operational, with a total downtime of less than two hours.

The engineering solution was achieved by rebating vertical sections in the tunnel. At a cost of \$50,000, it was well worth it for the reduction in risk with the added benefit of reducing down-time for roller changes and ground bin repairs.

THE MINERS' PROMISE FAMILY

Faced with a crisis event or the sudden death of a loved one, who can you turn to? Miners' Promise was established in 2010 to support employees of Australia's resources sector and their families in the event of an illness, injury or death that has happened in or outside of the workplace.

The independent member-based organisation was founded by Helen Fitzroy, who lost her husband, Steven, in an underground mining accident in 1991. The emotional and financial hardship following her husband's death and the lack of available support led her to the concept of a not-for-profit legacy-type organisation to assist resources sector workers.

"I saw people crying out for basic information on process, legal advice, access to support services, and often just emotional support when they had no-one to talk to. I saw people crumbling under the weight of emotional, legal, financial and bureaucratic challenges that would plague them for months after the event," Helen said.

Now in its sixth year of operation Miners' Promise has been able to assist over 100 families through member subscriptions, and additional individual and corporate donations and sponsorship.

Practical, emotional and financial support following a significant crisis event or death is the organisation's fundamental service. In addition to this core service, Miners' Promise can act as an advocacy and referral service with a range of screened professional service providers ready to address member's concerns. These include legal advice, financial planning and counselling services.

The organisation also provides help in the good times, arranging family events (e.g. family fun days), often in association with participating employers and Miners' Promise sponsors. Through its newsletter *The Promise*, the organisation provides useful information on a number of topics and resources. Members' stories are a regular feature of the newsletter.

While its services have expanded, the organisation's core purpose remains and, in August 2015, Miners' Promise published *A Life Lost: The Road to Recovery*. The pamphlet is a fully comprehensive and free resource for people directly affected by the sudden death of a loved one.



Miners' Promise
your family our family

The *Road to Recovery* contains three essential types of information:

- a guide on the roles and responsibilities of the various agencies and organisations involved in the process following a person's death, particularly where the death occurred in a workplace
- a comprehensive list of support services across Australia, broken down into State jurisdictions and including full contact details (correct at the time of publishing)
- information about coping with grief, and how to support others dealing with grief.

The publication is available to download from the Miners' Promise website at www.minerspromise.org.au/resources

SERVICES OF MINERS' PROMISE

Here are some of the ways contributions are assisting members and their immediate family during a crisis event or following a fatality:

- providing emergency financial assistance to enable financial commitments to be met (e.g. assisting with payment of bills, mortgage or rent)
- counselling and psychological services
- liaising with financial institutions, solicitors and utility providers from an administrative perspective
- study assistance for dependent children
- supporting the family by acting as a liaison during the investigation and inquest process
- co-ordinating funeral arrangements and funding, and matters of estate, where requested
- sourcing, hiring and paying for domestic services (e.g. cleaning, gardening and meal deliveries)
- providing and seeking information for members to assist them in understanding the most appropriate course of action to take in their particular circumstance.

Visit the website at www.minerspromise.org.au to find out more about joining the Miners' Promise family or supporting the organisation by becoming an individual or corporate sponsor, participating employer or ambassador

QUARRY BODY ISSUES CODE OF CONDUCT

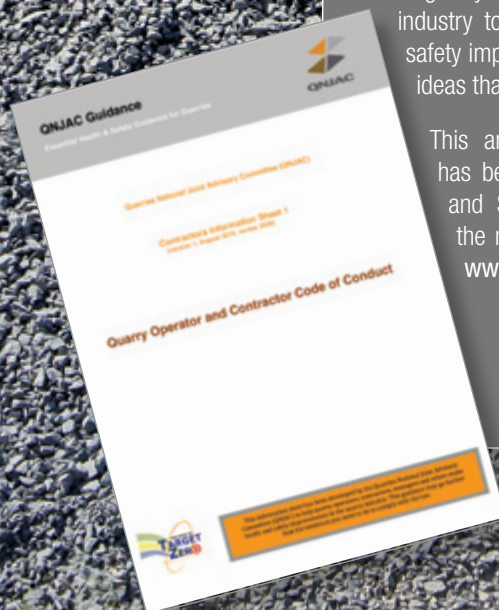
Maintaining the relationship between an operator and a contractor is important in order to continually deliver both business and operational objectives, including those of health and safety. Good contract management starts before procuring a contract and follows through the life cycle.

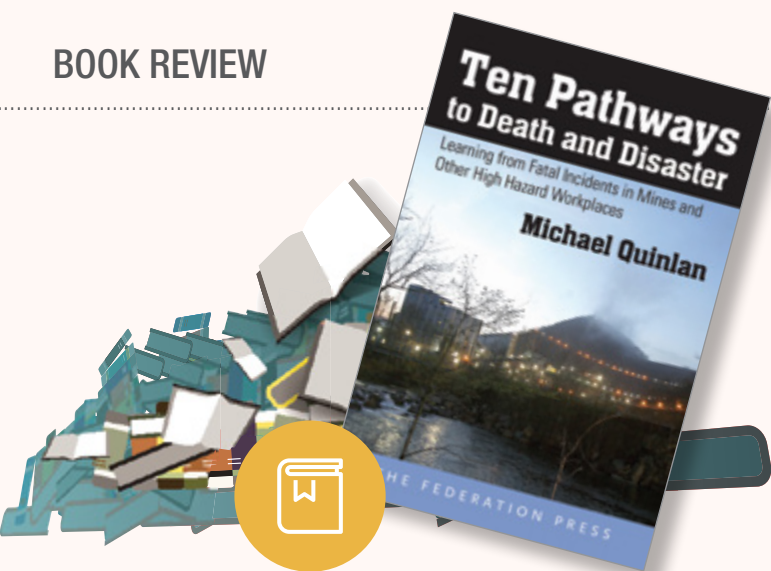
To that end, the Quarries National Joint Advisory Committee (QNJAC) has published the *Quarry operator and contractor code of conduct – Contractors information sheet 1*. This document is intended to assist both quarry operators and contractors in understanding what they should bring to the relationship and to help build partnerships. This includes:

- adherence to good practice
- risk management systems
- routine reviews
- engagement at all levels.

Originally developed for the United Kingdom's quarry industry to help in the development of health and safety improvements, the information sheet provides ideas that can be used by industry stakeholders.

This and other guidance from QNJAC (which has been approved by the UK regulator Health and Safety Executive) is available by visiting the mineral products health and safety hub at www.safequarry.com/qnjac.aspx





The following book review is provided by Martin Ralph, IFAP's Managing Director.

Ten Pathways to Death and Disaster: Learning from Fatal Incidents in Mines and Other High Hazard Workplaces

Author: Michael Quinlan

Publisher: The Federation Press,
www.federationpress.com.au

Professor Michael Quinlan has been conducting research into workplace issues, accidents and trends since the 1970s and has risen to be one of Australia's foremost occupational health and safety (OHS) experts. He teaches OHS and risk management at the University of New South Wales' School of Management. The author has also been involved in a number of high profile government-led inquiries, including the 2006 Beaconsfield underground mine collapse and the 2010 Pike River coal mine explosion. As such, this book seems like a logical extension to his recent experiences, and he is exceptionally well positioned to reflect on the issue of fatal incidents in the mining industry.

The book opens with the author explaining how he came to write the book. Quinlan had been engaged to audit the Tasmanian mines inspectorate in 2010, and was in New Zealand at the time of the Pike River incident, therefore had mine fatalities at the front of his mind. He started to piece together his Ten Pathways theory and presented it to the Tasmanian authorities, where it was well received. After adding in his previous experiences in the long-haul transport and construction industries, he was able to identify patterns of failure in general workplaces, but especially in the mining industry.

Quinlan poses the question, "Why do mine disasters continue to occur in wealthy countries when major mine hazards have been known for more than 200 years and subject to regulation for well over a century?" Also, "What lessons can be drawn from these disasters and are the stakeholders in mining drawing the correct conclusions from such events?" Finally, "Are the underlying causes of multiple fatality disasters

LEARNING FROM FATAL ACCIDENTS

substantially different from those that result in one or two deaths?". In his search for the answers, Quinlan systematically analysed mine disasters and fatal accidents in five Western industrialised nations since 1992. Some of his findings will seem readily apparent, but others will come as a surprise.

It would be remiss of me to reveal the Ten Pathways – the reader should purchase the book to learn of them. But here comes the surprise, at least three of the pathways identified featured in every accident! In many of the cases, five or more of the pathways were apparent.

In an apparent challenge to some contemporary thinkers, Quinlan's research found no evidence to support seemingly popular explanations of mine safety which focus on behaviour, culture or complex technologies. Further, he illustrates there is little to differentiate the failures that result in single or multiple fatalities. The author does highlight that investigations into 'near miss' events might shine some light on the underlying causes of fatal events.

What I enjoyed most about the book is its depth of detail and thorough analysis of the topic – be it the three-page analysis of fatal accidents from 1802 to 1970; a discussion of the regulatory regimes of five countries; or the three chapters establishing and analysing the pathways. Please don't confuse comment on the depth of detail with the idea that this is a dry academic treatise of the topic. In fact, the opposite applies. This book is very readable, and uses everyday language that many outside of the work health and safety (WHS) profession could readily understand.

My take is that Professor Quinlan has done the entire WHS community a terrific service by virtue of this publication. It is one of those books that should be on our shelves, but also adorning the bookcases of managers and engineers (especially those involved in safety in design). It should be regularly tabled for discussions at committee meetings or safety management forums, and used as a prompt for table-top audits. I can see the question, "Which of the Ten Pathways presents the most risk to our organization?" being put by C-level executives to safety professionals.

Maybe, just maybe, the Ten Pathways could be another phrase to add to the WHS lexicon?



“

EMERGENCY RESPONSE COMPETITIONS THAT ARE OPEN TO THE PUBLIC ALSO PROVIDE A UNIQUE OPPORTUNITY TO INTERACT WITH THE COMMUNITY AND SUPPORT THE INDUSTRY'S SOCIAL LICENCE TO OPERATE.

– **SIMON RIDGE**
EXECUTIVE DIRECTOR RESOURCES SAFETY

”

Boddington Gold Mine participating in the rope rescue scenario at the MERC 2015 TYC



Incident response room briefing

BRONZEWING: PERSONAL PERSPECTIVES

Thankfully, the skills of the emergency response teams (ERTs) who participated in the 2015 Underground Mine Emergency Response Competition had not been put to the ultimate test. However, on a June afternoon in 2000, an incident at Normandy's Bronzewing underground gold mine in Leinster involved many in the emergency response (and mining) community – the effects of which are still felt to this day.

On the 15th anniversary of the Bronzewing inrush disaster, all those involved in the incident and the recovery phase were remembered at the CME awards evening following the underground competition. James Donnelly, who was part of the incident control team, and Brad Sheldrick, who was captain of a mutual aid ERT, wove their personal perspectives through the incident time-line as they described what happened.

They reflected on the responsibilities of being in an emergency response team and the personal toll of such incidents. Their presentation reinforced the importance of training and competition for preparing a team and incident controllers so they can respond to the best of their abilities in an emergency situation.

At 5 pm on 26 June 2000, Leinster Nickel Operations received a call from Bronzewing (its mutual aid program partner) requesting an ERT with medically trained personnel. A back-fill retaining wall on 12 level had failed and released

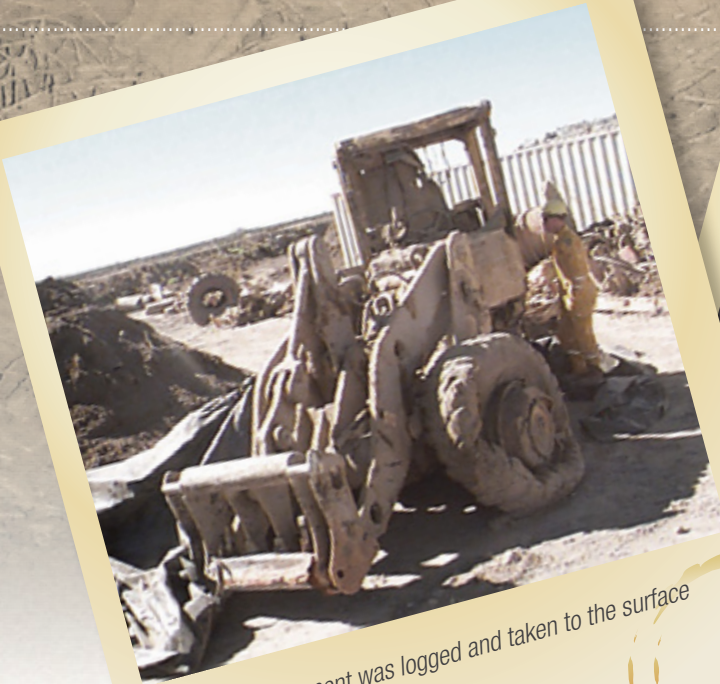
about 18,000 m³ of sand-slurry, sludge, mud and rock that was being used to fill a stope. The material had flowed down through the mine workings to the bottom of the central decline on 14 level, gathering equipment along the way and almost filling three underground levels.

At the time the call came through, personnel were unaccounted for. Unfortunately, by 8 pm that evening, even at such an early stage in the emergency, Leinster ERT captain Brad Sheldrick was briefed that this was a recovery operation and that three people were missing – Timothy Lee Bell (21), Shane Hamill (45) and Troy Terrence Woodard (26). His team was instructed to check the escape ways and immediate areas for anyone who might have managed to get there but was incapacitated and unable to progress further.

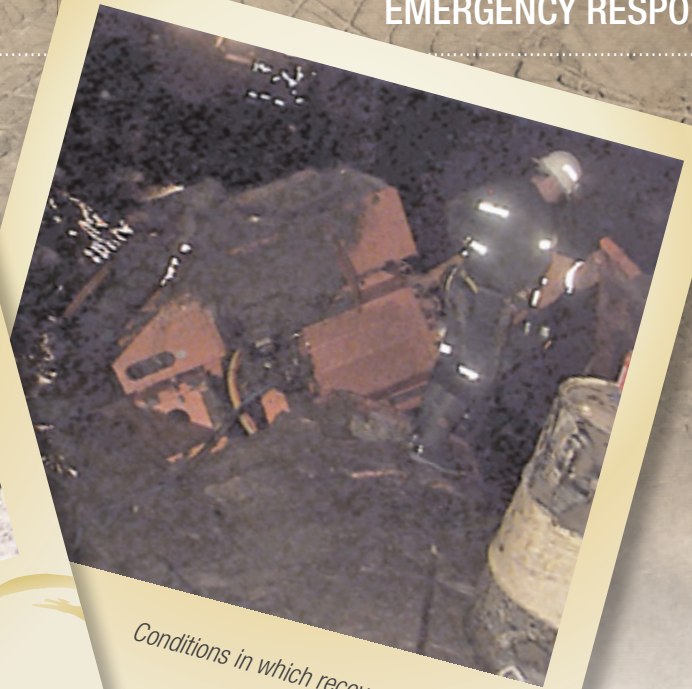
While the slurry in the upper levels was being bogged, the Leinster team was split into three groups and paired with a Bronzewing ERT member for local knowledge. Brad remembers climbing down an escape way until they reached water.

“In the murky water was a miner’s belt floating. You could just see it floating there. So I braced myself against the ladder and I grabbed this belt by its cap lamp strap and pulled on it. It turned out to just be a belt, and I think the relief was evident on my face.”

Once the escape ways were cleared, Brad's team was stood down. The next day the original Leinster team was rotated due to their roster. It became apparent over the following days that the recovery operation would be protracted, and considerable



Recovered equipment was logged and taken to the surface



Conditions in which recovery teams worked

All photos courtesy James Donnelly

support would be required for a safe and effective conclusion. Offers of assistance came from across Western Australia and interstate. In all, ten mining operations mobilised personnel to Bronzewing, and 105 mines rescue volunteers supported the recovery.

There were many challenges ahead for the recovery effort. A second retaining wall for another stope further up the decline was a cause for concern, and was constantly monitored. The recovery operation was suspended on several occasions, and all personnel removed to the surface until flow rates and pressure readings stabilised.

As the process of removing the waste fill progressed, more and more debris was encountered – parts of heavy mobile equipment and light vehicles, as well as underground infrastructure. Each advance was mapped and trucks carrying material logged their loading location. A grid system was set up at the waste dump to sort through the fill, and assist in the investigation. Every item and piece of equipment was recorded and logged on maps.

“The final 100 metres of decline proved to be very arduous,” related James Donnelly. “A vast amount of debris, including a light vehicle, jumbo and integrated tool carrier, was encountered.”

Finally, after weeks of toil, the first of the missing men was discovered. The entire operation was suspended for around 24 hours until police forensic officers arrived on site.

“The recovery was conducted methodically and with dignity for the deceased,” said James. “In the next couple of days, the remaining two men were recovered and brought to the surface.”

As the recovery process was brought to an end, ERT members were briefed.

“I was glad we had some closure and I hoped that everyone's effort would provide some solace to the families who were affected,” said Brad. “People involved with the recovery process carried themselves with professionalism in a difficult situation.”

Fifteen years on, as we reflect on the incident, the role that mine emergency response competitions have in preparing the emergency response community for the worst-case scenario is clear. The controlled, high-stress competition environment allows individuals, teams and potential incident control personnel to test and improve their skills in a no-consequence environment. This is important for mines rescue teams and incident control personnel to reach their full capabilities and do their best for those involved in an incident.

Such events also bring together teams from around the State, establishing camaraderie and helping to build a strong responder network. The commitment to emergency response training and competition by individuals, teams and mine operators benefits all in the Western Australian mining industry.



TYC

St Barbara Leonora Operations participating in the team skills event

CHANGE OF SCENERY ADDS TO SCENARIOS

The Underground Mine Emergency Response Competition was given a new home in 2015 at the Northern Star Resources' Kanowna Belle decline. This was after being held at Kalgoorlie Consolidated Gold Mines' Mount Charlotte mine for five successful years.

