Resources Regulator
Department of Regional NSW

Consolidated report

Fire or explosion mechanical-stage 2

Coal mines below surface

September 2022 to June 2023

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More information

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Table of Contents

Executive summary

A crucial part of the NSW Resources Regulator's Incident prevention strategy for mines and petroleum sites involves:

- targeted assessments and planned inspection programs - focusing on assessing an operation's control of critical risks through evaluating the effectiveness of control measures in the mine's safety management system
- priority programs - proactively assessing a topic that is an emerging risk across the industry, that is driven primarily from incident data as well as evolving industry trends. Although these topics may also be contained within the Regulator's planned inspection programs, the aim of compliance priority programs is to gather further information and knowledge about how the industry is managing and controlling a specific issue.

The Regulator has developed a bowtie hazard management framework and standardised assessment checklist for each program plan. Under each program plan, the effectiveness of the safety management system at each mine site is assessed against a standard set of control supports and critical controls.

Fire and explosion mechanical hazards at coal mines below surface was one of the hazards identified in the mechanical engineering control plan (MECP) bow tie. These types of hazards can occur within various mining environments and have the potential to cause serious and/or fatal injuries to workers if not controlled effectively. An inspection program was developed to assess how mines are prepared to manage that risk.

Explanatory notes on the assessment system are also listed in Appendix A.

For **18** coal mines below surface this report summarises the assessment findings in relation to fire and explosion – mechanical-stage 2, conducted between September 2022 and June 2023.

There were **16** compliance notices issued to **10** mines in relation to this assessment program.

Assessment criteria

Critical controls were identified by the Regulator related to each potential threat.

The threats/consequence and critical controls included in this report is shown in Table 1.

Table 1. Threat/Consequence and critical controls for the fire or explosion – mechanical stage 2 – coal mines below surface

	Threat/Consequence	Critical control
Threat	1. Electrical energy in the presence of fuel 2. Mechanical energy in the presence of fuel	PC 1.5 Equipment suitable for the atmosphere
	2. Mechanical energy in the presence of fuel	PC 2.1 – Minimise friction control hot surface
Consequence	One or more fatalities	MC 1.4 – Automatic fire suppression

Findings

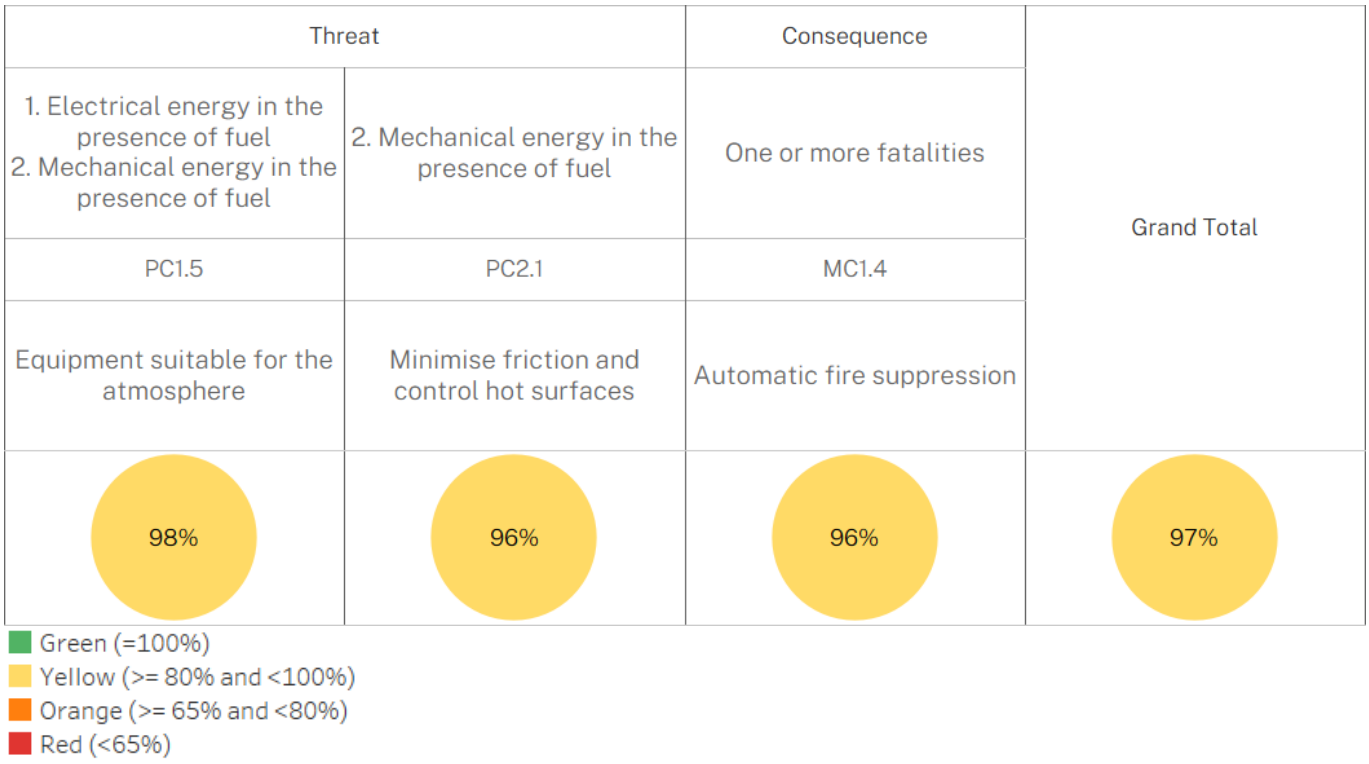
Overall, the findings were:

