



**Industry &  
Investment**

# **Report into Emergency Management Systems in NSW underground coal mines**

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## Introduction

The Chief Inspector of Coal Mines directed that a program of audits of the Underground Emergency System (UES) at underground coal mines in NSW was to be carried out. This task was undertaken by Inspector Macpherson in the period October 2005 to June 2006. Underground Emergency Systems at coal mines are regulated by the Coal Mines Regulation Act, 1982, subordinate regulations and guidelines including MDG 1020 “Underground Emergency Escape Systems and the Provision of Self Rescuers.”

This is the report into the findings of the directed audits. The audits showed that there were several common deficiencies in the development, operation and maintenance of the Underground Emergency Systems. The audits were carried out at all of the underground coal mines that were carrying out production during the time of the program (29 mines in total).

The audit assessed the Emergency Management System against the requirements of the Coal Mine (Underground) Regulation 1999 (Clauses 9 and 102 to 107), against the Management System Foundation Elements of AS 4801 and against the reference material contained in MDG 1020.

Each mine audited received a report consisting of recommendations from the auditor plus the audit document with comments noted against each element of the audit.

Actions taken as a result of the audits included:

- initial feedback to the site on identified issues
- a meeting of underground mine managers in the North East region to discuss identified issues and potential improvements
- notices under s63 *Coal Mines Regulation Act 1982* were issued on all North East underground mines
- follow-up audits undertaken to determine the level of conformance with the s63 notices

The follow-up audits indicated that a level of systematic non-conformance still exists.

At each mine the audit was carried out over two days and included reviewing the documentation, interviewing personnel and inspecting the physical requirements of the Underground Emergency System.

An electronic presentation outlining identified issues and future considerations, was given at the meeting of underground mine managers in the North East region. A copy can be downloaded at: [www.dpi.nsw.gov.au/minerals/safety/publications/statistical-publications](http://www.dpi.nsw.gov.au/minerals/safety/publications/statistical-publications)

## Outcomes

The following comments were common to a majority (and in some cases all) of the mines audited:

1. There was no risk assessment used in the development of the UES
  - No assessment of potential emergencies
  - No assessment of potential atmospheres
  - No assessment of potential TARPs
2. Provision of transport to panels was not considered
  - Panels not allocated transports
  - Escape protocols did not include transports
3. Non-compliance with training requirements for breathing apparatus (CBA, FSR and SCSR)
  - Generally 12 month retraining period required
  - Where external training providers were used it generally became an 18 month or longer frequency
  - Contractors generally complied
  - No action if employees not trained
  - Training records, often, could not be searched for required training
  - Some employees had never been trained in the mines systems
4. Non-compliance with training requirements for Incident Management Team
  - Most systems provided for IMT training
  - Virtually no IMT training carried out
  - The training that was carried out generally consisted of giving the IMT a list of responsibilities
5. Non-compliance with training requirements for 2<sup>nd</sup> egress
  - Most systems had requirements for 2<sup>nd</sup> egress walks
  - Extremely poor compliance
6. No identified training requirements for Competent Person (control room operator)
  - No specialised training on Underground Emergency System
  - Relief operators had poor knowledge of system
7. Staff members not included in training sessions
  - No mine had full compliance for training for staff members
  - Staff members often “reschedule” training but no check if training carried out

8. No escape protocol developed
  - Most mines did not have formal escape protocols
  - Protocols that did exist were incomplete, e.g. no transport or assembly points identified
9. No graded Trigger Action Response Plans (TARPS)
  - Many mine monitoring systems set to alarm at 50ppm CO
  - Single alarm setting
10. No evacuation trigger from monitoring systems
  - Most TARP responses are simply for “investigation” even if situation rapidly changes
11. Duty cards confusing with no clear objectives set when evacuating with breathing apparatus
  - Focus is on getting duty cards allocated
  - Lack of prioritisation for duty cards
12. No trigger for calling Mines rescue when evacuating with breathing apparatus
  - Few mines had a trigger for calling mines rescue – left up to incident controller
13. No communication protocol for use with SCSR and FSR
  - Non-verbal communication strategies not identified
14. No standards developed for cache/refill/changeover stations
  - Many stations did not have communications
  - Most stations did not have plans
  - Little consideration of Respirable Air Changeover Stations and provisions for re-hydration
15. No marking of primary egress route
  - No lifelines or reflective streamers in most mines
16. No provision for rapid and effective sealing of the mine
  - Generally this legislative requirement was ignored
17. Loss of major controls (e.g. communication, monitoring, transport) not considered in withdrawal conditions
  - The lack of the initial risk assessment process meant that critical controls were not recognised and included in withdrawal conditions.