The competition is co-ordinated by the Eastern Regional Council of the Western Australian Chamber of Minerals and Energy (CME), and is an opportunity for mines rescue teams to compete against each other in simulated emergency situations. Ten teams competed in eight events over the weekend of 6 to 8 November 2015.

CME Chief Executive Reg Howard-Smith said that the event was focused on training industry personnel to respond to hazards present in the resources sector.

"The aim of the event is to create a training environment similar to a potential real-life situation in a modern working decline operation," he said.

"It is a terrific opportunity for emergency responders to hone the skills which are critical for a successful outcome if there is an emergency on site."

The annual event challenged the six-member teams across a number of scenarios. Organisers wanted the scenarios to replicate realistic situations, with some recreated from real-life significant incidents reported to the Department of Mines and Petroleum.

The first aid scenario simulated a mass casualty situation following a face burst caused by seismic activity. Emergency teams were required to enter the confined space and provide initial treatment before handing the five casualties over to ambulance officer. The partial amputations, head injuries and open wounds were made suitably realistic with the aid of make-up experts and an abundance of fake blood.

In the fire skills section, teams were required to don breathing apparatus, put out a fire and find a casualty through thick black smoke.

The rope rescue scenario involved competitors climbing over processing plant equipment to rescue a trapped miner who had broken his arm while working on a plate feeder. Ropes and harnesses were used to carry the victim to safety.

For the team skills scenario, a passage of the mine was closed off and an elaborate crawl space constructed. It even featured a toilet. The teams voted this the best scenario.



SH

Northern Star Kalgoorlie Knights participating in the first aid event

One of the hardest parts of the competition was search and rescue, which is designed to test team strength and endurance. Responders used maps to find a casualty then carry the injured person on a stretcher up the decline for distance almost a kilometre.

Terry Siefkin, a mines inspector based in Kalgoorlie, has been involved with the competition since 1994 and said that the change of venue provided the challenge of operating in unfamiliar surroundings.

Mr Siefkin is an adjudicator in the incident management scenario, which takes place in an office-type environment with adjudicators helping in the simulation of an emergency incident. White boards, wall charts and props such as a telephone and two-way radios are used.

“Ideally the event lends itself to registered managers or other managers, who are likely to find themselves in the ‘hot seat’ when an emergency occurs at their mine site,” Mr Siefkin said.

There is also value in other participants being involved. Line managers, emergency services officers and others, who may be thrust into the situation on the day, are also encouraged to give it a go.

“I firmly believe in the value of the competition and emergency response teams for the industry, and all those involved.

I subscribe to the philosophy that you can’t have too many drills,” said Mr Siefkin.

Mr Siefkin, who is passionate about emergency response and the mine rescue competitions, said that the skills learnt during training and competition go far beyond their application in the workplace.

“Emergency response team members are dedicated, and submit themselves to rigorous training,” Mr Siefkin said.

The winners of the competition were announced at a presentation dinner held at the Goldfields Institute of Technology.

St Barbara Limited took out overall honours for Best Team with Northern Star Kalgoorlie Knights and Kalgoorlie Consolidated Gold Mines taking second and third place, respectively.

St Barbara’s Finlay Wilkinson was named Best Captain and John Farr from Norton Gold Fields Limited’s Paddington Bears took out the Craig Stonham Award for incident management.

The Kanowna Belle mine is a modern, operating underground mine. More than 200 competitors, event managers and volunteers worked tirelessly over the weekend to produce a successful event.

HONOUR BOARD

1st best team	St Barbara Leonora Operations
2nd best team	Northern Star Kalgoorlie Knights
3rd best team	KCGM
Best captain	Finlay Wilkinson, St Barbara Leonora Operations
Best new team	KCGM
Best new captain	Nathan Campbell, Northern Star Kalgoorlie Knights
Theory	Agnew Gold Mining Company
Theory individual	Jake Benson, Northern Star Kalgoorlie Knights
Team skills	Metals X Higginsville
Breathing apparatus (BA) skills	St Barbara Leonora Operations
Search and rescue	St Barbara Leonora Operations
Rope rescue	KCGM
Fire fighting	Gold Fields Granny Smith
First aid	St Barbara Leonora Operations
Team safety	St Barbara Leonora Operations
Incident management scenario	John Farr, Norton Gold Fields
Overall breathing apparatus (BA) skills	St Barbara Leonora Operations
Overall first aid	St Barbara Leonora Operations
Best scenario (voted by competing teams)	Team skills
Chief Adjudicators' award for event management	Team skills

COMPETING TEAMS

Agnew Gold, Agnew Gold Fields Mining Company
Gold Fields Granny Smith, Gold Fields Australia
Gold Fields St Ives Lions, Gold Fields Australia
Kalgoorlie Consolidated Gold Mine (KCGM)
The Xmen HGO, Metals X Higginsville Gold Operation
Metals X SKO, Metals X South Kalgoorlie Operations
Northern Star All-Stars (Jundee, Plutonic, Kanowna Belle), Northern Star Resources
Northern Star Knights, Northern Star Resources
Paddington Bears, Norton Gold Fields
St Barbara Leonora Operations, St Barbara

BREATHING APPARATUS SKILLS



FIRE FIGHTING



FIRST AID



INCIDENT MANAGEMENT



SEEN AROUND



Northern Star Kalgoorlie Knights



Agnew Gold



Team skills event team



2015 UNDERGROUND MINE EMERGENCY RESPONSE COMPETITION



THEORY

TYC



SEARCH AND RESCUE

Gold Fields Granny Smith

SH



TEAM SKILLS

Norton Gold Fields

TYC



TYC



St Barbara

SH



KCGM

SH



ROPE RESCUE

Gold Fields St Ives

SH



Metals X South Kalgoorlie

TYC



St Barbara Leonora Operations

TYC



Gold Fields Granny Smith

SH



Metals X Higginsville

TYC



Muja Power Station participating in the emergency response team readiness scenario

MUJA POWER STATION ENERGISES MERC IN ITS FIFTH YEAR

The green lawns of Langley Park on the Perth foreshore were again host to the annual Mining Emergency Response Competition (MERC). Nine emergency response teams came together from across Western Australia to compete and hone their rescue skills on the last weekend in November 2015.

Now in its fifth year, the MERC allows for teams to compete in realistic scenarios that test their proficiency and skills. The lessons learnt from the scenarios allow the team to develop and improve. Ultimately, this ensures a team is prepared as well as can be expected for a real-life event and the best possible outcome is achieved.

State Mining Engineer Andrew Chaplyn said, "The competition is an excellent opportunity for emergency response teams to test their capabilities in challenging and realistic scenarios."

Mr Chaplyn said that recent incidents in the mining sector have provided a reminder of the importance of a site's emergency response capacity.

Seven scenarios make up the competition and reflect the essential emergency and rescue disciplines. Teams were assessed in first aid, firefighting, road crash rescue, hazardous material, confined space rescue, rope rescue and emergency response team readiness (sponsored by the Department of Mines and Petroleum).

2015 saw some innovative scenarios. At the road crash rescue event, a different environment was simulated by a structure built over the area – with sprinklers hanging down from

the roof and controlled lighting. This created dark and rainy conditions, with occasional lightning flashes, reflecting the diverse situations teams have to work in.

The metropolitan location of the competition allowed family and friends, industry representatives and the local community to come down and support the MERC. There was also the opportunity for everyone to get involved in a series of skills sessions and demonstrations, which included wound dressing, CPR and the latest in road-crash cutting equipment.

"It was great to see everyone at Langley Park supporting the nine competing teams," said Sue Steele, MERC committee member.

"These teams put their lives at risk every day – it is wonderful for them to be acknowledged by the public," Sue added.

The event also takes the opportunity to give back to the Western Australian community with the nine competing teams choosing a cause to support. Over \$18,000 was raised this year and distributed to the nominated charities. To date, MERC has raised over \$188,000 for charity organisations.

The competition concluded with the awards ceremony. Muja Power Station was the overall winner and captain Justin Burns also took out the award for best captain. The Department's own mines inspector Peter O'Loughlin was awarded outstanding volunteer for his adjudication role – no mean feat given how hard the supporters of MERC work to make this two-day event run smoothly and successfully.

For more information about the competition, visit the MERC website at www.themerc.com.au



SH

First aid scenario – Telfer



SH

Volunteers at the fire fighting scenario

TRAINING AND DEVELOPMENT OPPORTUNITY FOR KARARA

Four volunteers from Karara Mining's newly formed emergency response team joined MERC 2015 to take up casualty roles as a training and development opportunity.

MERC committee member Sue Steele said, "We were approached by Peter Burton, Karara's Superintendent (Emergency Management), about opportunities to help develop the emergency response skills and confidence of Karara's team of new volunteers."

While Karara was not yet in a position to field a team at MERC, Karara's senior management supported Peter's objectives to gain experience to take back to site.

"We felt as a committee that this was a great initiative by Peter, showing great leadership in safety by organising the group and coming up with the concept," Sue said.

To help facilitate the group, the committee offered four Karara ERT members the opportunity to take on role of a casualty in fire fighting, first aid and confined space scenarios.

The role of casualties at emergency response competitions is not always an enviable one, often involving adverse conditions and handling by many teams as they test their extraction and treatment skills. However the casualty is exposed to many techniques and can see first-hand how emergency response teams work together. The knowledge of what makes a successful team and delivers the best result for a patient can be shared with others on the team, then applied back onsite and during training. Exposure to the competition and how it works also helps to familiarise team members with the competition environment when they compete in the future.

This was a valuable learning experience for the Karara team. Those who volunteered have already requested to be involved in this year's competition.

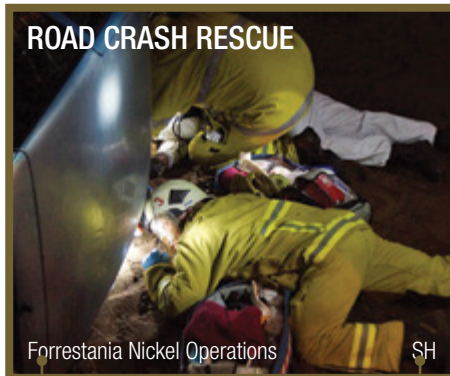
PARTICIPATING TEAMS

Argyle Diamonds, Rio Tinto
 Birla Nifty Copper, Aditya Birla
 Boddington Gold Mine, Newmont Asia Pacific
 FMG, Fortescue Metals Group
 Forrestania Nickel Operations, Western Areas
 Muja Power Station, Synergy
 Rio Tinto, Rio Tinto Iron Ore
 Sunrise Dam, Anglo Gold Ashanti
 Telfer ERT, Newcrest Mining

HONOUR BOARD

Overall first place	Muja Power Station
Overall second place	Boddington Gold Mine
Overall third place	Sunrise Dam
Best captain	Justin Burns, Muja Power Station
Best medic	Jess Baatard, Rio Tinto
Overall team safety	Boddington Gold Mine
Overall breathing apparatus (BA) skills	Muja Power Station
Road crash rescue	Argyle Diamonds
Hazardous materials	Muja Power Station
Vertical rescue	Boddington Gold Mine
Fire fighting scenario	Muja Power Station
Confined space rescue	Sunrise Dam
First aid scenario	Boddington Gold Mine
Emergency response team readiness	Muja Power Station
Outstanding volunteer	Peter O'Loughlin, Department of Mines and Petroleum







PROSECUTIONS

MINES SAFETY

Company fined for failing to provide a safe working environment

Process Minerals International Pty Ltd, the operator of the Woodie Woodie fines treatment plant, was fined \$90,000 after pleading guilty to two charges of failing to provide a safe working environment after a worker was seriously injured in 2012. The charges were laid following a Department of Mines and Petroleum investigation.

On 25 and 31 October 2012, Process Minerals failed to provide a procedure for workers to safely unload pipes from a truck. Worker Meliton Garcia and another worker were unloading 20-metre long polyethylene pipes from a truck on 31 October. The pair were involved in rigging the pipes to a crane for unloading.

Mr Garcia was injured after he was struck by a one tonne pipe. He was swept off the stack of pipes and fell about four metres.

Department of Mines and Petroleum's Director Mines Safety, and State Mining Engineer, Andrew Chaplyn said that falls from height are a major cause of fatalities on mine sites, despite being easily preventable.

"There was a genuine risk that workers could have been killed and it was only luck that the consequences were not much worse," Mr Chaplyn said. "It is incidents such as this that provide a stark reminder for industry to take the risk of fall from height seriously."

"In this case, the workers were not provided with a safe system of work and were unnecessarily exposed to a serious hazard. This decision sends an important message about ensuring safety is given the highest priority on Western Australia's mine sites."

Maintenance death leads to court appearance

Pilbara Iron Company Pty Ltd, a subsidiary of Rio Tinto, was fined \$70,000 for failing to provide a safe working environment after the death of 27-year-old fitter Brent Glew at the company's Brockman 2 iron ore mine in 2011. Rio Tinto pleaded guilty to failing to provide a safe working environment and was sentenced in Perth Magistrates Court.

On 16 August 2011, Mr Glew and two other workers were conducting maintenance on a front-end loader in the mine's workshop. The work required the removal and suspension of a tilt cylinder. While suspended from a crane, the 1,400 kg cylinder slipped and fell striking Mr Glew.

An investigation by the Department of Mines and Petroleum found that none of the workers held the appropriate rigging qualifications or were properly certified for high risk work.

State Mining Engineer Andrew Chaplyn said that Mr Glew's death was an avoidable tragedy.

"This has been a heartbreaking, life-changing event for Mr Glew's family, friends and co-workers," Mr Chaplyn said.

"It is a tragic reminder of what can happen when safety isn't given the priority it deserves. Every worker should be entitled to return home safely to their family and friends at the end of a shift or swing."

Mr Chaplyn said that, since the incident, the company had put in place changes to its safety procedures.

"Rio Tinto has implemented a number of changes to ensure similar incidents do not occur again across its mining operations," he said. "However, this provides little comfort to the family, friends and co-workers impacted by the tragic death of Mr Glew."

"The only way to avoid similar tragedies is to ensure safety is the number one priority across Western Australia's mine sites."

Company fined after maintenance death

BTP Equipment Pty Ltd was fined \$195,000 and ordered to pay \$100,000 in costs for its involvement in the death of worker Paul Torre on 24 December 2010.

Mr Torre was working in the mobile maintenance workshop at Fortescue Metal Group's Cloudbreak iron ore mine in the Pilbara. This was through a labour hire arrangement as a contract fitter for BTP Equipment (operating as Ausdrill Mining Services at the time).

State Mining Engineer Andrew Chaplyn said that Mr Torre was fatally injured during maintenance work on a haul truck.

"Mr Torre was working on the truck's suspension cylinder unit, which consists of a strut and spindle," Mr Chaplyn said. "The strut is part of the shock absorption and suspension system of the truck. It is essentially a hollow rod and cylinder, the inside of which is charged with high pressure nitrogen gas and hydraulic oil."

"An investigation by the Department of Mines and Petroleum found that the strut had been removed from the truck by the night shift workers on 23 December 2010. However it had not been depressurised as required by the original equipment manufacturer's procedure."

Additional work, which was also not in accordance with the original equipment manufacturer (OEM) procedure, was performed on the strut. It caused the end plug to be jammed into the strut in such a way that it was no longer effectively stable and restrained.

"Our investigation indicated that Mr Torre was most likely unaware that the strut was still under high pressure while he was working on it," Mr Chaplyn said.

The end plug ejected under pressure from the strut and hit Mr Torre, fatally injuring him on the morning of 24 December 2010.

BTP Equipment pleaded guilty to the charge under the *Mines and Safety Inspection Act 1994* of causing the death of Mr Torre by its failure to provide a safe working environment.

Mr Chaplyn said that the company implemented a number of procedural changes to prevent similar incidents from occurring.

"Unfortunately, these changes were too late to prevent the death of Mr Torre, and provide little comfort to his family, friends and co-workers," Mr Chaplyn said.

"It is a tragic reminder of what can happen when safety isn't given the priority it deserves. Every worker should be entitled to return home safely to their family and friends at the end of a shift or swing."

Mr Chaplyn also acknowledged the length of time it has taken to investigate and prosecute the case.

"This has been a long process and has undoubtedly impacted Mr Torre's family, friends and co-workers," he said. "I hope that the court's decision can bring some degree of closure."

PROSECUTION DATABASES

Department of Mines and Petroleum

The primary focus of much of the legislation administered by Resources Safety is to ensure resources development in Western Australia is carried out in a way that is safe for workers and the public.

The legislation provides a range of enforcement and prosecution measures to help achieve this. When required, enforcement or prosecution action is taken in the public interest to protect people and the environment.

Prosecutions undertaken by the Department (and its predecessors) under the *Mines Safety and Inspection Act 1994*, and which have resulted in a conviction, are summarised in an online list. This information is provided to raise public and industry awareness of the scope and scale of the Department's enforcement activities.

Starting with prosecutions in 2006, the list is updated when new prosecutions result in a conviction, or new information regarding an existing conviction becomes available.

The list is available to view at www.dmp.wa.gov.au/Dangerous-Goods/Summary-of-prosecutions-13083.aspx

Department of Commerce, WorkSafe

A list of successful prosecutions undertaken by WorkSafe under the *Occupational Safety and Health Act 1984* and Occupational Safety and Health Regulations 1996 are available online. The list details prosecutions from 1 January 1997, and is available in the public arena to assist in the awareness of matters relating to occupational safety and health.

Visit prosecutions.commerce.wa.gov.au to view the list.

SAFETY PERFORMANCE DATA RELEASED



The Resources Safety Division of the Department of Mines and Petroleum recently released its *Safety performance in Western Australian mineral industry: Accident and injury statistics report for the 2014-15 financial year*.

The annual report includes information on:

- fatal accidents
- serious injuries
- lost time injuries
- workers' compensation premiums
- injuries by commodities
- restricted work (disabling) injuries

for mining, plus some statistics for exploration activities.