- 18 coal mines below ground assessments reviewed for this report.
- 234 individual findings.
- 16 notices were issued to 10 mines from assessments during the program.

The overall assessment findings by threat, consequence and critical control is 97% (refer Figure 1):

- the critical control of equipment suitable for the atmosphere ranked 98%
- the critical control of minimise friction and control hot surfaces ranked 96%
- the critical control automatic fire suppression ranked 96%

Figure 1. Summary assessment findings overall results by threat/consequence and critical control



The overall assessment findings summary by threat, consequence, critical control and the critical control supports are detailed in Figures 2 to 5:

Figure 2. Summary assessment findings overall results by sector, threat/consequence and critical control

	Threat		Consequence	Grand Total
	1. Electrical energy in the presence of fuel 2. Mechanical energy in the presence of fuel	2. Mechanical energy in the presence of fuel	One or more fatalities	
	PC1.5	PC2.1	MC1.4	
	Equipment suitable for the atmosphere	Minimise friction and control hot surfaces	Automatic fire suppression	
01	93%	100%	90%	94%
02	100%	92%	100%	97%
03			100%	100%
04	100%		92%	96%
05	96%		100%	98%
06	100%			100%
07	100%			100%
Grand Total	98%	96%	96%	97%

Green (=100%)
Yellow (>= 80% and <100%)
Orange (>= 65% and <80%)
Red (<65%)

The critical control support number ‘PC1.5 -01 the commencement of each hazardous zone is clearly identified by signposting or by other reasonably practicably means’ ranked the lowest at 93%.

Figure 3. Summary assessment findings overall results by critical control and control support – PC 1.5 Equipment suitable for the atmosphere

Threat	1. Electrical energy in the presence of fuel 2. Mechanical energy in the presence of fuel	PC1.5	Equipment suitable for the atmosphere	01	The commencement of each hazardous zone is clearly identified by signposting or by other reasonably practicable means	93%
				02	Workers can identify a hazardous zone and explain the restrictions for working within a hazardous zone	100%
				04	Installed or introduced equipment Design Registration documents and labelling align with hazardous area classification. • Diesel Engine System • Transport Braking System	100%
				05	Relevant workers are aware of shut down devices on the equipment they are using and how to test their effectiveness (Mech or Elec)	96%
				06	Relevant workers understand and show compliance to procedures in place to remove an energy source before atmosphere becomes explosive (Mech or Elec)	100%
				07	Relevant workers can explain special maintenance conditions for explosion protected apparatus	100%
					Relevant workers can explain special maintenance conditions for explosion protected apparatus.	100%
Grand Total						98%

Green (=100%)
Yellow (>= 80% and <100%)
Orange (>= 65% and <80%)
Red (<65%)

The critical control support number ‘PC2.1 -02 inspections are conducted to ensure the health of identified controls’ ranked the lowest at 92%.