**18. Audits not carried out**

- All systems required audits
- Where audits were carried out they generally checked the system included corporate requirements rather than check implementation of the system
- All internal audits carried out were ineffective in identifying training shortcomings

**19. Document control procedures were poor**

- Out of date documents were often found
- Incorrect dates on reviews and revisions of documents
- Reviews not carried out as required
- Changes not documented

**20. No routine management review of the effective implementation of the system**

- Nearly all mines had no effective management review of the system
- Simple review measures such as work order completion and training compliance were not considered for management review

**21. Simulations/testing of the system were poorly designed without clear objectives.**

- Mines were confused re simulations – were they for system testing or are they part of a training exercise
- Few mines had objectives identified prior to designing exercises

### **Auditor Comments about MDG 1020 Review**

As the guidance material MDG 1020 is up for review I make the following points to be considered as part of the review based on the audits carried out in NSW in 2005/2006. These are personal comments based on the Underground Emergency System auditing work I carried out.

Generally MDG 1020 is still relevant. The required outcomes are good - however it is not "forceful" enough in describing what needs to be done to achieve those outcomes. I would prefer a code of practice that defines minimum standards that can still be replaced by controls delivering equivalent safety.

### **Current System Elements**

Early warning - audits showed that the TARPs rarely went to "evacuate" - they focused on further inspection, opinions of people. There is a need for firm TARPs that include the step of evacuation based on gas monitoring.

Communication - should include references to new technology - individual two way radios etc. There should be an emphasis on mines moving to the best systems with consideration to "survivability" from foreseeable events (explosion or fire). Some mines have dropped PED and not replaced it with any other back up system.

Self rescuer apparatus - training, training, training !!!! We know 12 people at Sago ditched their self rescuers because they didn't understand them. Rescue stations report that when miners come in for refresher training they are no longer competent on the gear (i.e. the frequency is inadequate).

Guidance systems/lifelines - mines focus on second egress marking and forget about the primary egress. There should be a requirement for primary egress marking that will assist transport drivers in low visibility.

Escapeways and transport - several issues - new mines should be designed with segregated intake second egress in main headings, that can be driven. Existing mines should consider if this can be implemented. It is preferable that the second egress can be driven at least in main headings. I would want a transport - mines still do not routinely provide a machine in the section.

Change over stations - there is only one mine that attempts to provide RACOS. Another mine has respirable air stations for the purpose of rehydration. For SCSR mines RACOS should be high on the agenda. For CABA mines rehydration should be considered - manufacturers are looking at including provision on the masks for a "straw" that allows for drinking.

Refuge options - should definitely be limited to where there is a preplanned strategy to get the people out. They have recently been successful in metal mines in Tasmania (2 or 3 people) and Canada (around 150 people) for around 24 hours - but these were for equipment fires and obviously the mine itself will not catch fire.

Boreholes - do not believe they are really a factor for most mines due to depth, surface constraints etc. Existing boreholes or shafts could be considered for use - e.g. providing a place of safety at the bottom of an intake borehole, but still require a strategy to get people out.

Competency - training, training, training - audit showed that mines do not train as required under their own plans. If people are not trained then they should not be underground. Additional training for supervisors, control room and incident controllers is required.

### **Potential System Elements**

Control room - virtually all UG mines have a control room - what are the minimum requirements for a control room and a control room operator. Key function in an emergency is to track personnel, track the emergency - these are often lost in the documentation provided.

Emergency management plan - there should be a discrete element for emergency escape - simple documents that lead the control room, officials through the requirements - if people are escaping in breathing apparatus then track people, monitor/control the emergency, alert rescue station, management etc. All the other issues - media control, front gates etc can be dealt with when there are sufficient people to deal with them. These issues often swamp the few critical areas.

Incident Control Team - generally will not be formed for some hours. Qld Level 1 exercises have shown that these may not be the best system for initial response - paralysis by analysis. Where they are formed early they must have simple objectives - get people to safety, control emergency.

Protocol - mines should have a firm escape protocol - very few do. For a panel this should include assembly point and preferred route and method of travel. Obviously there will be occasions when this has to be varied but training on the protocol works – at Sago they barricaded themselves in because that was what they were trained to do.

Place of safety - where mines rely on a place of safety (e.g. segregated intake) then the integrity of the place of safety requires to be confirmed under a variety of conditions - fan off, fan off and major fire. If it is possible that it can be compromised then it cannot be considered a place of safety and further escape equipment must be provided. The integrity should also have a means of monitoring to ensure that doors are not left open etc.

Test - The Qld level 1 exercises show some shortcomings - they keep getting the same poor results. I believe that regular smaller scale training is better. This must cover the whole workforce on a regular basis, preferably on a crew basis as well as control room operator and ICT training.

Audit - the audits carried out showed a high level of non-compliance. External auditing on a regular basis should be required with results to Industry & Investment NSW.

Definitions - Self escape is where a person or group of persons are escaping with the resources they have - rescuers, transports etc. Aided escape is where external resources assist with the escape - e.g. rescue teams. Self escape is never "every man for himself".

**David Macpherson**

Inspector of Coal Mines

Auditor – Underground Emergency Systems – October 2005 to June 2006