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WHAT ARE THE OUTCOMES FROM 21 YEARS OF LEVEL 1 EMERGENCY EXERCISES IN QUEENSLAND?

Martin Watkinson¹

ABSTRACT: Level 1 emergency exercises have been run annually in Queensland since 1998. The 21st exercise was run in July 2018 at Grosvenor mine. This paper will discuss and identify the improvements to emergency response and coal mine safety that have resulted from the running of these exercises.

INTRODUCTION

The Wardens inquiry into the explosion at the Moura No. 2 Mine in August 1994 recommended -“Emergency procedures should be exercised at each mine on a systematic basis, the minimum requirement being on an annual basis for each mine.” (Windridge, *et al.*, 1996). In December 1996 the “Approved Standard for the Conduct of Emergency Procedures Exercises” was published and was subsequently reissued as Recognised Standard 08 (RS08) Conduct of Mine Emergency Exercises. This document provides guidelines for conducting mine site emergency exercises as well as the requirement for a test of state-wide emergency response by holding a Level 1 Mine Emergency Exercise at one mine on an annual basis. Since 1998 there have been 21 Level 1 Mine Emergency Exercises held in Queensland, Australia.

Several papers have been written primarily on individual exercises or summarising the exercise status to date. There have been 863 recommendations made as a result of the 21 exercises and a summary spreadsheet has been prepared to collate the recommendations. One paper in particular Watkinson (2006) provides an update to industry as a result of the exercises and noted that exercise reports were not freely available. In particular, one coal mine that held the Level 1 exercise had 20 hard copies of the report sent to the mine. A couple of years later the mine was sold and not one copy of the report was available. Copies of all 21 reports are now available on the Queensland Government website.

SCENARIOS

There have been several scenarios used over the 21 exercises and all have been used more than once. Scenarios are developed after visiting the mine and reviewing the mine site hazards. Sometimes scenarios are developed to reinforce an issue that industry is facing. Most of the scenarios will require coal mine workers (CMWs) to wear breathing apparatus, Self-Contained Self-Rescuers (SCSR) and/or Compressed Air Breathing Apparatus (CABA) as part of their self-escape. This normally also involves changing over from one SCSR to a new one or from SCSR to CABA.

RS08 also requires a deployment of Queensland Mines Rescue Service (QMRS) underground (UG) to effect a rescue or recovery.

In order to create a situation where CMWs have to effect an escape using breathing apparatus there are a limited number of scenarios available. Likewise the need to deploy QMRS would

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require an irrespirable atmosphere to be present otherwise the mine could undertake recovery operations using mine staff. A list of the scenarios is given in Table 1.

Table 1 List of Scenarios

Scenario	Mine and date
Surface fire	Newlands 2008 Ensham 2013 Broadmeadow 2017
Roof fall	Kestrel 2001 Aquila Mine 2011
Explosion	Southern Colliery 1998 (FI)* Oakly No 1 2004 (FI) Grasstree 2007 (FI) Oakly North Mine 2012 (FI) North Goonyella 2015 Grosvenor 2018 (FI)
Conveyor fire	Kenmare 1999 Cook Colliery 2009 Kestrel 2014 Grasstree 2016
Other UG fire	Newlands 2000 North Goonyella 2002 Crinum 2003 Moranbah North 2005 Broadmeadow 2006 Carborough Downs 2010
Spontaneous combustion	Part of North Goonyella 2002

*FI is frictional ignition

MAJOR RECOMENDATION

Surface

Many of the recommendations in the early exercises related to the organisation of the emergency response in particular the formation and running of the incident management team. The handling of data, debrief information and the use and number of duty cards also fall into this category.

Duty cards were often not suitable for the task to be carried out by the card holder. The cards then developed into task sheets sometimes several pages long and tasks critical to the situation were sometimes on the second page of the document and not acted upon in a timely manner.

There were also observations on the ability of the control room operators to quickly interpret the gas data and a lack of awareness of the range of gas instruments.

Debrief of CMWs and the care of injured personnel was also raised as areas for improvement.

QMRS also came under criticism for the approach used in assessing the hazards associated with underground deployment in particular the QMRS deployment guidelines.

Underground

In all the exercises the ability of CMWs to don a SCSR and change over either to another SCSR or CABA is tested. Video footage is taken of this process to enable a thorough assessment of the issues associated with this activity. There have been many cases where CMWs have failed to undertake this process successfully. Every exercise report makes recommendations to improve this outcome. The main emphasis is on the training of the CMWs and the fact that this is an area where CMWs are responsible for their own safety.

Low light evacuation is also tested using smoke goggles as is the ability of CMWs to communicate to the surface when wearing a SCSR using non-verbal communications. There was one mine where two different forms of non-verbal communication were used and many recommendations have been made to standardise the system across Queensland. This was fortunately captured by the video recording and is a timely reminder for the need to standardise across industry. One positive outcome from this was the ability of the control room operator to quickly identify the issue and make positive communications with the escaping CMWs.