Figure 4. Summary assessment findings overall results by critical control and control support – PC 2.1 Minimise friction and control hot surfaces

Threat	2. Mechanical energy in the presence of fuel	PC2.1	Minimise friction and control hot surfaces	01	Confirm that the following controls have been considered and implemented: • Water jackets. • Shielding...	100%
				02	Inspections are conducted to ensure the health of identified controls.	92%
Grand Total						96%

Green (=100%)
Yellow (>= 80% and <100%)
Orange (>= 65% and <80%)
Red (<65%)

The critical control support number ‘MC1.4 -01 automatic fie suppression systems have been installed to design on plant where it is identified as a control’ ranked the lowest at 90%.

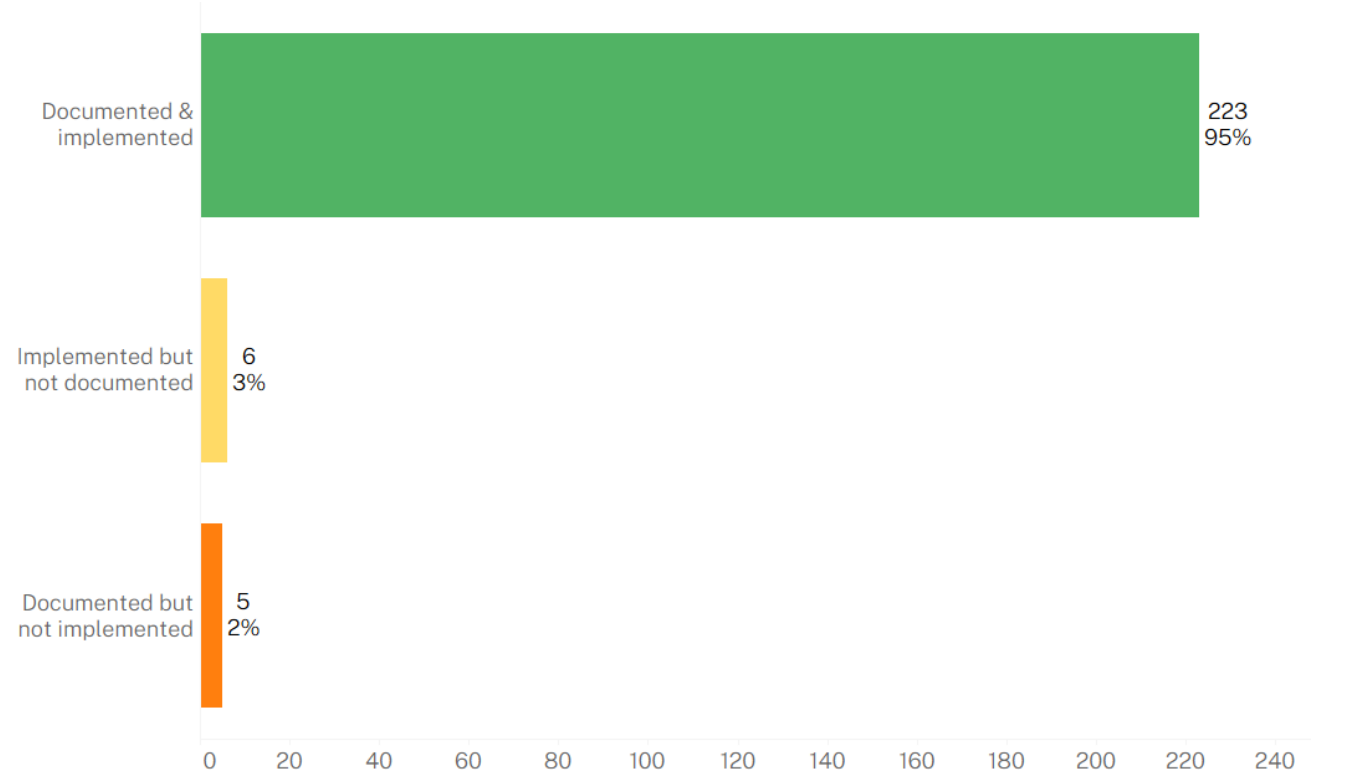
Figure 5. Summary assessment findings overall results by critical control and control support – MC 1.4 Automatic fire suppression