In 2014-15, there were four fatal accidents in the Western Australian mineral industry. Of these, three were on mining operations and one was associated with an exploration operation. While there has been an overall decrease in the number of fatalities per thousand workers over the last 20 years, the rate of improvement has slowed in recent years.

State Mining Engineer and Director Mines Safety, Andrew Chaplyn, said in his introduction to the report that the costs of not building safety into the way a company does business are counted not just in dollars and cents, but in lives lost and changed forever.

"It is unacceptable for even one person to be killed while working, let alone four. We can and should do better," Mr Chaplyn said.

This annual compilation represents one of the many ways the regulator communicates with the State's mining operations. The report can be used as a tool to better understand the industry's injury risk profile.

A summary of the mine site and exploration accident and injury data for 2014-15 is given below. To view the full report, visit the mining publications section at www.dmp.wa.gov.au/Safety

WHAT DOES THE MINES SITE DATA TELL US?

People working on mine sites

- There was an average workforce of 105,964 workers in 2014-15, a decrease of about 1% from the previous year's average of 107,335.

Fatal accidents

- There were two underground fatalities (one in a gold mine and the other in a base metals mine) and one surface fatality (in a bauxite mine).

Lost time injuries (LTIs)

- There were 413 LTIs during the year, 43 less than the previous year.
- The overall LTI duration rate improved by about 22%, falling from 24.4 to 19.1, while the overall LTI frequency rate (LTIFR) for 2014-15 improved by 5%, falling from 2.3 to 2.2.
- The overall injury index improved by about 26%, falling from 57 in 2013-14 to 42 in 2014-15.
- Serious LTIs in mining during 2014-15 totalled 351, 35 less than the previous year, with the overall serious LTIFR improving from 2.0 to 1.9.

Injuries by commodity group

- The iron ore sector LTIFR improved by 24% during 2014-15, falling from 1.7 to 1.3.
- The bauxite and alumina sector LTIFR remained unchanged at 4.0.

- The gold sector LTIFR improved 4% during the year, falling from 2.6 to 2.5.
- The nickel sector LTIFR deteriorated by 10%, rising from 3.0 to 3.3.

Restricted work injuries (RWIs)

- There were 753 RWIs during 2014-15, 159 less than in the previous year (912 RWIs were reported in 2013-14).
- The overall RWI frequency rate improved by 13%, falling from slightly less than 4.7 to 4.0.
- The overall RWI incidence rate fell from 8.5 to 7.1.

WHAT DOES THE EXPLORATION DATA TELL US?

People involved in exploration activities

- There was an average workforce of 2,179 workers, a decrease of 5% from the previous year's average.

DID YOU KNOW?

In the Western Australian mining industry for the 2014-15 financial year, 56% of people worked on iron ore operations, 18% on gold operations, 7% on bauxite and alumina, and 6% of workers were employed on nickel operations.

The rate of lost time injuries per million hours worked (LTIFR) for gold was 2.7 for surface operations (compared to 2.2 for all surface mining) and 1.9 for underground (compared to 2.6 for all underground mining). For iron ore, bauxite and alumina, and nickel operations the LTIFRs were 1.3, 4.0 and 3.3, respectively. These are compared to the LTIFR of 2.2 for all mining.

What was reported to the Department?

- There was one exploration fatality in 2014-15.
- Ten LTIs were reported, four more than in the previous year.
- The overall LTIFR deteriorated by 92%, rising from 1.3 to 2.5. Rates for exploration such as LTIFR vary significantly from year to year due to the low numbers of both the LTIs reported and hours worked.
- There were 10 RWIs reported for exploration during 2014-15, resulting in a RWI frequency rate of 2.5, a decrease of 61%.
- The RWI incidence rate fell from 13.0 to 4.6.

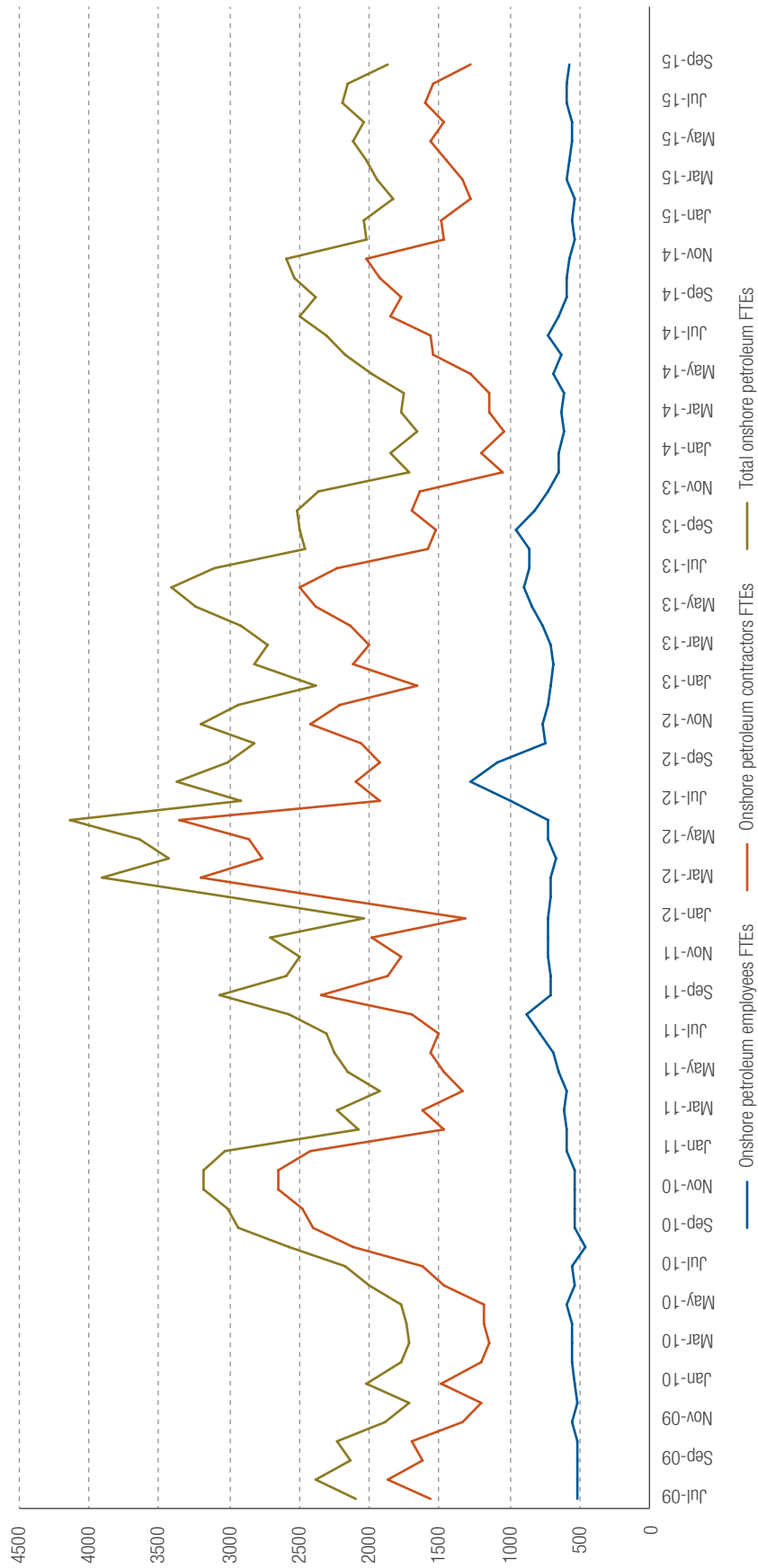
HOW IS PETROLEUM PERFORMING?

The *Safety performance in the Western Australian petroleum industry* poster for 2012-2015 has been released. There were 45 serious injuries reported for the petroleum industry from July 2012 to June 2015. The frequency rate for serious injuries deteriorated during the period from 2.7 in 2012-13 to 3.6 in 2014-15. Serious injuries include lost time injuries (onshore > 1 day), alternative duties injuries, and medical treatment injuries.

The main cause of serious injuries in the petroleum industry during the period was being hit by moving objects, and the majority of serious injuries were received at onshore production and processing facilities. The poster is available for download at www.dmp.wa.gov.au/SafetyDocs

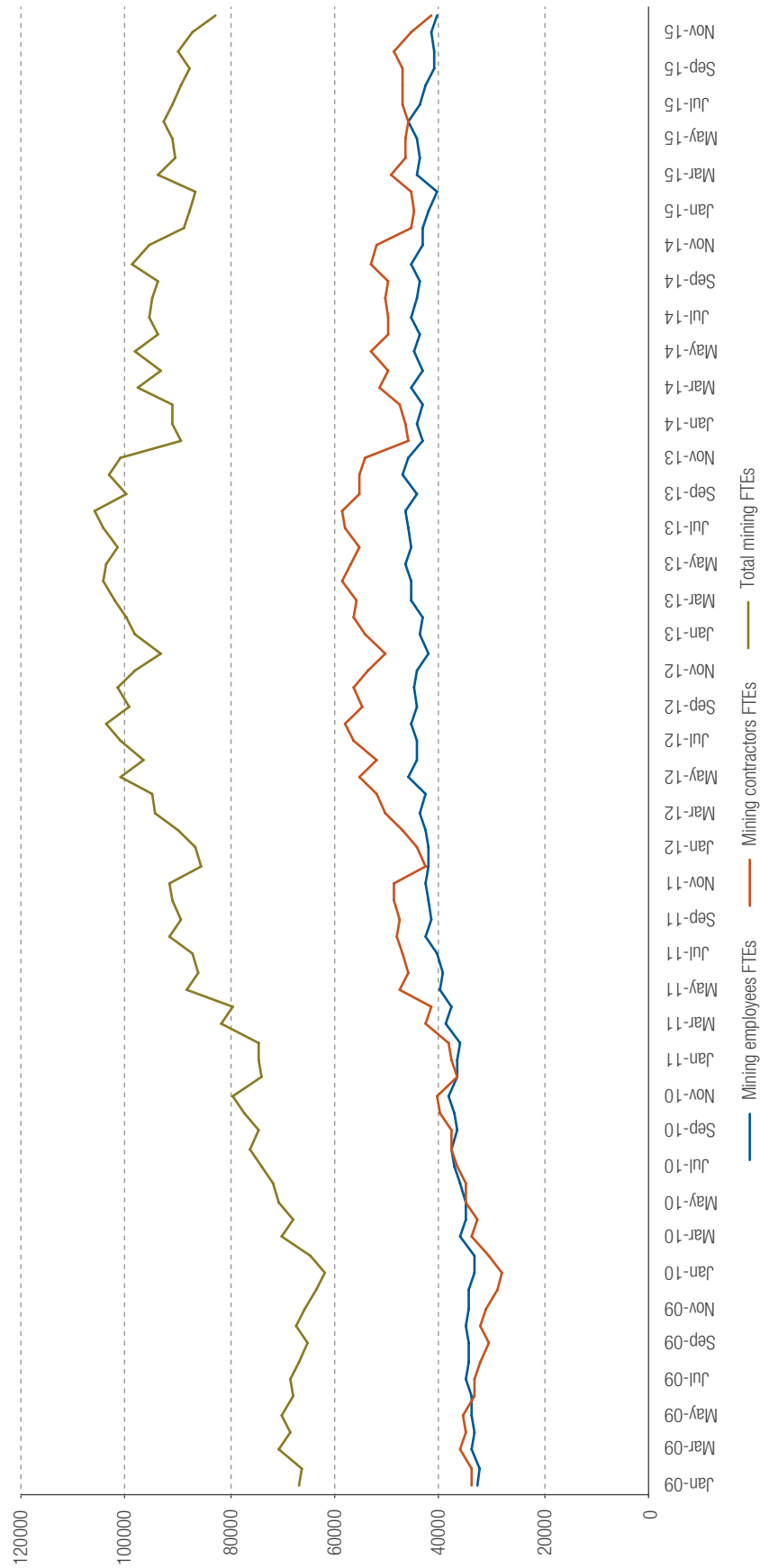
WA'S MONTHLY ONSHORE PETROLEUM WORKFORCE (SEPTEMBER 2015)

NOTE: Monthly petroleum workforce figures reported as hours but plotted as full-time equivalent (FTE), where 1 FTE = 2,000 hours worked per year

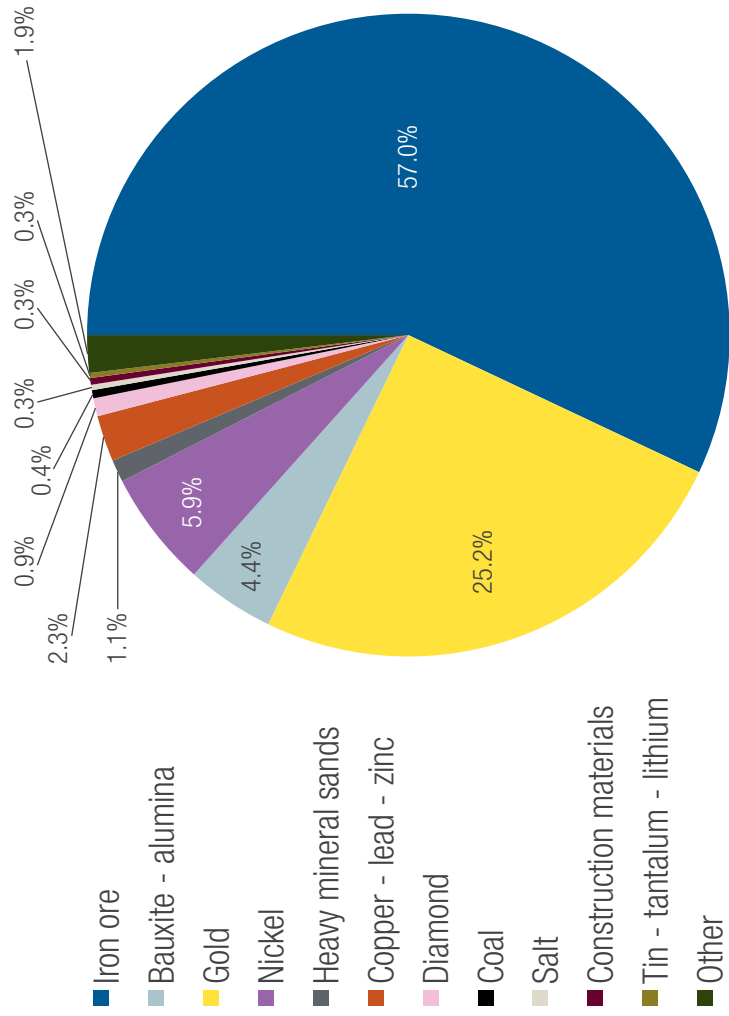


WA'S MONTHLY MINING WORKFORCE (DECEMBER 2015)

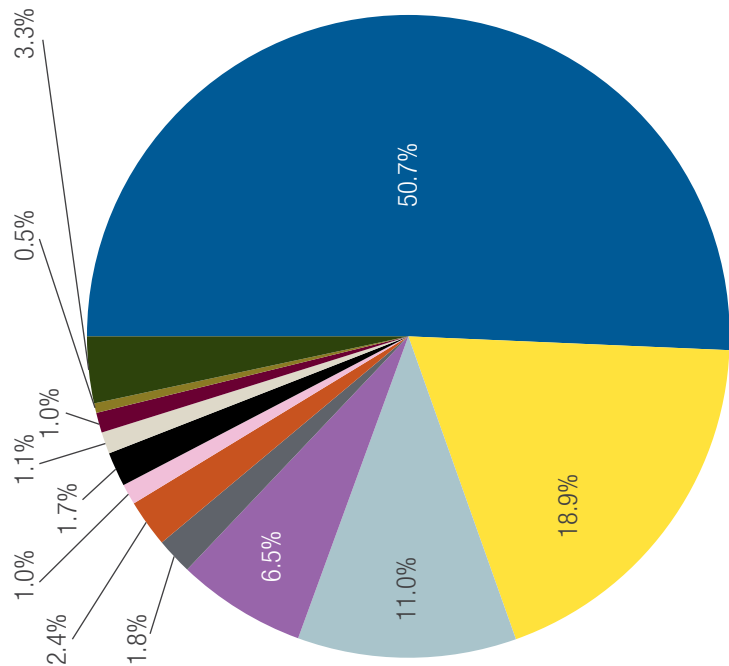
NOTE: From 1 July 2009, monthly mining workforce figures are plotted as full-time equivalent (FTE), where 1 FTE = 2,000 hours worked per year



WA'S MINING WORKFORCE – PERCENTAGE BY COMMODITY (DECEMBER 2015)



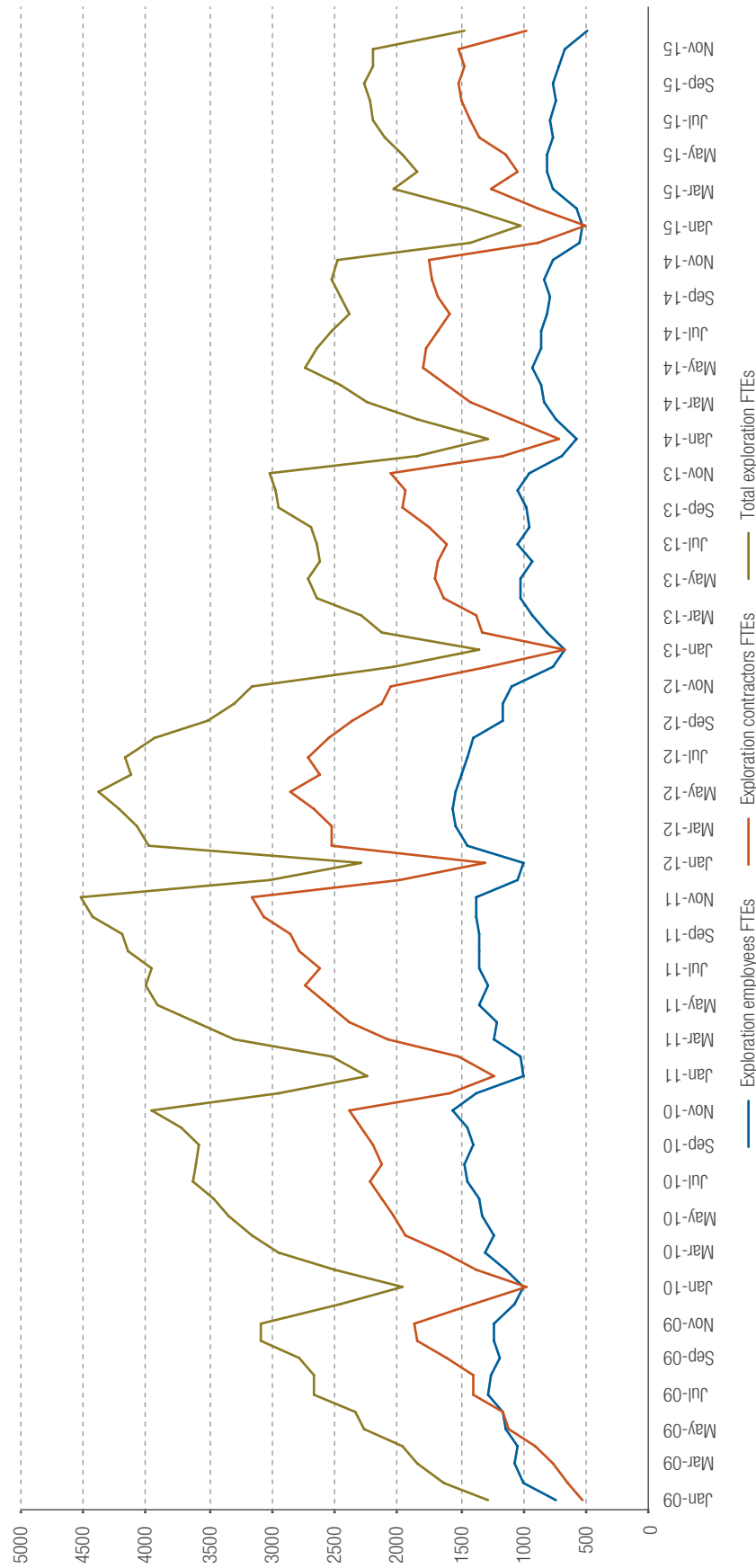
Mining employees FTEs



Mining contractors FTEs

WA'S MONTHLY MINERAL EXPLORATION WORKFORCE (DECEMBER 2015)

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



MINES SAFETY SIGNIFICANT INCIDENT REPORT NO. **227**

GRID MESH FALLS FROM DRILL MAST

ISSUED: 06 OCTOBER 2015

Summary of incident

A rotary blast-hole drill rig was trammed from the workshop to the drill site to start work. The driller stabilised the drill rig using the jacks and raised the mast into position. After raising the jacks, he trammed the rig forward about ten metres to drill the first hole in the blast pattern.

When the driller stopped moving the drill rig forward, he heard a loud bang. An object had landed on the drill deck next to the operator's cabin he was occupying. It was a 41 kg piece of grid mesh from the mast's walkway that had detached and fallen to the drill deck 18 metres below.

Probable causes

Direct

- The fastening mechanisms holding the grid mesh to the drill mast failed.

Contributory

- There were worn washers and non-locking type nuts fitted to the six bolts retaining the grid mesh to the walkway structure.
- Inspections were inadequate and did not identify structural defects in the drill rig.

Actions required

The following actions are recommended to help ensure the structural integrity of plant.

Employers

Implement safe systems of work such that:

- a competent person
 - identifies areas of plant requiring periodic inspection (e.g. areas prone to wear, corrosion or fatigue)

- defines daily and scheduled inspections
- carries out inspections at required intervals
- reports defects for assessment
- when a defect is identified on plant, a competent person
 - assesses the defect and potential for workers to be exposed to hazards, and specifies the necessary repairs
 - repairs the defect as specified by the competent person who assessed the defect
 - inspects and tests the plant before it is returned to service to verify it is repaired in accordance with the specifications of the original equipment manufacturer (OEM) or the competent person who assessed the defect.

Managers and supervisors

- Obtain information from equipment suppliers or OEMs relating to any known design flaws or updated inspection requirements, and make this information available to the competent persons involved in inspecting, assessing and repairing plant.
- Arrange daily inspections that cover each area or item of plant as specified by a competent person following a risk assessment.
- Verify persons as competent to undertake the plant inspections, assessments and repairs required.
- Do not allow plant to be used until it is deemed fit for use by a competent person.

Workers

- Follow the approved safe system of work when performing a task, and do not operate or use defective plant.
- Do not operate or use plant before it is inspected and cleared for use.
- Report damaged plant (e.g. missing or worn parts) to the supervisor.

MINES SAFETY SIGNIFICANT INCIDENT REPORT NO. 228

WORKER SERIOUSLY INJURED WHEN SPRAYED BY ANHYDROUS AMMONIA AFTER FAILURE OF FLEXIBLE RUBBER HOSE

ISSUED: 09 OCTOBER 2015

Summary of incident

Note: The Department of Mines and Petroleum's investigation is ongoing. The information contained in this significant incident report is based on materials received, knowledge and understanding at the time of writing.

A process worker and colleague were preparing for a scheduled maintenance task in the ammonia storage area of a processing plant.

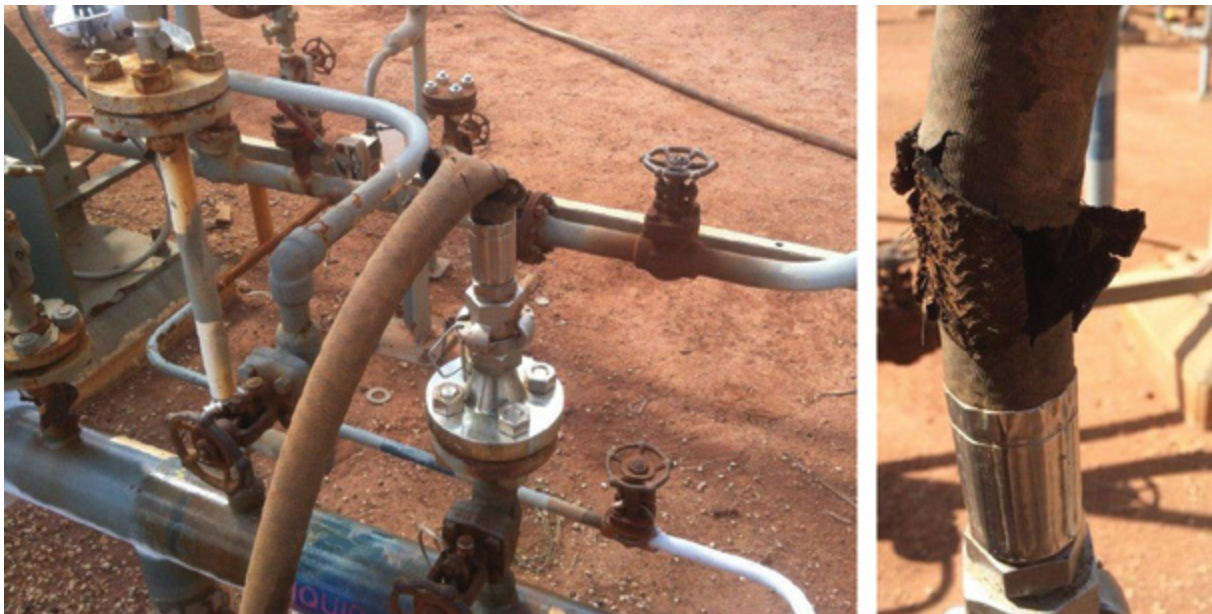
As part of a routine purging operation, the process worker connected a flexible rubber hose via a coupling to a purge connection point. The purge hose was charged with nitrogen and the valve was being opened slowly, allowing nitrogen to flow into the system, when the hose ruptured above the connection point.

The worker was exposed below the waist to pressurised anhydrous ammonia at about -33°C , and was enveloped in the ensuing ammonia cloud. His colleague was able to get the worker to a nearby safety shower before contacting the site's emergency services. The worker was air lifted to a city hospital and treated for serious chemical burns.

Probable causes

Direct

- The purge hose failed as the valve was opened.
- The worker was next to the hose when it failed.



Flexible rubber hose and assembly connected to anhydrous ammonia purge point. Close up (right) shows rupture in hose above connection point

Mines Safety Significant Incident Report No. 228 continued

Contributory

- It appears that the hose was not in a serviceable condition, with factors including:
 - lack of information about its recommended use, either visible on the hose or provided by the site
 - repeated bending of the hose to less than its minimum design radius during routine use, damaging the steel braiding and inner rubber lining
 - loss of structural integrity can be difficult to identify from visual examination.
- Although there were several procedures covering flexible hose safety and integrity, the procedures were either past their review date or under review, and most operators were not aware of their availability.
- The processing plant had experienced other hose failures over the previous 12 months and had implemented a training program for all workers covering:
 - specific requirements for flexible hose use
 - pre-start or pre-use checks for hose integrity
 - how to confirm that a hose is fit for its intended purpose
 - removal from service of old or degraded hoses
 - removal from service of unidentified hoses.

In this incident, it appears that not all aspects relating to flexible hose safety and integrity were followed when the hose was selected for the task.

Actions required

As part of an operation's safety management system, responsible persons are reminded of the importance of monitoring and reviewing the safety and integrity of equipment over its life. Some recommendations are listed below for flexible hoses.

- When selecting flexible hoses, consider their specific application and whether they comply with the appropriate Australian standard. Take into account factors such as:
 - pressure, temperature, type of fluid, gas or chemical being conveyed
 - any special hose requirements (e.g. abrasion-resistant, fire-resistant, anti-static, cryogenic service, minimum bend radius).
- Implement a management system that defines:
 - an appropriate inspection, testing and maintenance regime, based on a risk assessment, manufacturer specifications, supplier recommendations and

applicable Australian standards and previous experience

- how each hose type will be inspected and tested (e.g. competent person using appropriate testing equipment), and marked or tagged accordingly
- how each hose type will be stored, based on manufacturer recommendations.
- Implement a training program so that workers understand:
 - the risks associated with using flexible rubber hoses under pressure
 - how to do a pre-task inspection on a flexible hose to confirm that it is fit for purpose before being used
 - the actions to take when a hose is found not to meet the requisite standards for the task.

Note: Workers are not in a position to identify internal degradation of the hose, hence the need for periodic testing by a competent person.

- Hoses deemed to be at the end of their life should be rendered unserviceable and discarded to prevent further use.



Flexible rubber hoses showing external damage. Only testing by a competent person will reveal whether the internal integrity of the hose has been compromised

Further information

- Australian Standards, www.standards.org.au
 - AS/NZS 2554 *Hose and hose assemblies for air*
 - AS 2594 *Hose and hose assemblies for liquid chemicals*
 - AS 3791 *Hydraulic hose*
 - AS/NZS 4233.1 *High pressure water jetting systems – Safe operation and maintenance*

MINES SAFETY SIGNIFICANT INCIDENT REPORT NO. 229

WORKER INJURED USING HIGH-PRESSURE WATER JETTING EQUIPMENT

ISSUED: 18 NOVEMBER 2015

Summary of incident

A worker in a confined space was cleaning demister pads using high-pressure water jetting equipment (jetting gun, lance and pencil nozzle supplied by a water-jetting pump). The worker had taped a torch to the end of the lance because the workspace was dark with poor visibility due to the dispersion of water and particles from the cleaning process.

The worker stood upright, holding the high-pressure water lance between his legs, with the lance facing down and at 90° to the demister pads. The jet of high-pressure water struck his protective gum boot while cleaning the pads.

The force of the water was sufficient to pass through the lining of the boot and penetrate the worker's foot, creating a high-pressure injection wound that entered and exited through the inner ball of his foot.

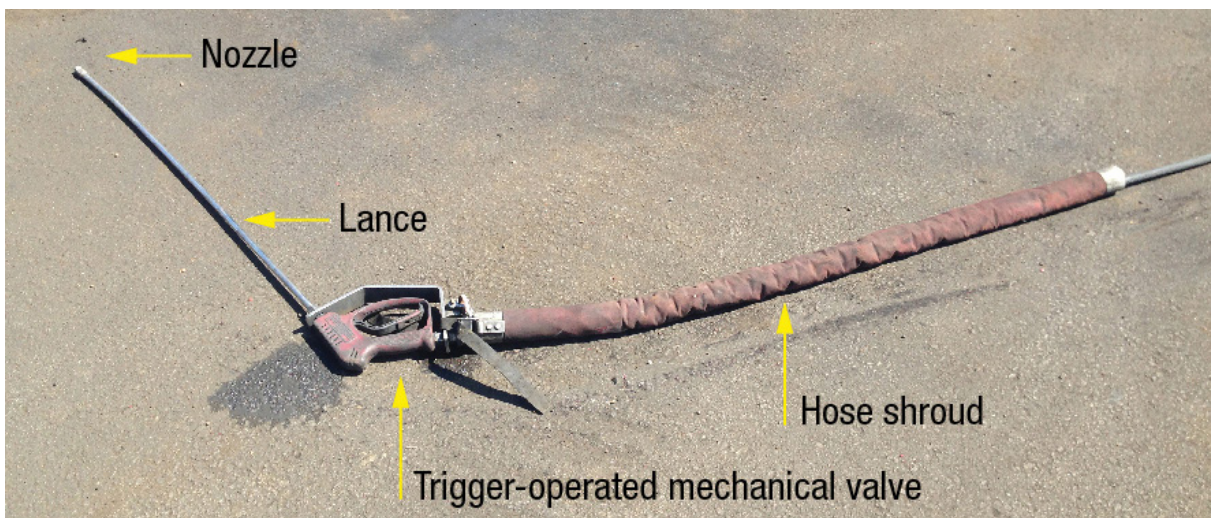


Entry point where high-pressure water jet penetrated boot lining

Probable causes

Direct

- The operating pressure of the water jet greatly exceeded the pressure rating of the protective gum boot worn by the worker.
- The worker pointed the nozzle directly down, within the vicinity of his feet.



Example of high-pressure water jetting equipment

Mines Safety Significant Incident Report No. 229 continued

Contributory

- The pressure setting and water flow rate used during cleaning resulted in twice the recommended reaction force.

Note: A reaction force is created as water leaves the nozzle. This force acts in the opposite direction to the water flow. Exceeding the reaction force makes it more difficult for an operator to control the direction of the water jet.

- Personal protective clothing and footwear capable of withstanding the force of the water jet was not worn.
- The torch attached to the lance partially obscured the worker's vision of the nozzle head and working area.
- There was insufficient lighting for the work task and environment. Intrinsically safe lighting available at the workplace was not utilised.

Actions required

The following actions are recommended to help reduce the potential for injuries when using high-pressure water jetting equipment.

Risk assessment

- Prior to any high-pressure water jetting operations, conduct a suitable risk assessment for the proposed work task. Consider the nozzle type, maximum operating pressure of the pump, type of equipment and water flow rate to be used.

Reaction force

- Calculate the reaction force using the high-pressure water jetting pump's maximum pressure rating and nozzle charts supplied by the manufacturer.
- Use the calculations to confirm that the reaction force when operating the jetting gun will be equal to or less than the maximum reaction force of 250 N or 25.5 kg, as specified in Safe Work Australia's Guide for managing risks from high-pressure water jetting.

Note: When a reaction force greater than 250 N or 25.5 kg is required to achieve acceptable results, use mechanical devices to control the nozzle (e.g. mechanised equipment or engineered structures designed to hold the excess reaction force in all planes).



Personal protective equipment. Left: Worker using high-pressure water jetting equipment while wearing appropriate face shield, blast suit, protective gloves, and boots with covering foot shield. Right: Protective boot and covering foot shield

Protective footwear and clothing

- Workers should wear protective footwear complying with Australian Standard AS/NZS 2210.3 *Occupational protective footwear – Specification for safety footwear*.
- Where there is a risk of injury, personal protective equipment (PPE) should include:
 - a foot and lower leg guard or shield
 - leg and body armour
 - protective gloves, face shield and eye protection.
 These should be made of materials capable of withstanding the direct force of the water jet.
Note: Always wear suitable PPE regardless of the other control measures in place.
- Workers should wear waterproof protective clothing complying with:
 - AS/NZS ISO 6529 *Protective clothing – Protection against chemicals – Determination of resistance of protective clothing materials to permeation by liquids and gases*
 - AS/NZS 4503.2 *Protective clothing – Protection against liquid chemicals – Test method: Determination of resistance to penetration by a jet of liquid (jet test)*
 - AS/NZS 4503.3 *Protective clothing – Protection against liquid chemicals – Test method: Determination of resistance to penetration by spray (spray test)*.

Workers and the environment

- Workers operating high-pressure water equipment should direct the water jet away from their body at all times.
- There should be sufficient lighting provided to the working environment.

Further information

Guide and standards

- Safe Work Australia, www.safeworkaustralia.gov.au
 - Guide for managing risks from high pressure water jetting (2013)
- Standards Australia, www.standards.org.au
 - AS/NZS 2210.1 *Safety, protective and occupational footwear – Guide to selection, care and use*
 - AS/NZS 2210.3 *Occupational protective footwear – Specification for safety footwear*
 - AS/NZS ISO 6529 *Protective clothing – Protection against chemicals – Determination of resistance of protective clothing materials to permeation by liquids and gases*
 - AS/NZS 4503.2 *Protective clothing – Protection against liquid chemicals – Test method: Determination of resistance to penetration by a jet of liquid (jet test)*
 - AS/NZS 4503.3 *Protective clothing – Protection against liquid chemicals – Test method: Determination of resistance to penetration by spray (spray test)*
 - AS/NZS 4233.1 *High pressure water jetting systems – Safe operation and maintenance*
 - AS/NZS 4233.2 *High pressure water jetting systems – Construction and performance*
 - AS 3791 *Hydraulic hose*
 - AS/NZS 1680.1 *Interior workplace lighting – General principles and recommendations*

High-pressure injection injuries

High-pressure injection injuries are serious with the potential to threaten life and limb. The combination of irritant material and high pressure can lead to extensive inflammatory reaction, vascular compression and local necrosis.

Note: The pressure required to penetrate the surface of skin is about 7×10^5 N/m² or 100 psi

MINES SAFETY SIGNIFICANT INCIDENT REPORT NO. 230

DUMP TRUCK ROLL-OVER – FATAL ACCIDENT

ISSUED: 18 NOVEMBER 2015

Summary of incident

Note: The Department of Mines and Petroleum's investigation is ongoing. The information contained in this significant incident report is based on materials received, knowledge and understanding at the time of writing.

An operator driving a dump truck was hauling waste rock from an open pit to the waste dump. For reasons unknown, the operator failed to negotiate a slight left-hand bend and the truck took a gradual path to the left before colliding with the hard rock windrow.

Tyre marks indicate that the truck's front and rear left tyres mounted the windrow, and the dump truck rolled onto its right side. There is no evidence of braking before or at the time the truck mounted the windrow.

Two workers nearby heard the collision and one ran over to assist. The operator was still in the driver's cab (on the upper left side of the truck) and shortly after fell about 3.75 m to the ground from the passenger's side of the cab.

Despite the efforts of work colleagues and the emergency services, the operator died a short time later.

A vehicle examination showed the dump truck to be in full working order. The driver's seat belt was also deemed to be in good working order.

Probable causes

Direct

- The dump truck mounted the hard rock windrow, changing its centre of gravity and causing it to roll over.

Contributory

- The investigation is ongoing and contributory causes are yet to be confirmed.



Rear and front views of the dump truck

Actions required

The following actions, required under the Mines Safety and Inspection Regulations 1995, support safe driving practices on mine sites.

For employers and mine managers, regulations 4.16(1) and (2) require:

- each vehicle used at the mine to be fitted with seat belts and seat belt anchorage points that conform with the Australian Design Rules
- if any seat position is added to a vehicle used at the mine, the seat to be fitted with a seat belt and seat belt anchorage point that conforms with the Australian Design Rules
- if a seat is a suspension seat, the seat belt anchorage to be attached to the seat assembly and the seat belt fitted with the appropriate retractor.

Regulation 4.16(3) requires people driving or travelling in a vehicle where a seat belt is fitted for that seat position to properly adjust and securely fasten that belt.

Workers should be instructed, through training and inductions, regarding the importance of using the seatbelts provided in vehicles to reduce the impact of potential collisions.

Further information

- Resources Safety, Department of Mines and Petroleum, www.dmp.wa.gov.au/ResourcesSafety
 - *Haul truck driving – Mine Safety Matters pamphlet*
- Department of Infrastructure and Regional Development, https://infrastructure.gov.au/roads/motor/design/adr_online.aspx
 - *Third Edition Australian Design Rules*

MINES SAFETY SIGNIFICANT INCIDENT REPORT NO. 231

FALLING ROCK DAMAGES TELE- HANDLER LEADING TO SERIOUS INJURIES

ISSUED: 24 NOVEMBER 2015

Summary of incident

A worker in a pit was conducting ground support activities from a work basket attached to a telehandler elevated about 12 metres above the ground. The worker was manually removing a rock from the face when it fell, striking the hydraulic check valve block on the right-hand front jack of the telehandler.

The impact dislodged the check valve block, releasing hydraulic fluid. The affected jack retracted, destabilising the tele-handler, which then tipped on to its side. The work basket became wedged against the wall, 6 metres above the pit floor,

trapping the worker's legs. The mine's rescue team extricated the worker, who had a fractured lower right leg and crush injuries to his left foot.

Probable causes

Direct

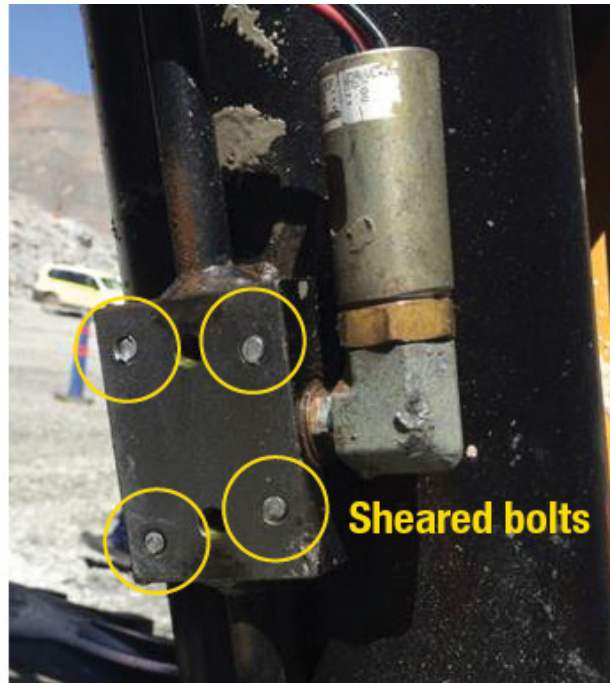
- A rock struck and damaged the check valve block causing hydraulic fluid release and retraction of the jack.

Contributory

- The original equipment manufacturer's (OEM's) check valve covers were inadequate to prevent damage from impact by large or heavy objects.
- Work planning did not consider the potential for equipment to be struck by falling rocks outside the demarcation zone.
- The design of the work basket did not prevent the extension of body parts past the basket's edge protection during uncontrolled movement.



Incident scene showing position of tele-handler and attached work basket



Damaged check valve block. Left: Check valve separated from block. Right: Sheared bolts on check valve block

Actions required

- The following actions are recommended so the potential for objects to strike critical components, causing failure, can be addressed.
- Conduct a review of equipment fitted with check valves to determine if a risk of impact exists for the check valve and block.
- For tasks involving working at height, identify scenarios where objects could fall and strike critical equipment and people below.
- For work baskets used to conduct work at height, determine the adequacy of the basket's design to prevent body parts extending past edge protection if there is uncontrolled movement.

Further information

- Standards Australia, www.standards.org.au
 - AS 1418.19 *Cranes, hoist and winches – Telescopic handlers*

Note: Refer to Section 2.7.3.3 Failure of energy supply or hydraulic circuit

“...in the event of a failure in the hydraulic circuit of the load lifting, tilting, telescoping, stabilising or lateral levelling system(s) or in the event of failure of the driving power supply, means shall be provided to maintain the load or tele-handler in its position.”

MINES SAFETY SIGNIFICANT INCIDENT REPORT NO. 232

UNDERGROUND OPERATOR COLLAPSES UNDERGROUND – FATAL ACCIDENT

ISSUED: 30 NOVEMBER 2015

Summary of incident

Note: The Department of Mines and Petroleum's investigation is ongoing. The information contained in this significant incident report is based on materials received, knowledge and understanding at the time of writing.

A 28-year-old jumbo offsider collapsed while working underground on night shift and was taken to the surface. He initially received treatment from the mine medical staff and then from the Royal Flying Doctor Service but passed away during the early hours of the next day.

Probable causes

Direct

- The underground operator was undertaking heavy physical work in hot and humid conditions.

Contributory

- The investigation is ongoing and contributory causes are yet to be confirmed.

Actions required

The following actions are recommended to prevent and manage heat stress.

Employers

Review operating procedures in accordance with the requirements of r. 9.15 of the Mines Safety and Inspection Regulations 1995. Recommended actions include:

- not exposing employees to heat so far as is practicable
- isolating sources of heat, so far as is practicable, through shielding, containment and remote handling techniques
- providing engineering controls, such as ventilation, that deliver an adequate volume, velocity and quality of air to achieve a healthy atmosphere and reduce heat loads
- adopting safe work practices and appropriate administrative procedures such as job rotation
- providing training to workers on measures to be taken to avoid any harmful effects from heat, and implementing appropriate workplace environmental controls and monitoring
- if other means of controlling exposure are not practicable or adequate, providing suitable personal protective equipment.

Managers and supervisors

- Ensure workers are trained to recognise the symptoms of heat stress.
- Provide detailed safe work practices that identify the hazards and controls for working in hot and humid conditions and ensure controls are implemented.
- If the wet bulb temperature exceeds 25°C, an air velocity of not less than 0.5 metres per second must be provided for underground workplaces or in a tunnel under a surge stockpile.
- Seek urgent medical treatment for anyone suspected of suffering heat-related illness.

Workers

- Understand the risks and symptoms of heat stress, and report any signs of heat stress to a supervisor.
- Ensure appropriate quantities of water are consumed to remain hydrated.

Further information

- Resources Safety online guidance about heat and thermal stress management, www.dmp.wa.gov.au/Safety/Guidance-about-heat-and-thermal-6968.aspx
- Resources Safety publications, www.dmp.wa.gov.au/Safety/Mining-Safety-publications-16162.aspx
 - *Working in hot processes – Mine Safety Matters pamphlet*, www.dmp.wa.gov.au/Documents/Safety/MSH_MSM_P_WorkingHotProcesses.pdf
 - *Heat stress – toolbox presentation*, www.dmp.wa.gov.au/Documents/Safety/MSH_TB_HeatStress.ppt
 - *Management and prevention of heat stress – guideline*, www.dmp.wa.gov.au/Documents/Safety/MSH_G_ManagementAndPreventionOfHeatStress.pdf
- US Occupational Safety and Health Administration, https://www.osha.gov/OshDoc/data_Hurricane_Facts/heat_stress.pdf
 - *Protecting workers from the effects of heat – OSH factsheet*

MINES SAFETY SIGNIFICANT INCIDENT REPORT NO. 233

WORKER SERIOUSLY INJURED BY HOT CAUSTIC SOLUTION WHILE CLEANING AN INLINE STRAINER

ISSUED: 01 DECEMBER 2015

Summary of incident

During routine maintenance, a process operator was cleaning a screen box (inline filter) connected to pipework below a thickener tank. He opened the drain valve to verify isolation before undoing four bolts to open the screen box door. On opening the screen box door, the operator found the screen full of material. As he pulled the screen out of its housing, a blockage upstream of the screen box dislodged. The operator was engulfed in 95°C caustic solution, receiving thermal and caustic burns to his body and face.

An emergency responder found the main isolation valve open.

Probable causes

Direct

- The main isolation valve was open, so the screen box and associated valves were not isolated.
- The process operator was in front of the screen box when the blockage dislodged.

Contributory

- The isolation of valves was not verified through either a second and independent method of ensuring all valves were closed, or checking the effectiveness of each isolation point by separately observing a “change of state”.
- The operator mistakenly thought he had closed the main isolation valve but its function was actually being performed by a blocked pipe.
- Excessive scale had built up inside the vessel after scheduled maintenance was delayed.

- It was difficult to determine the position of the main isolation valve (i.e. open versus closed).
- Operators were not required to lock or tag isolation points for routine work.

Actions required

The following actions are recommended for work involving hazardous substances.

Plant design and modifications

- Consider plant design that enables positive and proven isolation methods such as physical disconnection, single block and bleed and spade, and double block and bleed.
- Consider modifying the plant to include facilities for proving an isolation point. Where drain lines are used, they need to be as close as possible to the isolation to prevent a false verification due to a line blockage.
- Isolations should be as close as possible to the piece of plant being isolated.
- Consider installing flushing systems to verify pipework and plant are free of blockages.

Safe systems of work

Implement safe systems of work such that:

- safe work procedures are provided for isolations, including the basic principles of **lock, tag, try test** and finally **test for dead**
- safe work procedures are updated to capture operational experience to ensure known risks have adequate controls
- vessels are maintained to reduce material or scale build-up inside pipelines, drain lines or valves, as blockages may falsely indicate isolation
- plant and equipment are clearly identifiable to prevent incorrect isolation
- gases and liquids are not trapped in sections of plant that do not have adequate pressure or vacuum protection or thermal relief.

Verifying isolation

An isolation valve may leak and fail to isolate. If the isolation is not verified appropriately, the leak or failure may not be recognised until the job starts.

- When conducting an isolation, prove all isolation points before proceeding with intrusive work. Each isolation valve should be proved separately by observing a “change of state” between **close-open-close** positions after the system has been fully drained. Valves need to experience full system pressure to ensure they hold.
- A “try test” needs to be completed to verify all electrical, hydraulic and instrument air circuits have been isolated.
- The “test for dead” needs to consider all potential hazards, such as residual amounts of corrosive, toxic or flammable substances, retained pressure, hot condensate and steam. Do not rely on an unproven or inconclusive isolation. Consider:
 - extending the isolation boundary
 - implementing additional controls
 - deferring the work until a shutdown.

Further information

- Resources Safety, Department of Mines and Petroleum, www.dmp.wa.gov.au/ResourcesSafety
 - Mines Safety Bulletin No. 118 *Working alone with corrosive substances – potential loss of communications*
 - *Isolation of hazardous energies associated with plant in Western Australian mining operations – guideline*

MINES SAFETY SIGNIFICANT INCIDENT REPORT NO. 234

LIGHT VEHICLE DRIVEN PARTLY OVER EDGE OF OPEN STOPE

ISSUED: 09 DECEMBER 2015

Summary of incident

In April 2015, an underground surveyor arrived at the level that accessed the top of a recently completed stope to conduct a cavity monitoring survey (CMS). After removing the danger and warning signs at the level access, the surveyor reversed the light vehicle towards the open stope expecting to encounter a second set of signs hanging in the access, in accordance with the site's standard procedure. This was the location commonly used to unload the survey equipment.

The vehicle reversed until the rear wheels dropped over the edge of the 18 metre deep open stope, and the frame bottomed out on the floor at the edge of the void. The vehicle's frame skidded 20 to 30 centimetres before stopping. The expected second set of signs had not been hanging in the access.

Using the vehicle's two-way radio, the surveyor called for emergency assistance. An underground loader arrived shortly after and the vehicle was secured to the loader using a chain.



Light vehicle attached to loader with chain

On arrival, the emergency response team further secured the vehicle with additional slings and rope then extracted the surveyor through the driver's side window. Fortunately, the individual was not injured.

Probable causes

Direct

- The open stope lacked appropriate hard barriers, allowing personnel inadvertent access to the void.

Contributory

- Management relied on the lower order control of signage with no hard barriers to prevent access to the top of the open stope.
- The signage process in the site's signage procedure was inconsistent (i.e. reliance on a second sign being in place that was not).
- There was no official procedure for conducting a cavity monitoring survey.
- There was insufficient detail in the procedure for working around an open hole (which is different from working at heights).

Actions required

Resources Safety has issued safety alerts covering similar incidents and guidance on working around openings underground. Mine operators are again reminded of the importance of developing safe systems of work and implementing appropriate controls for all work or travel near open holes underground.

The following actions are recommended to mitigate the risk associated with access to voids in underground mines.

Hard barriers

- Hard barriers should be:
 - designed, constructed and located to prevent equipment accessing the edge of open holes

- used in conjunction with lower-tier control systems (e.g. clear sign-posting, lockable barriers controlled by supervisors or managers)
- wherever possible, installed before creating an open hole.

Safe work practices

- Standard operating procedures should be concise and unambiguous for high-risk repetitive tasks.
- Work instructions given to operators should be clear, unambiguous and understood so that there is no misinterpretation of job requirements.

Further information

- Resources Safety safety alerts, www.dmp.wa.gov.au/Safety/Mines-safety-alerts-13194.aspx
 - Significant Incident Report No. 110 *Vehicle over stope edge*
 - Significant Incident Report No. 149 *Loader falling into an open stope*
 - Significant Incident Report No. 199 *Manned loader drives into open stope – fatal accident*
 - Safety Bulletin No. 3 *Vertical opening safety practice*

MINES SAFETY SIGNIFICANT INCIDENT REPORT NO. 235

SCAFFOLDER FALLS FROM HEIGHT IN A PROCESS VESSEL AT A REFINERY – FATAL ACCIDENT

ISSUED: 18 DECEMBER 2015

Summary of incident

Note: The Department of Mines and Petroleum's investigation is ongoing. The information contained in this significant incident report is based on materials received, knowledge and understanding at the time of writing.

On 25 November 2015, a scaffolder died after falling into a process vessel at a refinery.

A bank of six digesters at the refinery had been off-line for maintenance and refurbishment work since July 2015. All pipework had been disconnected and scaffolding installed in August for refurbishment work inside the digesters. When the refurbishment work was almost complete, scaffolders began dismantling the scaffolding. Scaffolds had been removed from three digesters in the days before the fatal accident.

On the day of the incident, a five-man scaffolding team had established a ladder at the bottom entry of a digester that still contained scaffold. The scaffolder had gone up a series of stairways over three levels, with another team member, to the top level of the digester bank to enter through the top manway of the digester being worked on. However, he inadvertently entered a manway into an adjacent digester, from which the scaffold had already been removed, and fell about 12 metres.

Note: The top deck of the scaffold in the digester being worked on was about 1.5 metres below the manway. There was no platform or temporary stair to allow safe footing when alighting onto the scaffold platform. All the scaffolders were wearing fall arrest harnesses, which they would connect to a safe anchor point once on the platform.



Top level of the digester bank showing disconnected pipework

Probable causes

Direct

- There was no device or guard on the open manway to prevent inadvertent access to the digester from which scaffolding had been removed.

Contributory

- A digester has two manways. The company procedure required a mechanical guard to be fitted on each manway when the doors were opened for maintenance to proceed, but did not address how guards were to be removed and replaced during and after the work. On the day of the incident, not all guards were in place.
- The company procedure for scaffolding did not address how scaffolds were to be constructed in process vessels and how to access them.
- There was confusing terminology in the company procedures regarding confined spaces.
- There was a lack of appropriate signage, and digester entry points were not identified or differentiated with a number or name.



Left: Manway into a digester with mechanical guard fitted. Right: Manway entry for the digester without scaffolding (tape placed by emergency response team)

Actions required

Falls from height remain one of the three main hazards leading to fatalities and serious injuries in the mining industry. Mineral process plants can be large and involve work on multiple levels in and around vessels and buildings, with the potential to expose workers to serious fall hazards.

It is critical that mine operators conduct detailed risk assessments of areas or tasks where workers might be exposed to fall hazards and take preventative measures. Mine operators, employers and workers should ensure that safe work procedures are available, followed and enforced.

Further information

- Resources Safety guidance about working at height, www.dmp.wa.gov.au/Safety/Guidance-about-working-at-height-6262.aspx
- Resources Safety *Down to Earth* hazard awareness videos, www.dmp.wa.gov.au/HazardVideos

MINES SAFETY SIGNIFICANT INCIDENT REPORT NO. 236

NEAR MISS WHEN A PICK-AND-CARRY CRANE ROLLS OVER

ISSUED: 21 DECEMBER 2015

Summary of incident

In November 2015, an articulated, pick-and-carry mobile crane at a mine site was positioning acyclone tie-down block weighing about two tonne. The crane operator moved the machine with the boom almost fully extended, the hook block sheave in hard contact with the boom end sheave (known as two-blocking), and a swinging load (with no control on the tag line).

As the crane moved backward, was articulated, then moved forward, a front wheel travelled onto soft material on sloping ground and the crane tipped onto its side. The dogman, who was acting as a spotter, had to move quickly to avoid injury as the crane rolled towards him. The crane operator was uninjured.



Pick-and-carry crane on its side

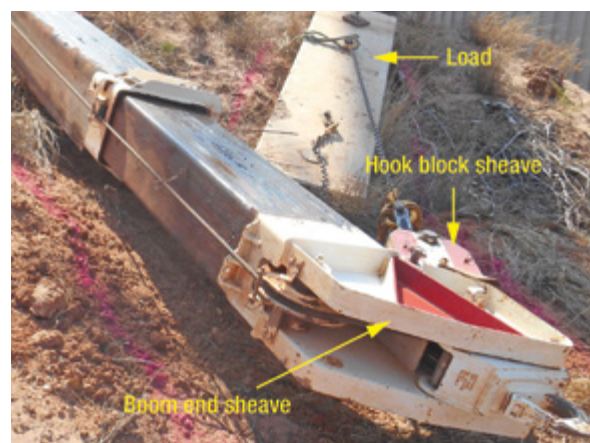
Probable causes

Direct

- The crane was being operated outside of its design criteria, changing its centre of gravity and destabilising the machine:
 - the boom was almost fully extended and elevated
 - the crane was articulated while travelling, with the load raised and swinging.
- The ground was sloping and uneven (e.g. front wheel travelled from sealed hardstand to uncompacted material).

Contributory

- The hazards associated with moving the load were not fully identified or controlled. For example, the boom end sheave and hook block sheave were in hard contact (i.e. two-blocked).
- The mine site verification of competency appears to have been remiss in identifying shortfalls in the competency of the crane operator and dogman.



Extended boom of the crane and the two-blocked sheaves

Actions required

The following actions are recommended to reduce the potential for pick-and-carry cranes to destabilise.

Competency

The following requirements apply under the Mines Safety and Inspection Regulations 1995.

- A person (e.g. crane operator, dogman, rigger) must not do high risk work of a particular class at a mine unless they hold a high risk work licence for that class of work [r. 6.37 (1A)(a)].
- Before commencing work at a mine every worker must be assessed to verify they are competent to perform the tasks assigned and operate any plant or equipment they are required to operate (e.g. pick-and-carry crane) [r. 4.13 (1)(b)].
- Construction work is to be carried out by competent persons [r. 4.20].

Safe systems of work

- Before a crane operation is undertaken, a competent person should conduct a risk assessment.
- A competent person should:
 - formulate a safe work procedure
 - monitor the procedure for its ongoing effectiveness
 - modify the procedure if found to be deficient, the task changes, or associated risks change.

Crane operation

- The requirements of the following Australian standards should be met when pick-and-carry cranes are operated:
 - AS 2550.1 *Cranes, hoists and winches – Safe use – General requirements*
 - AS 2550.5 *Cranes, hoist and winches – Safe use – Mobile cranes*.
- When determining load capacity, ensure the original equipment manufacturer's (OEM's) derating instructions for ground slope are available and followed.
- When operating a crane, follow the instructions of the OEM for:
 - determining load capacity
 - extension of the boom (e.g. consider load capacity, articulation and ground slope)
 - articulation, movement and load position

- movement of the boom and hoisting the load (e.g. at rest)
- eliminating two-blocking practices.
- Confirm ground conditions are capable of supporting the crane and its load where the crane will be operating.

Further information

- Resources Safety safety alerts, www.dmp.wa.gov.au/Safety/Mines-safety-alerts-13194.aspx
 - Mines Safety Bulletin No. 102 *Addressing the potential for mobile (pick-and-carry) cranes to topple sideways*
- Resources Safety manufacturer's product safety alerts, www.dmp.wa.gov.au/Safety/Manufacturer-s-product-safety-4998.aspx
 - *Notes to accompany Terex Information Bulletin: Operating on side slopes (May 2014)*
 - *Terex Information Bulletin: Operating on side slopes (September 2007)*
- Resources Safety Raising the issue hazard awareness videos and toolbox, www.dmp.wa.gov.au/Safety/Hazard-awareness-videos-16435.aspx
- Standards Australia, www.standards.org.au
 - AS 1418.1 *Cranes, hoists and winches – General requirements*
 - AS 1418.5 *Cranes, hoists and winches – Mobile cranes*
 - AS 2550.1 *Cranes, hoists and winches – Safe use – General requirements*
 - AS 2550.5 *Cranes, hoist and winches – Safe use – Mobile cranes*
- The Crane Industry Council of Australia (CICA), www.cica.com.au/docs/defaultsource/technical-information/cica-pa-0009-b-position-paper-articulated-crane-operatorrequirements.pdf?sfvrsn=2
 - CICA Position Paper, *Articulated Crane Operator Requirements*

DANGEROUS GOODS SAFETY SIGNIFICANT INCIDENT REPORT NO. **01-15**

ALUMINIUM POWDER DUST EXPLOSION AT EXPLOSIVES MANUFACTURING PLANT

ISSUED: 11 DECEMBER 2015

Summary of incident

In November 2015, an operator at an explosives manufacturing plant was tasked with transferring aluminium grit atomised powder (aluminium powder) from a flexible intermediate bulk container (IBC) outside the plant to the hopper inside the plant. Using a pneumatically-driven vacuum suction pump and transfer pipe work (which incorporated five metres of PVC piping) the operator successfully transferred part of the powder from the IBC.

When the hopper began to empty the operator resumed transferring product. Just after repositioning the suction pipe inside the IBC, he heard a loud explosion that sounded like a cartridge of explosives detonating, and felt the pipe shake violently in his hand. The operator ran inside the plant to find that the vacuum pump and chamber were on fire and had

been blown off the hopper. There were spot fires of burning product. The operator used an extinguisher to put out the fires. There were no injuries.

There was charring on the inside of both the vacuum chamber and transfer pipe work but not inside the hopper. It appears a dust explosion was triggered by a static discharge inside the vacuum chamber creating a flash-back through the transfer piping.

Probable causes

Direct

- The aluminium powder contained fines, which has the potential to form an explosive dust atmosphere.
Note: The material safety data sheet (MSDS) warned that the product could form explosive dust atmospheres.
- The inner and outer chambers of the pneumatically-driven vacuum pump were not effectively bonded and only one chamber was earthed. This allowed for the build-up of static electricity (a potential ignition source).
- Non-conductive PVC piping had been incorporated within the conductive transfer piping. The transfer piping was not earthed which allowed for the build-up of static electricity.



Damage to transfer system. Left. Vacuum pump chamber and pump, PVC transfer piping and evidence of spot fires on the floor. Right. Distortion of hopper caused by explosion

Contributory

- The relative humidity was exceptionally low, allowing for static charge to accumulate.
- The grade and quality of the aluminium granules (e.g. size and percentages of fines) was unknown.
- Workers were unaware of a standard operating procedure (SOP), including the MSDS, for safely transferring aluminium powder.
- Electrical continuity for all equipment could not be confirmed.
- The earthing point on the flexible IBC was not used and the bag was sitting on a wooden pallet which insulated it from the ground.

Actions required

Where aluminium powder is used, the following actions are recommended to prevent dust explosions.

Product specifications

Particle shape (e.g. flake, atomised) and particle size distribution (i.e. proportion less than 420 microns in size) determines the propensity to create an explosive dust atmosphere.

Information to determine whether the product meets specifications can be obtained by:

- requesting certificates of analysis
- undertaking independent analysis to confirm particle size distribution.

Plant design, construction and modifications

- Changes to plant and transfer piping that differ from the original plant specification constitute a design change. Before changes are made they should be carefully considered using a change management approach.
- Reduce the potential to generate a static charge by:
 - selecting a suitable low-energy transfer system for product (e.g. avoid high-energy pneumatic systems where possible)
 - using conductive material to assist in the dissipation of static charge (e.g. avoid non-conductive materials such as PVC)
 - effectively bonding and earthing plant and transfer piping.

Training and safe systems of work

- Workers should:
 - be provided with SOPs
 - be trained in the safe use of plant and equipment
 - have an understanding of the mechanisms that lead to dust explosions.

Further information

- United States Chemical Safety Board (CSB)
 - Combustible dust: an insidious hazard – video, www.csb.gov/videos/combustible-dust-an-insidious-hazard/
 - Hayes Lemmerz aluminium dust explosions and fire – final investigation report, www.csb.gov/hayes-lemmerz-dust-explosions-and-fire/

PETROLEUM SAFETY SIGNIFICANT INCIDENT REPORT NO. **01/2015**

WORKER SERIOUSLY INJURED BY EXPLOSION OF CONDENSATE DRAIN LINE ON AIR BOOSTER COMPRESSOR

ISSUED: 10 SEPTEMBER 2015

Summary of incident

Note: The Department of Mines and Petroleum's investigation is ongoing. The information contained in this significant incident report is based on materials received, knowledge and understanding at the time of writing.

An operator at a dewatering spread was required to drain condensate from a knock-out drum (scrubber), which removes water from the air booster compressor system.

As he actuated the drain valve, hydrocarbon deposits in the high-pressure condensate drain line ignited and the metal line ruptured (see "Further information" for explanation).

The explosion resulted in permanent, debilitating injuries to the operator.

Probable causes

Direct

- The localised pressure shock wave produced by adiabatic ignition of hydrocarbon deposits in the drain line exceeded the system rating, and pipes and fittings ruptured.
- The operator was positioned next to the drain line when it exploded.

Contributory

- The design of the compressor system did not protect against the risk of adiabatic compression:
 - use of fast opening valve (sudden pressure differential)

- geometry of condensate line (high-velocity particles impinge on localised area, allowing heat build-up and contributing to adiabatic ignition)
- equipment not earthed (gas flow across the valve trim may have generated a static charge).
- Inappropriate maintenance practices included:
 - mixing lubricants with different auto-ignition temperatures
 - not addressing the presence of contaminants in the lubricants (dust and fine debris behave as high-velocity particles with kinetic energy transformed into heat upon impact).

Actions required

Responsible persons are reminded of the importance of monitoring and reviewing the design, installation and use of plant to ensure workers can undertake tasks safely. The following measures are recommended.

Design considerations

- Confirm the adequacy of design factors of safety for all pipework and receivers connected to systems downstream of a switching valve, including the use of screwed fittings in high-pressure air systems.
 - Install remotely operated valves where practicable. If not, consider cracking condensate drain valves in the open position.
- Avoid using fast-opening valves where the risk of adiabatic ignition exists.
- Avoid sharp bends, tees and elbows to minimise the potential for high velocity particles impinging on localised areas.
- Reduce the potential to generate a static charge on fittings.
 - Ensure electrical continuity between all parts of the system, especially valves.
 - Earth all compressors and boosters in accordance with Australian Standards.

- Consult the original equipment manufacturer (OEM) regarding the suitability of non-metallic system components.

Note: Ball, butterfly and eccentric disc valves have an inherent risk as the grounding path between the trim and valve body is inadequate. Soft-seated valves may produce a static discharge from the rapid relative motion between the disc and seat.

- Using materials with high thermal conductivity will assist in heat dissipation from hot spots.
- Use additional safety devices such as bursting discs to protect against adiabatic ignition.

Note: Pressure relief valves (PRVs) have slow response times and are not designed to protect against adiabatic ignition events.

Operational and maintenance considerations

- Consult with the original equipment manufacturer (OEM) before modifying or changing operating parameters.
- In consultation with operators and maintenance personnel, undertake a formal risk assessment of high-pressure compressed air systems to reduce risk to an acceptable level.
 - Review high-pressure air paths for potential “slam-on slam-off” operations that may result in adiabatic ignition events in the system.
- Do not assume that high-pressure air paths are unobstructed.
- Use only OEM-approved lubricants and cleaning agents.
- Lubricants should be clearly labelled to prevent cross-contamination, and operators and maintenance personnel trained in their use.

Note: Mineral oil-based lubricants have a lower auto-ignition temperature than phosphate ester-based lubricants.

- Establish an appropriate maintenance and inspection regime to:
 - maintain air intake and oil filters to minimise contamination
 - monitor air boosters and compressors for excessive oil loss as well as high discharge temperatures
 - identify potential contaminants (e.g. rust and other metal oxides) that can lower the auto-ignition temperature of lubricants
 - identify excessive (over)lubrication, which can increase the amount of combustible material in the system.

Note: Higher temperatures promote the occurrence of adiabatic ignition, while higher pressures increase the propagation speed of the shock wave.

Further information

What ignited the hydrocarbon deposits in the drain line?

Lubricated air compressors and boosters potentially have the three elements of the fire triangle (oxygen, ignition source and fuel) present at the same time.

When gas collides at great speed with a resistance, the temperature rises very quickly due to adiabatic compression, which is so rapid that the thermal energy cannot dissipate. In this incident, opening the valve led to adiabatic compression when high-pressure gas injected abruptly into a low-pressure system of reduced volume.

The temperature increase ignited hydrocarbon deposits (any airborne oils and lubricants) and non-metallic materials once their auto-ignition temperature was reached.

Related guidance

www.dmp.wa.gov.au/ResourcesSafety

- Mines Safety Bulletin No. 71 *Booster compressor explosions – reverse circulation (RC) drilling*
- *Evaluation of asset integrity management system (AIMS) – guide*

www.standards.org.au

Australian Standard AS/NZS 3000 *Electrical installations* (known as the Australian/New Zealand Wiring Rules)

MINES SAFETY BULLETIN NO. 124

STRUCTURAL SAFETY OF BUILDINGS, PLANT AND OTHER STRUCTURES

ISSUED: 16 SEPTEMBER 2015

Background

Structural failures, near misses and integrity issues on Western Australian mining operations over the past three years appear to have similar causation factors to the failures reported in Mines Safety Bulletin No. 43 *Structural safety of building and plant*, released on 13 August 1998. The inspectorate is concerned about:

- some recent serious and potentially serious incidents involving loss of structural integrity
- the management of assets through their life cycle
- the suitability and adequacy of structural repairs and/or modifications.

This bulletin updates Mines Safety Bulletin No. 43 with additional recommendations for industry to:

- better manage asset integrity
- address the potential for normalisation of risk for buildings, plant and other structures that typically have a long design life (i.e. people regularly passing damaged structural elements can become desensitised to the increasing risk of structural failure).

Note: For convenience, the term “structures” refers to any buildings, plant and other structures that are at risk of failure from lack of integrity.

While no-one was injured in the recent failures, all had the potential to cause multiple fatalities:

- collapse of a 30 tonne gross weight open-top mixing tank — although still under investigation, it appears the support steelwork failed due to corrosion damage and inadequate connection design
- rupture and collapse of a 2 million litre acid leach tank — although still under investigation, it appears the tank shell failed due to corrosion damage

- failure of a 80 tonne jib crane during testing — the strength of the crane was compromised by inadequate design and failure to appropriately communicate the design intent
- concrete supporting plinth for a conveyor take-up sheave tore out of its ground slab — the strength of the plinth was inadequate due to both design and construction defects
- failure of a back stay on a radial stacker — the stay member was excessively corroded
- failure of a stack — the stack experienced accelerated internal corrosion due a change in the composition of emissions
- failure of a winder sheave supporting shaft — a fatigue crack was not identified until it caused a complete fracture.

As well as the reported failures, mines inspectors have observed structural damage during site visits. Inspectors have required mine management to have the following situations assessed by competent persons:

- corrosion of steelwork members where a large portion of the gross area is missing or webs are corroded through over substantial areas or lengths
- damaged concrete where large areas had spalling (cover damage due to internal corrosion) resulting in compromised bond strength, or there were full-thickness cracks
- impact damage of steelwork members where the permanently deformed shape far exceeds the limits of the design standard
- modified structures where the original design intent is clearly compromised (e.g. removed or improperly modified vertical bracing).

Structural issues identified by inspectors during site visits that needed to be addressed immediately include:

- the potential failure of a run-of-mine (ROM) bin that had one remaining bolt preventing the collapse of the tie wall and the overall collapse of the bin's side walls — the bin had shown signs of distress for some months
- large cracks identified in the support steelwork under a ROM bin — weld repairs and patching were ineffective, and the last remaining structural members were cracked through and displacing

- large cracks in underpans beneath vibrating screens — the original support bracket details were not adequate to accommodate the dynamic loading.

Summary of hazard

- Structures can fail when their strength is inadequate for the load applied (i.e. not robust or reliable). Failure can involve an entire assembly or parts.
- Catastrophic structural failures are often rapid events with little warning. There is usually insufficient time to escape the vicinity.
- The consequences (including knock-on effects) of structural failure increase when the contained energy or resisted load has secondary harming potential, such as when the failure of one structure (or structural component) causes the failure of others (i.e. a domino effect), or harmful liquids are released.
- Structural failures almost always involve high energies. Even small parts falling from height can result in a fatality or serious injury.

Contributory factors

Design

- Original design or design modifications not undertaken by a competent person.
- Inadequate quality control during the design process.
- Change management not adequately implemented.

Communication

- Lack of confirmation of design intent between the designer and manufacturer (e.g. checking that the manufacturer's interpretation meets the design intent).
- Original designer did not communicate the assumptions and limitations to the manufacturer and end-users (e.g. maintainers, operators).
- Inadequate specification by the user or developer for the design expectations, including those for monitoring and maintenance.

Competency

- Those tasked with assessing the structural integrity condition of structures at workplaces did not understand:
 - the limits on the reliability and robustness of those structures
 - the potential consequences of structural failure.

- Original construction did not follow required work practices and standards.

Monitoring

- Failure to ensure the condition of the structure remains within the design limits.
- Workplace assessment by a competent person not undertaken.
- Inadequate assessment and reporting of damage, including:
 - assuming that the original design and construction were correct when determining the plan of action (e.g. some construction has inadequate proof of design or manufacturing data, or insufficient physical build details)
 - not assessing the risk ranking of the structure using consequence of failure and degree of unreliability.
- Following a qualitative assessment (e.g. visual inspection by competent person) where the structural integrity is determined to be inadequate, a quantitative assessment was not undertaken where necessary to determine the most appropriate plan of action.

Note: Quantitative assessments usually involve accurate calculation of strength and reliability based on measurements and calculated probability.

Maintenance

- Repairs were not undertaken by competent persons.
- Failure to identify and remedy the root causes of the failed areas during the original and subsequent repairs.
- Lack of use or utilisation plan to maintain structures in line with the original design intent.
- Inadequate risk ranking, prioritisation and urgency allocated for remedial measures.

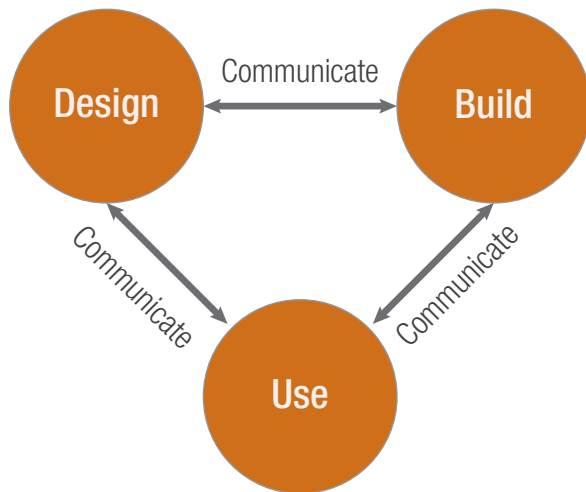
Use

- Failure to ensure the loading applied was limited to the design value.

Actions required

Responsible persons are reminded of the importance of managing the structural integrity of structures. Structural integrity and safety rely on good practice throughout a structure's life cycle (see AS 5104, table A.1). There are three key areas to consider when addressing the causation factors for failure: design, build and use.

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The arrows indicate the transfer of design intent. If communication does not happen or is ineffective, structural integrity and safety may be compromised

The following actions are recommended.

Design and communication of design intent

- Designers are reminded of their responsibilities regarding items of plant under section 14 of the *Mines Safety and Inspection Act 1994* and regulations 6.3, 6.4 and 6.5 of the Mines Safety and Inspection Regulations 1995.
- Competent persons should check the adequacy and suitability of designs and modifications.
- Connections known to be at risk of rapid crack failure should not be used in structures supporting dynamic equipment.

Manufacturing verification

- The construction of all structures should be verified by a competent engineer (ideally, the original engineer) to ensure it meets the intent of the original design.

Competency

- Only persons competent in the structural design of the particular structure should manage the asset, including decisions about its continued use or modification.

Note: An example of a competent person would be a professional structural engineer with suitable training and experience.

- The manufacturer or constructor's work practices should be reviewed if their output has defective details — in particular, problems arising from the welding of dynamic equipment are well documented.

Monitoring

- During the life cycle of structures at a workplace, a person whose competency covers the specific structures should assess them for structural adequacy. A risk-based approach should be adopted to determine the timing of inspections and monitoring.
- Where a structure has inadequate strength or reliability (robustness), a competent person should advise the immediate measures to be taken to ensure there is no exposure to harm while decisions are made regarding the appropriate course of action in terms of its design life or planned obsolescence.

Provision, maintenance and repairs

- Employers, including Principal Employers, are reminded of their responsibilities regarding the provision and maintenance of workplaces, plant and systems of work under sections 9 and 13 of the *Mines Safety and Inspection Act 1994* and regulations 6.2, 6.17, 6.18, 6.19, 6.20, 6.21, 6.22 and 6.23 of the Mines Safety and Inspection Regulations 1995.
- Once a defect is identified, take all practicable measures to correct the defect to ensure the safety of personnel.
- For immediate risk mitigation, when structures are discovered to be at risk of failure, risk reduction measures should be applied in accordance with the hierarchy of control (e.g. remediating to the original design and construction state, modifying or strengthening, preventing access).
- For assessment of reliability and robustness where immediate risks are not present, quantitative assessments should be considered to determine the most appropriate plan of action.

Use

- A use and utilisation plan should be developed and implemented to limit the loading and state of degradation, such that the structural integrity does not decay below an acceptable degree of reliability (robustness).

Further information

www.dmp.wa.gov.au/ResourcesSafety

- Mines Safety Bulletin No. 43 Structural safety of buildings and plant
- Evaluation of asset integrity management system (AIMS) – guide

www.standards.org.au

- AS 5104 *General principles on reliability for structures*
- AS/NZS 1170 *Structural design actions* (series)
- AS ISO 13822 *Basis for design structures – Assessment of existing structures*

MINES SAFETY BULLETIN NO. 125

COMPLIANCE REQUIREMENTS FOR BATCH-TYPE PNEUMATIC FILTER PRESSES USED IN LABORATORIES

ISSUED: 24 SEPTEMBER 2015

Background

Batch-type pneumatic filter presses are pressure vessels (i.e. classified plant) commonly found on mine sites in gold rooms, assay laboratories and other metallurgical test facilities. They are typically used to remove the liquid fraction from small batches of mineral slurries to produce a damp filter cake, which is further dried before analysis.

Although designs vary, most units typically consist of a cylindrical barrel supported in a free-standing frame. The top closure is commonly clamped in place using a bridge bar and manually operated power screw (or pneumatic actuator). The bottom closure supports the filter cloth or metal mesh and includes collector channels directed to a filtrate drain nozzle.

Liquid is pressed out of the filter cake using regulated compressed air (typically < 700 kPag), which is fed into the cylinder barrel above the liquid level. The filtrate nozzle is left open to allow the liquid to drain out.



Typical free standing batch type pneumatic filter press for laboratory use. This example has a manually operated top closure

Summary of hazard

Numerous hazards can arise with this type of equipment, including:

- uncontrolled release of pressure, liquid and material (from the seals) while the filter is pressurised
- premature seal failure, with the potential for uncontrolled pressure release and loss of containment if
 - seals are not checked for chemical compatibility with the liquid materials being filtered, particularly when tasks change in the laboratory
 - there is an uncontrolled substitution of sealing materials with alternatives not approved by the original equipment manufacturer (OEM)
- the common hazards associated with the use of compressed air (e.g. air blast, pressure injection), including the generation of noise as compressed air vents through the drain nozzle when liquid is pressed out of the filter cake
- uncontrolled release of pressure if incorrectly rated hose or fittings are substituted (e.g. water hose instead of air hose) when the compressed air supply connection is not permanently fixed
- unsecured free-standing filter presses being knocked or pulled over
- hazardous manual tasks associated with repeated disassembly, assembly and clamping down of the top and bottom closures (e.g. charging with mineral slurry, removal of filter cake, cleaning and maintenance).

Contributory factors

Since filter presses work with the filtrate drain always open, some duty holders are operating under the misconception that this type of equipment is not categorised as a pressure vessel (i.e. classified plant). However, to slowly force liquid out, the filter barrel necessarily stores pressure above the filter cake for prolonged periods. In addition, pressure will build if the filtrate outlet becomes blocked and the drain valve is inadvertently left closed.

Recent mine site inspections have identified many issues and potential problems with this type of equipment. Factors that may contribute to an increased risk of harm include:

- failure to
 - install and maintain an appropriate safety relief device to protect the vessel in situations where the filter press can be inadvertently over-pressurised
 - proactively inspect and maintain the equipment, instead of “running to failure”
 - secure air hose connections with locking pins, clips or whip checks
 - adequately secure the filter to the floor or bench
 - provide adequate warning and instruction signs for equipment
- undertaking ad hoc modifications, such as
 - substitution of seals
 - using incorrectly rated air hoses and fittings
 - replacing corroded barrels with pipe sections of different material or wall thickness
- fitting additional leverage on the closure capstan and excessive tightening of the top closure, which can increase the risk of failure and uncontrolled pressure release by overstressing the barrel of the filter or bridge piece, or damaging the seals
- lack of operator awareness of
 - the design pressure or maximum allowable working pressure (MAWP) of equipment (e.g. connecting filter presses to 7, 8 or 10 bar compressed air supplies without checking that the filter press is adequately protected from over-pressure)
 - the corrosion allowance or need to monitor wall thickness when inspecting and maintaining equipment.

Actions required

Regulatory requirements

Duty holders are reminded of the following requirements of the Mines Safety and Inspection Regulations 1995:

- keep certain records, particularly for registered classified plant [r. 6.25]
- inspect, operate and maintain pressure equipment in accordance with AS/NZS 3788 [r. 6.26]
- design, construct and test pressure vessels in accordance with AS 1210 [r. 6.33]
- register pressure equipment, other than piping, that has a hazard level of A, B, C or D according to AS 4343 with the State Mining Engineer before it is used on a mine site — unless it is already design registered with another statutory authority in Australia [rr. 6.34(1) and 6.34(5); General Exemption dated June 2013]
- inspect registered classified plant
 - using a competent person appointed under section 44 of the *Mines Safety and Inspection Act 1994*
 - keeping records of such inspections in a classified plant record book
 - for general pressure vessels, inspecting at intervals no greater than three years [r. 6.40; General Exemption dated December 2003].

Safe systems of work

- Duty holders who operate this type of plant need to confirm the plant is included on the site's classified plant register so it can be managed accordingly.
- Undertake a task-based risk assessment for each laboratory task, and generate appropriate safe working instructions for each application where this type of equipment is utilised.
- Review the risk assessment whenever there is a change of use.

Training and assessment

- Train and assess operators and maintainers in the safe use and maintenance of this type of equipment, and provide suitable information and instruction.

Further information

Visit www.dmp.wa.gov.au/ResourcesSafety for information on general exemptions.

www.standards.org.au

- AS/NZS 3788 *Pressure equipment – In-service inspection*
- AS1210 *Pressure vessels*
- AS 4343 *Pressure equipment – Hazard levels*

MINES SAFETY BULLETIN NO. 126

INSPECTION AND RE-CERTIFICATION OF A ROLL-OVER OR FALLING- OBJECT PROTECTIVE STRUCTURE (ROPS OR FOPS)

ISSUED: 09 OCTOBER 2015

Background

A roll-over protective structure (ROPS) or falling-object protective structure (FOPS) is used to protect individuals travelling correctly (e.g. seatbelt fastened, doors closed) in the cabin of mobile equipment from the consequences of a roll-over or objects falling on the cabin.

These structures are designed and destructively tested in accordance with International Standards ISO 3471 and ISO 3449 to provide full protection to the operator. They are certified as compliant by the manufacturer or supplier at the time of delivery. Prior to acceptance of the design of any ROPS or FOPS, destructive tests must be carried out on a prototype of each structure and the test results must comply with the standard.

However, the ISO standards do not provide guidance for ongoing periodic maintenance, inspection or re-certification to ensure the structure continues to provide full protection for the life of the equipment. Also, there is duty holder confusion regarding the application of some standards and the Mines Safety and Inspection Regulations 1995.



Example of typical ROPS/FOPS structure for protection of small excavator cab

Regulatory requirements for a ROPS or FOPS

The requirements applicable to these structures under the Mines Safety and Inspection Regulations 1995 are described below.

- Powered mobile plant must be fitted with appropriate operator protective devices if there is an otherwise uncontrolled risk of exposure to overturning or falling objects. [rr. 6.4(2)(b) and (c)]
- Earth-moving machinery used at a mine must be fitted with a ROPS that complies with Australian Standard AS 2294. [r. 4.15]

Note: The latest (1997) version of this standard effectively adopted the ISO standards. The Mines Safety and Inspection Amendment Regulations 2012 (gazetted in January 2013) adopted the latest versions of Australian Standards, therefore AS 2294:1997 is now mandatory for equipment manufactured after January 2013.

- The definition of "earth-moving machinery" is extended to include earth-moving machinery that has been modified to perform other service functions (e.g. off-highway haul trucks converted to water trucks). [r. 4.15(1)]

Note: Because regulation 4.15(1) excludes earth-moving machinery that is only used underground, regulation 4.15 only applies to "quarry operations" as defined in Section 4 of the Mines Safety and Inspection Act 1994. This includes any associated roads, ore stockpiles, waste dumps and tailings dams and all areas of the mine where earth-moving machinery is used for mining production or development work.

- Depending on risk assessment, on-highway type trucks used in quarry operations, particularly as water trucks, may also be expected to have a ROPS. [rr. 6.4(2)(b) and (c) may apply; refer to guidance in Mines Safety Bulletin No. 28 Rollover protection for surface earth moving machinery]
- Any agricultural tractor used at a mine must have a ROPS that complies with AS 1636. [r. 4.15]
- All trackless underground mining equipment (with an on-board operator) and underground service units must be fitted with a FOPS that complies with AS 2294. [r. 10.46]

The regulations require a ROPS or FOPS to be fully functional whenever the vehicle is in service, regardless of age or condition. It is expected that, as part of the mining operation's safety management system, a ROPS or FOPS is appropriately inspected and maintained to confirm its function is not impaired.

- If the ROPS or FOPS on a vehicle is structurally damaged, the vehicle must be withdrawn from service until the structure is repaired or replaced to a fully functional condition so that it conforms with AS 2294. [rr. 4.15 and 10.46]
- Whenever any plant is damaged to the extent that its function or condition is impaired and hazards increase, the damage must be assessed by a competent person, and any repair, inspection and, where necessary, testing is carried out by a competent person. [r. 6.22]

Summary of hazard

A ROPS or FOPS provides protection during a roll-over or when objects (e.g. rocks) fall on the cabin because the structure and its mountings absorb energy. However, if the structure's integrity is compromised, the cabin may be damaged or crushed in an incident, and occupants harmed.

Contributory factors

Reduced performance

The performance of a ROPS or FOPS may reduce over time due to factors such as:

- corrosion arising from age and exposure to moisture (e.g. water trucks, underground equipment) or corrosive dust (e.g. nickel sulphide ores)
- excessive flexing of vehicle chassis leading to metal fatigue (e.g. poor road conditions, cracked welds)
- exposure to excessive vibration (i.e. metal fatigue)
- unauthorised modifications to the structure
- general damage to the structure (e.g. impacts, accident damage)
- vehicle fire or excessive heat
- a ROPS or FOPS relocated from an old vehicle to a new vehicle with a higher mass (i.e. may not be fit for purpose)
- incorrect re-installation of a ROPS or FOPS when relocated from an old vehicle to a new vehicle.

Lack of understanding of requirements

Some common sources of misunderstanding and confusion in industry are discussed below.

- Earlier versions of the ISO ROPS standards only included criteria for "mid-range" sized earthmoving machines. In the past, therefore, some very small and very large machines were often delivered without a ROPS, or with a ROPS that was not certified to the standard.

The latest versions of the standards now include criteria for all sizes of machines. The current version of AS 2294 and the reference ISO standards were in place in January 2013 when the Mines Safety and Inspection Regulations 1995 were amended to update Australian Standards. This means the later criteria are enforceable for machines purchased after January 2013.

- AS 2294.1:1997 effectively adopted the ISO standards. However, since 1997, Parts 2, 3 and 4 of AS 2294 have been discontinued. Because the regulations only refer to AS 2294, some duty holders have interpreted that the ISO standards are not mandatory. However, AS 2294 Part 1 (which has not been updated) is still in place and adopts the ISO standards.
- As neither the Australian nor ISO standards recommend any periodic inspection intervals, some duty holders only inspect a ROPS or FOPS when damage or incidents are reported. In some circumstances, this may not be a sufficiently safe system of work.
- There is uncertainty about what is considered to be "minor damage" not requiring immediate action to repair. AS 2294 defines minor damage as deformations that are "well outside the deflection-limiting volume with no damage to welds or any cracks in the structure". ISO 3164 has further guidance on determining the deflection-limiting volume.

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Actions required

- The following actions are recommended for duty holders to help maintain the structural integrity of a ROPS or FOPS so it performs as designed.

Compliance plates and documentation

- Confirm that any ROPS or FOPS on site includes an appropriate manufacturer's compliance plate on the machine that is visible and legible.
- Confirm that documentary evidence is available on site that the ROPS or FOPS is certified compliant with AS 2294, AS 1636, ISO 3471 or ISO 3449 as appropriate.

Note: Acceptable documentary evidence may include either a copy of the destructive test report (see "Further Information") from an acceptable certifying body and/or a signed compliance statement from the manufacturer referencing the correct test report. Details in the test report or compliance statement should be complete, correct and match the information on the compliance plate.

- Immediately re-certify and re-plate, or replace, any ROPS or FOPS in service that has no legible compliance plate, and for which insufficient supporting documentation is available to demonstrate compliance.
- Do not swap a ROPS or FOPS between vehicles. Compliance plates and compliance statements should include the vehicle identification number (VIN) or another unique vehicle identifier to help discourage such practices.

Maintenance and inspection

- Implement a system of periodic inspections by suitably competent persons to ensure a ROPS or FOPS is not damaged to an extent that its function may be impaired. Use a risk assessment to select the interval between inspections.
- Where possible, contact the original ROPS or FOPS designer, manufacturer or supplier to inspect and re-validate the certification of the structure.
- Provide a pre-start checklist for the machine operator that includes visual checks of the ROPS or FOPS. Train operators so they are aware of the defects to look for.
- Assign a competent person or the original manufacturer or supplier to assess significant damage to a ROPS or FOPS in accordance with the ISO standards and sound engineering practice.

- A significantly damaged ROPS or FOPS should be removed from service until the structure is replaced or properly repaired and re-inspected by a competent person or to the satisfaction of the original manufacturer or supplier (i.e. re-certified and re-plated).
- When a ROPS or FOPS is repaired or modified, confirm that documentary evidence is available on site showing compliance with the appropriate standard (i.e. re-certified and re-plated).

Note: Do not repair or modify structural members by actions such as welding on additional parts, drilling holes, cutting, grinding or bending because these changes can affect the rigidity of the ROPS or FOPS and therefore its performance.

Further information

Standards and safety alerts

- International Standards Organisation, www.iso.org
 - ISO 3471:2008 *Earth-moving machinery – Roll-over protective structures – Laboratory tests and performance requirements*
 - ISO 3449:2005 *Earth-moving machinery – Falling-object protective structures – laboratory tests and performance requirements*
 - ISO 3164:2013 *Earth-moving machinery – Laboratory evaluations of protective structures – Specifications for deflection-limiting volume*
- Standards Australia, www.standards.org.au
 - AS 2294.1:1997 *Earthmoving machinery – Protective structures – General*
 - AS 1636:1996 (Parts 1, 2 and 3) *Tractors – Roll-over protective structures – Criteria and tests*
- Department of Mines and Petroleum, www.dmp.wa.gov.au/ResourcesSafety
 - Mines Safety Bulletin No. 28 *Rollover protection for surface earth moving machinery*
 - Mines Safety Bulletin No. 34 *Retrofitting of roll-over protection structures (ROPS) to mobile equipment on mines – Regulation 4.15*

Destructive test report for a ROPS or FOPS

A test report from a suitably accredited certifying body is required for each ROPS or FOPS. The report should include:

- identification details of the machine and the prototype tested
- the tare weight range, gross vehicle mass range or other mass-related design criteria for the structure, whichever is required in accordance with the relevant standard.
- location of the deflection-limiting volume (DLV)
- calculations of the test forces required
- confirmation of the performance of the tests
- a photograph of the prototype in the test rig
- copies of any relevant design drawings
- name and address of the test facility
- date of the test
- name and signature of the person carrying out the test.

ROPS and FOPS manufacturers or suppliers must provide operators with either:

- a copy of the test report, or
- other compliance documentation that references the correct test report.

ROPS and FOPS manufacturers or suppliers should retain the original test reports. If the test report is unavailable, operators should consider having the ROPS or FOPS recertified or replaced.

MINES SAFETY BULLETIN NO. 127

MAINTAINING THE EFFECTIVENESS OF WATER-MIST FIRE SUPPRESSION SYSTEMS ON MOBILE PLANT

ISSUED: 09 OCTOBER 2015

Background

High-pressure water-mist fire suppression systems are used widely in the Western Australian mining industry. Such systems are commonly fitted to mobile plant, heavy vehicles, generators and compressors with enclosed engine spaces that typically require suppression of Class B fires (flammable and combustible liquids).

The systems are used instead of conventional aqueous film-forming foam (AFFF), gaseous and water sprinkler systems. Water, typically with a very low concentration of AFFF additive, is rapidly discharged from fine spray nozzles at high pressure, forming a mist to extinguish the fire. The advantages of these systems include not using toxic or asphyxiating chemicals, low system costs, and efficiency in suppressing certain types of fires, particularly in enclosed spaces.

Water-mist fire suppression systems are permitted by Australian Standard AS 5062 provided they comply with AS 4587 or National Fire Protection Association Standard NFPA 750. Although not referenced in Western Australia's mines safety and inspection legislation, AS 5062 may be used as a guide to good practice.

The Department of Mines and Petroleum has become aware of potential issues with pre-engineered water-mist systems that use pressurised piston and cylinder (multi-chamber) type containers to store the water. The issues mainly relate to:

- the design of the system
- competency and actions of the original installer, ongoing service provider or service personnel.

Summary of hazard

With regard to water-mist fire suppression systems, there may be an increased risk of:

- systems not discharging correctly or completely in the event of a fire, and therefore failing to adequately suppress or extinguish the fire
- extinguisher cylinders not fitted with fusible plugs on the propellant gas (e.g. nitrogen) end rupturing if a cylinder is incinerated during a fire or inadvertently over-pressured by other means.

These risks are of particular concern when the purpose of the fire suppression system is to help safeguard life. For example, if the fire suppression system on a haul truck does not discharge correctly or completely, it may not give the driver sufficient time to evacuate safely.

Contributory factors

Factors that may contribute to risks associated with water-mist fire suppression systems include:

- pistons jamming in the bore of the extinguisher cylinder during or after servicing.
- issues with piston o-rings, such as substitution with non-original equipment manufacturer (OEM) o-rings and use of non-OEM lubricants
- heat-affected extinguisher cylinders inadvertently re-charged and returned to service
- competency issues with regard to installation and service personnel
- defects not adequately reported to the manufacturer by service providers or otherwise not properly resolved.

Actions required

For duty holders relying on fire suppression systems on mobile plant to safeguard life, the following actions are recommended.

- The fire suppression system should be:
 - selected and designed based on sound fire risk management principles using a methodology consistent with AS 5062 Section 2
 - designed and manufactured by competent persons to an industry-recognised standard such as AS 5062 or an international equivalent

Note: Assurance of conformity is typically provided by one or more industry-recognised certifying bodies.

 - installed, tested and commissioned by competent persons in accordance with the designer's, manufacturer's or supplier's instructions
 - periodically tested, inspected and serviced (typically six-monthly) by competent persons in accordance with the designer's, manufacturer's or supplier's instructions
- Installers and service personnel should be adequately trained, assessed and accredited by the fire suppression system manufacturer.
- Report any perceived equipment failures or defects to the fire suppression system manufacturer so they may be properly investigated and, if necessary, appropriate advice provided regarding corrective action.

Further information

- Standards Australia, www.standards.org.au
 - AS 5062 *Fire protection for mobile and transportable equipment*
 - AS 4587 *Water mist fire protection systems – System design, installation and commissioning*
- National Fire Protection Association, www.nfpa.org/codes-and-standards
 - NFPA 750 *Standard on water mist fire protection systems*

MINES SAFETY BULLETIN NO. 128

ISOLATION ISSUES WITH RAIL-MOUNTED STACKERS

ISSUED: 25 NOVEMBER 2015

Background

Rail-mounted stackers typically consist of a pin-jointed boom and counterweight assembly that relies on suspension ropes (pendants) and rigid stays for structural stability. The stacker's position is maintained by hydraulic luffing cylinders, a slewing drive system and long-travel drives.

The conveyor and counterweight booms are supported at a main luffing pivot on the slewdeck. This allows the entire assembly to luff under the action of two hydraulic luffing cylinders, as well as slew under the action of a slewing drive system.

Counterweights can be configured such that, if the hydraulic luffing cylinders fail to hold the stacker at the required luffing angle, the stacker will slowly luff up and away from the stockpile under the action of the counterweights.

Recently, two potentially serious incidents during shutdowns have raised concerns about the operation and isolation of rail-mounted stackers. On both occasions, workers located on the machine and in the vicinity had to evacuate when isolation procedures failed.

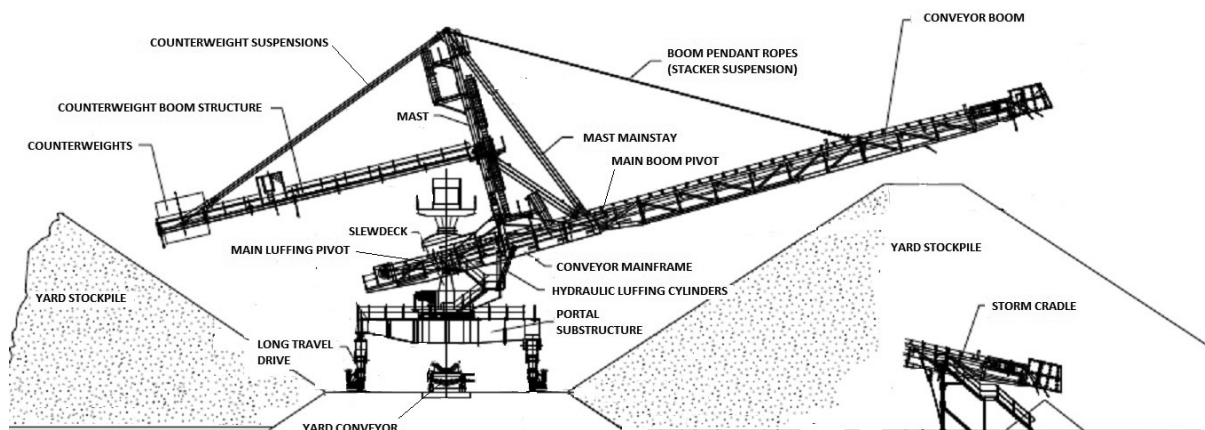
On one occasion, there was an unexpected, uncontrolled movement of the counterweight boom and conveyor boom structures while both boom pendant ropes were being replaced. The counterweight boom crept down by about 15° of arc over a period of nine minutes. Although parked on a supporting tower, without the boom pendant ropes to stabilise it, the conveyor boom pivoted at the main boom pivot as the counterweight boom dropped.

On another occasion, there was an unexpected, uncontrolled movement of the conveyor boom while workers were replacing belt rollers on the boom conveyor. The conveyor boom luffed upwards from a near-horizontal position to its fully raised position under the action of the counterweights. On its way up, the conveyor boom struck the sheave block of a mobile crane.

Summary of hazard

As well as general machinery hazards, rail-mounted stackers have unique hazards associated with their stability. There is the potential for:

- uncontrolled luffing movement of the boom assemblies (conveyor and counterweight) if the hydraulic luffing system fails to hold the load
- catastrophic structural collapse if suspension ropes, fixed stays or pin joints either fail or are removed
 - during maintenance activity
 - out of sequence without appropriate controls



Typical rail-mounted stacker configuration

- overturning if the machine is not correctly balanced with counterweights in accordance with the designer's intent
- overturning under abnormal loading conditions derailment from long-travel rails.

For people on or near these machines, there is the potential to be struck or crushed by moving or falling parts. In the event of a catastrophic structural failure, there is often little warning and usually insufficient time to escape the vicinity. There may also be further effects if the uncontrolled movement or failure interacts with other plant or structures.

Contributory factors

- The isolation procedures need to recognise and control all sources of hazardous energy, including gravitational potential energy. For example, the consequences of isolation failure may increase when inaccurate balance weight information is used.

Note: Although not identified as a significant contributory factor for these incidents, the isolation procedures had not been based on accurate balance weight information (e.g. derived from commissioning records or current hydraulic luffing trend information for the stackers).

- Solely relying on a single hydraulic system to resist luffing moment from an otherwise unrestrained load or loads is not a reliable method for isolating the machine from uncontrolled luffing movement.
- The hydraulic relief valves of the luffing system involved in both incidents cannot be tested in situ, making it impossible to confirm that the set-points (critical to the luffing functions of the machine) are correct and have not been tampered with.

Note: It was reported for one of the incidents that locking tabs had been removed from the relief valves and they appeared to have been adjusted. This may have allowed hydraulic oil from the luffing cylinders to relieve to the reservoir, preventing them from holding the load.

Actions required

The following actions are recommended for rail-mounted balanced structures to address the potential for unexpected and uncontrolled movement of counterweight and conveyor booms.

Isolation

- A "hydraulic lock" is not a positive isolation. Additional controls, such as those listed below, should be considered when isolating the machine.

- When changing pendant or suspension ropes, or rigid stays that support a boom in a balanced position, consider if it is practicable to replace one at a time while others are left in place to continue to support the boom. Such a methodology should be used in conjunction with additional forms of positive isolation to avoid any uncontrolled movement.
- Ensure the machine is correctly balanced to minimise the required stabilising force from the hydraulic luffing cylinders, supporting towers or other means of isolation.
- Use a supporting tower (e.g. storm cradle) that has been adequately designed, installed and maintained as specified by the stacker manufacturer.

Maintenance

- Competent persons should test, adjust and lock hydraulic relief valve set-points. Use appropriate tools and equipment in accordance with the manufacturer's instructions and original equipment manufacturer (OEM) design requirements.
- Pressure relief valves that are corroded, damaged, incorrectly installed, interfered with or have had their tamper proof seal or lock removed should be replaced with correct valves that have been set, tested and certified by a competent testing authority to OEM requirements.

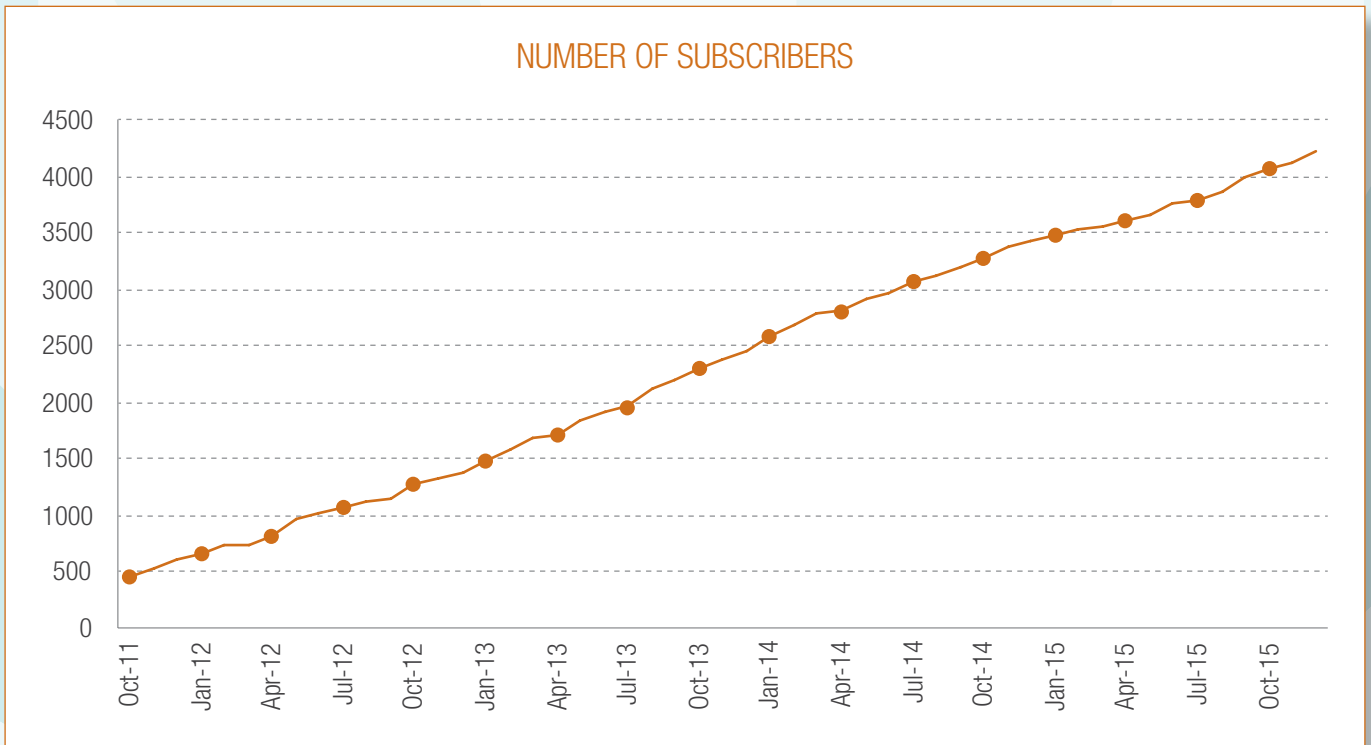
Stability

- At the commissioning stage, records should include a weight check. After a machine is erected, AS 4324.1 requires the "as-built" mass and centre of gravity of the machine to be determined. It is not unusual for the calculated mass of the machine to be an under-estimate of the final actual. This may affect stability and the mass of counterweights required. AS 4324.1 specifies that if the as-built mass exceeds the designer's calculated mass by more than 5 per cent, then the stresses in the machine should be re-checked.
- After commissioning, if recent luffing trend data (luffing cylinder pressure) is available from the control system memory, this should be used to check the balance condition of the machine.
- Use up-to-date balance data when designing alterations to the machine.
- Check that the balance condition of the machine has not changed before competent persons:
 - undertake risk assessments
 - make decisions about machine isolation
 - prior to any work that may affect stability.

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Further information

- Standards Australia, www.standards.org.au
 - AS 4324.1 *Mobile equipment for continuous handling of bulk materials – General requirements for steel structures*
- International Standards Organisation, www.iso.org
 - ISO 5049.1 *Mobile equipment for continuous handling of bulk materials – Part 1: Rules for the design of steel structures*



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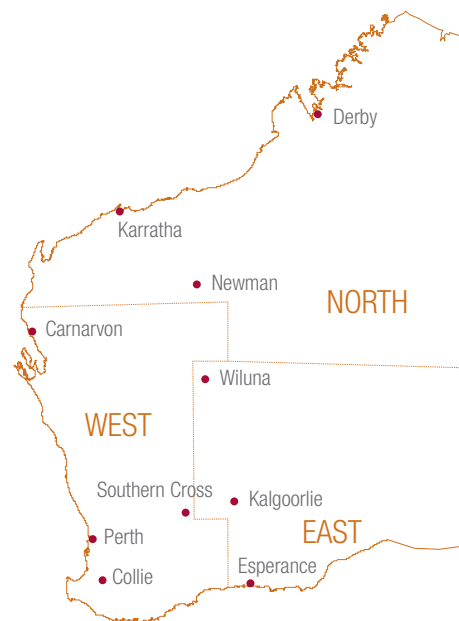
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