Lifelines have been introduced into many mines and the lack of maintenance of the system has often led to issues. Again recommendations have been made on standardising the configuration of cones and markers on the lifelines.

The CMWs who safely evacuated from the Moura No 2 explosion did so by using UG vehicles. There have been a number of occasions in exercises where the evacuating CMWs did not try to use a vehicle that was available.

Mine site specific recommendations are made where there are issues with particular evacuation routes i.e. flooded walkways, lifelines obstructed or air door pressures. Whilst these are specific to the mine site all coal mines Site Senior Executives (SSEs) should organise a review of their mine as a result of the Level 1 exercise report including mine specific issues.

OUTCOMES

Over the 21 years there have been distinct improvements made both underground and on the surface. Every year recommendations are made that identify opportunities for improvement. The Level 1 exercise drives a continuous improvement process and these outcomes are evidence of some of the improvements that have occurred.

One improvement has been the adoption of the Australasian Inter-service Incident Management System (AIIMS 2017) as method of coordinating the surface response to the presented scenario. The QMRS Mine Emergency Management System (MEMS) for emergency response is based on AIIMS and was developed to tailor the approach to coal mine specific scenarios. Many mines send their management teams to the MEMS course in the months leading up to the exercise. This system utilises an incident management team which has three working teams to support the decision making process these are operations, planning and logistics. The exercise team invited the senior sergeant from the Emerald Police to review the surface emergency response at the kestrel exercise in 2014. He was positive in that what he saw in the system was being used and recognised the process; the one thing he noticed was there did not appear to be an intelligence cell. He noted that the control room appeared an ideal location for this function.

In the past three years there has been an adoption of electronic data management systems, which assist in the processing of the data and makes the data available across all the sections of the surface response. Previous exercises have recommended the adoption of such a system.

Each mine uses this opportunity to review the site emergency response plan and update it in the months before the exercise. Many conduct desk top exercises and mock evacuations in the months before the exercise.

Underground there have been many improvements as a result of the focus on emergency response and Level 1 exercises. Many mines now have:

- Wind chimes / audible sounds to assist in finding caches, these are sometimes also attached to the life line should the ventilation be impaired.

- Signage to designate the primary and secondary escape routes, unfortunately this is not standard across Queensland mines.
- The emergency number 555 has been adopted at all but one Queensland mine. Many mines in NSW also use this number. The one mine in Queensland that does not have 555 as the emergency number due to reported technical issues with their telephone exchange.
- Blind men's sticks or candy canes to assist CMWs to evacuate in low light conditions.

The use of Change Over Bays (COBs) was recommended in the first Level 1 exercise at Southern Colliery. At that stage all mines in Queensland other than one (Newlands) had an escape strategy based on using SCSRs and caches for escape. In 2007 the exercise was held at Grasstree mine which is connected to the old Southern Colliery workings again recommended the use of COBs. The use of COBs was evaluated as part of the 2016 Level 1 exercise at Grasstree.

There is now a wider adoption of CABA for self-escape; this was tried and demonstrated during the Newlands exercise in 2000.

The Chief Inspector of Coal Mines brought together groups of industry personnel to develop a draft recognised standard on emergency management as a result a review of the recommendations from the Task Group 4 Committee's report. Task Group 4 was formed as a result of the recommendations from the Moura No 2 Wardens Inquiry report. This standard covers the first four hours of the mine site response. One of the information sources for this report was the summary spreadsheet of all the level 1 exercise recommendations. One part of this is the standardisation of:

- Escape way signage, markings and the colour coding of the mine escape plan to match.
- Hard hat colours at coal mines to identify trainee miners, inexperienced miners, statutory officials and mines rescue trained personnel
- Standard for non-verbal communication
- Standard for lifelines
- Standard for equipment at caches. Each mine to ensure that all caches are established to a mine site standard ie the same distance into the cut though, location of telephone/communications, first aid equipment

Coal mines are now replacing their older SCSRs and the older units have been available for CMWs to wear during the exercise. CABA is readily available and each mine allows at least one team to evacuate using their CABA suits. Where CMWs are wearing SCSR and are underground awaiting their recover by QMRS it is an ideal opportunity to test the longevity of the SCSR at rest. The CMWs are asked if they are willing to undertake this test and many including CMWs new to the industry have participated in this test. Some impressive results have been obtained as a result of this testing 2 hours 25 minutes at Grasstree (25 minutes walking and 2 hours at rest) and 3 hours 18 minutes from a CSE 100 at Grosvenor whilst at rest.

QMRS had an inflexible deployment guideline which underwent a risk based review in conjunction with New South Wales Mine Rescue Service (NSWMRS) to develop the Mine Re-entry Assessment System (MRAS). MRAS is designed to facilitate the re-entry of mines rescue

teams underground utilising mine site gas data and information to enable the Incident Management Team (IMT) to make sound decisions on the safety of mines rescue teams entering or re-entering a mine having CMWs remain underground.

Social media interaction has been tested at a number of the exercises. This was done by creating fake social media pages and emailing them to the mining company personnel for a response. There are differing opinions on the outcomes with some mining companies not officially engaging in social media. Whilst there is no direct outcome from this interaction it has highlighted the issue will need to be addressed during an emergency event.

CONCLUSIONS

Emergency response is not an everyday process for coal mine management to follow and there are often issues relating to the incident management in particular where electronic database systems are being used as they are not utilised to their full capacity. Mines should be using these systems as a part of their everyday management of the mine so that this just becomes another familiar tool to use during the emergency response process.

Another issue faced is the availability of personnel to fill the duty cards. One mine had 93 duty cards. That is probably more duty cards than there will be personnel on site during the proposed 2019 exercise. Whilst these are scalable systems it must be remembered that this system must be simple and easy to follow.

One exercise observer once posed the question should duty cards be written as a desired outcome rather than a process or number of dot points?

Whilst the exercise team always informs the host mine of the exercise intent and that it is a test of the mine and state response it is hard to break the opinion that this is pass or fail test. Comments such as you say that but don't mean it are common from some management staff. The best reply is it's like playing golf you are playing against yourself and trying to improve. Embrace it and enjoy the experience. It is for this reason that exercises are sometimes run on nightshift or weekend when senior management are not present onsite. This is even more important as some mines most of the senior staff operates on a Fly in Fly out (FIFO) basis. This makes the use of electronic database systems even more important as technical support to the exercise response can be provided remotely.

Social media will be a major issue in a real event. An example of this was the social media posts of the smoke coming out of the shaft at North Goonyella coal mine in September 2018. Each mine and mining company will need to address their response to social media posts. A proactive approach is best. It would be useful to have pre-prepared background information available on the mine including photographs and video footage. Factual information then needs to be released when possible as is the case for media releases. During a major incident there will be intensive press coverage and being prepared is the best position to be in.

Several exercises have involved Queensland Police deployment to site. If the mine has a fatality or multiple fatalities this could vary the Police response at the mine. The Police could take control of the response if they were not convinced of the diligence of the mine site response using the MEMS/AIIMS (2017) process and following it correctly. The Police would most likely utilise information and advice from the Queensland mines inspectorate and will defer control to them as they have the technical expertise. Where there are fatalities the Police are the coroners' representative and have ultimate control.

Any mine that has an emergency escape system based on SCSRs should have a self-escape process based on the use of COBs.

There are a large number of contract CMWs who can work at a different mine every week and therefore mines must adopt the standard practices that are being developed in the Recognised Standard for Emergency Management. It was identified at the 2015 North Goonyella exercise that two teams of evacuating CMWs used different protocols for non-verbal communications. .

CMWs at mine sites now embrace the Level 1 exercise and enjoy the opportunity to test their self-escape capability and are more than willing to participate in testing the longevity of SCSRs in a real underground test. Video footage of the 2018 exercise was very useful in demonstrating how things have improved with CMWs tapping stuck SCSRs to release them, assisting other CMWs who were struggling to don their SCSR and working as a team to self-escape. It was evident that the CMWs were well rehearsed and practiced in this process.

CMWs who are studying for statutory certificates are participating as assessors and report that they thoroughly enjoy the opportunity and experience offered by being involved. This involvement not only allows them to participate in the planning of the exercise but to build relationships with the inspectorate and industry safety and health representatives (ISHR) as well as other senior mining managers. These CMWs bring practical hands on approach to the running exercise and a realistic review of the underground response. Their involvement also means the learnings are quickly communicate to their mine sites and the crews that they work with.

It must be remembered that Queensland Level 1 Exercises are a learning opportunity for the mines and state services to test their response, communication systems and interactions with the aim of continual improvement of the whole state response system and it can be concluded that:

- Mineworkers are now more familiar with SCSR and CABA (ongoing refresher training still needed).
- MEMS was developed by QMRS and has been adopted by all of the mines. (More practice is still required). Coal mines must stick to the process.
- Any process that is used for emergency response must be practiced.
- Mine management needs to welcome the opportunity to test their emergency response plan and no longer regard it as a pass or fail test. It is the ideal opportunity to identify improvement opportunities.
- Industry needs to work on ways of sharing the lessons with each other as mutual safety is in everyone's interest.
- Standardisation is critical with the numbers of contract CMWs currently employed in the industry.



Figure 1: CMW wearing SCSR during 2007 Exercise

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