Consequence	One or more fatalities	MC1.4	Automatic fire suppression	01	Automatic fire suppression systems have been installed to design on plant where it is identified as a control.	90%
				02	Automatic fire suppression systems are maintained to a schedule consistent with OEM recommendations and considering published guidance material.	100%
				03	Sufficient information, training and instruction is available to the maintainer to complete the work they are assigned e.g. work order, procedure, specific training.	100%
				04	Personnel know what to do when the fire suppression system operates.	92%
				05	Personnel know what to do if the suppression system fails to operate.	100%
Grand Total						96%

Green (=100%)
Yellow (>= 80% and <100%)
Orange (>= 65% and <80%)
Red (<65%)

The analysis of the overall assessment findings ratings for documented and implemented was 95% and summarised in Figure 6:

Figure 6. Overall assessment findings ratings



Notices issued

Of the **18** coal mine below surface sites assessed under the inspection program, **10** separate mines were given **16** notices relating to compliance with the fire and explosion – mechanical assessments.

Some of the mines were issued with several compliance notices.

The notices issued for compliance with fire and explosion – mechanical were reviewed and Table 2 lists the notices issued by type and number.

Table 2: Notices issued for the planned inspection program – compliance with new legislation

NOTICE TYPE	TOTAL ISSUED	NUMBER OF MINES
s.23 notice of concerns	8	7
s.191 improvement notice	7	7
s.195 prohibition notices	1	1
Total	**16**	**10**
		Note: some mines issued multiple notices

Recommendations

Based on the findings outlined in the report and in relation to the numbers and types of compliance notices issued during the program. Mine operators should consider the following recommendations:

- Review the commencement of each hazardous zone is clearly identified by signposting or by other reasonably practicably means.
- Review equipment operator training on shut-down systems and testing for effectiveness of the system.
- Review the adequacy of inspection systems effectiveness to identify friction and potential for hot surfaces.
- Review fire suppressions systems are installed to design requirements on plant.
- Review equipment operator training on the operation of fire suppression systems on plant.

Further information

For more information on safety assessment programs, the findings outlined in this report, or other mine safety information, please contact the NSW Resources Regulator:

CONTACT TYPE	CONTACT DETAILS
Email	cau@regional.nsw.gov.au
Incident reporting	To report an incident or injury call 1300 814 609 or log in to the Regulator Portal
Website	www.resourcesregulator.nsw.gov.au
Address	NSW Resources Regulator 516 High Street Maitland NSW 2320

Appendix A – Assessment criteria rating

Each assessed criteria is rated from 1 through 4 based on evidence supporting the expected control supports identified at the mine site:

Evidence supporting expected control supports

Expected control supports	Rating	Evidence supporting rating / comments
	4 3 2 1	

Assessment findings results are calculated based on the total points allocated to the assessed ratings as a percentage of the maximum possible points for each criteria group, and any findings rated as 'Not applicable' were excluded from the calculation.

Criteria assessed ratings and points

Assessed as	Rating	Points
Documented & implemented	4	4
Implemented but not documented	3	2
Documented but not implemented	2	1
Not documented and not implemented	1	0
Not applicable		

Findings results (points) with colours assigned as follows: