Resources Regulator
Department of Regional NSW

Consolidated report

Fire or explosion mechanical

Metalliferous and extractives mines

July 2021 to May 2023

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More information

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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 metalliferous surface and underground mines (METEX) and extractives surface mines 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 the 5 surface and 11 underground METEX operations and 14 extractives surface operations this report summarises the assessment findings from a total of 30 sites in relation to fire and explosion - mechanical, conducted between July 2021 and May 2023.

There were 61 compliance notices issued to 30 mines in relation to this assessment program.

Assessment criteria

Critical controls were identified by the Regulator and assessment criteria were assigned 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 MUE fire or explosion – mechanical – METEX mines (0401 and 0402)

Program plan		
Surface (PP0001832) and Surface and Underground (PP0001604)	2. Mechanically generated heat 6. Explosives atmosphere	PC 2.1 – Minimise friction control hot surface
	3. Accumulated flammable material, leaks or spills	PC 3.2 – Flammable fluid containment
	5. Hot work	PC 5.1 - Manage hot work fuel sources
Surface and Underground (PP0001604)	One or more fatalities	MC 1.1 – Non-metallic material properties
		MC1.4 – Automatic fire suppression

Findings

Overall, the findings were:

- 30 site assessments reviewed for this report
- 882 individual findings (PP0001604 - 396 findings, PP0001832 - 486 findings).
- 139 findings with enforcement action recorded
- 61 notices were issued to 30 mines from assessments during the program

Note that other notices were issued relating to findings other than fire or explosion – mechanical.

The overall assessment findings by threat, consequence and critical control was 91% (refer Figure 1):

- the threat of mechanically generated heat, explosive atmosphere and manage hot work ranked 90%
- the threat of accumulated flammable material, leaks or spills ranked 93%
- the threat of managing hot work fuel sources ranked 90%

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

Threat			Consequence		Grand Total
2. Mechanically generated heat 6. Explosives atmosphere	3. Accumulated flammable material, leaks or spills	5. Hot work	One or more fatalities		
PC2.1	PC3.2	PC5.1	MC1.1	MC1.4	
Minimise friction and control hot surfaces	Flammable fluid containment	Manage hot work fuel sources	Non-metallic material properties	Automatic fire suppression	
90%	93%	90%	88%	98%	91%

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

The overall assessment findings by sector surface or underground and by threat, consequence and critical control (refer to Figure 2):

Surface:

- the threat of mechanically generated heat, explosive atmosphere ranked 88% and manage hot work ranked 92%
- the threat of accumulated flammable material, leaks or spills ranked 97%
- the threat of management of hot work fuel sources ranked 92%

Underground:

- the threat of mechanically generated heat, explosive atmosphere ranked 92% and manage hot work ranked 88%
- the threat of accumulated flammable material, leaks or spills ranked 87%.
- the threat of management of hot work fuel sources ranked 88%

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

	Threat			Consequence		Grand Total
	2. Mechanically generated heat 6. Explosives atmosphere	3. Accumulated flammable material, leaks or spills	5. Hot work	One or more fatalities		
	PC2.1	PC3.2	PC5.1	MC1.1	MC1.4	
	Minimise friction and control hot surfaces	Flammable fluid containment	Manage hot work fuel sources	Non-metallic material properties	Automatic fire suppression	
Surface	88%	97%	92%			92%
Surface and Underground	92%	87%	88%	88%	98%	90%

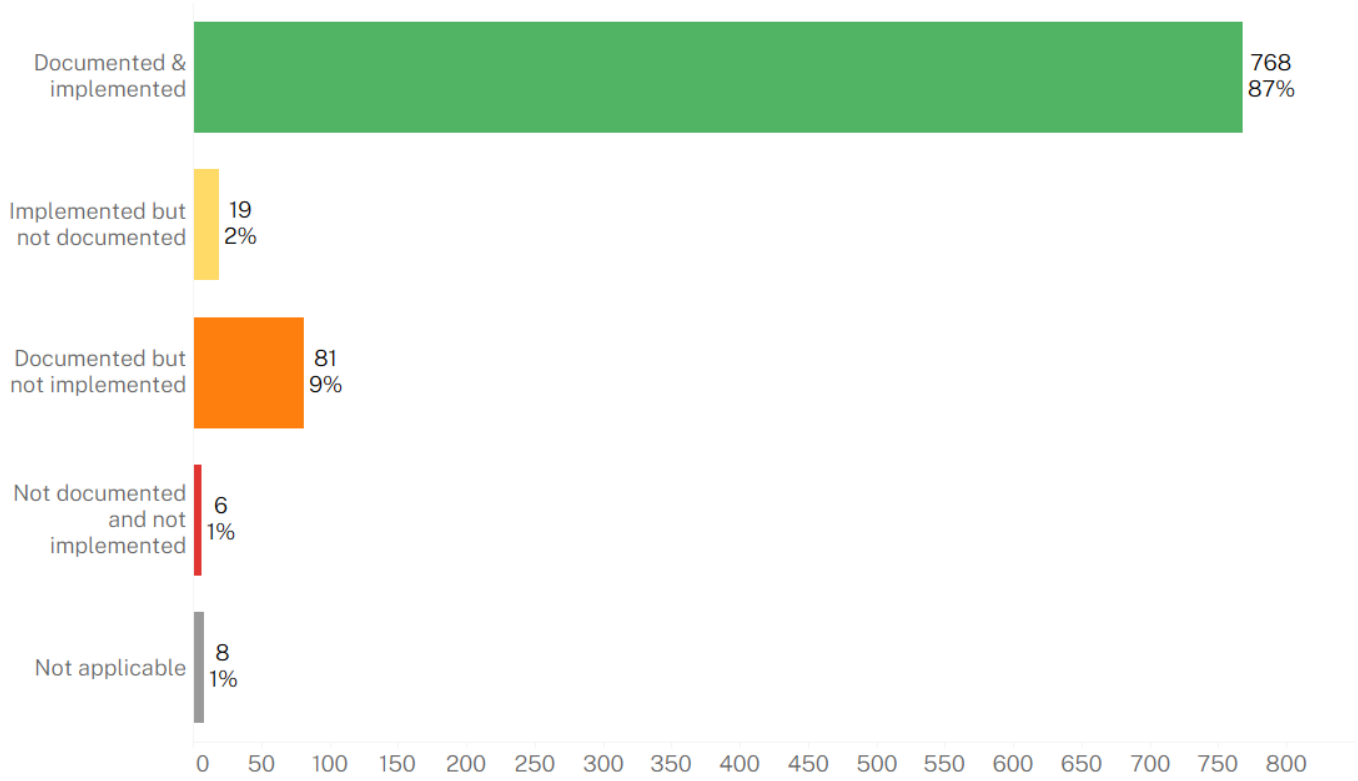
Green (=100%)
Yellow (>= 80% and <100%)
Orange (>= 65% and <80%)
Red (<65%)

The overall analysis of assessment findings ratings all sectors were found to be documented and implemented assessed at 87%. Implemented but not documented assessed at 2%.

The lowest category not documented and not implemented was found to be 1%.

The analysis of the overall assessment findings ratings for all sectors is summarised in Figure 3:

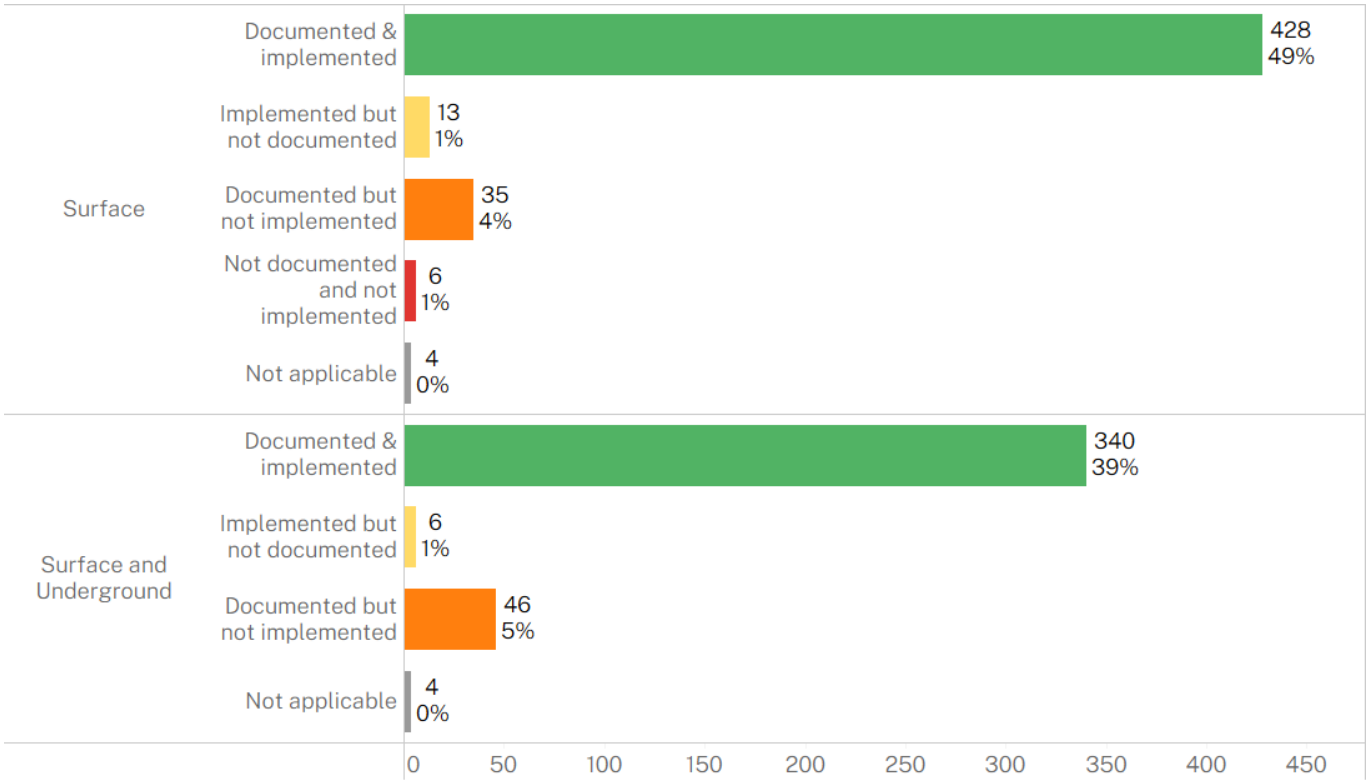
Figure 3. Overall assessment findings ratings – all sectors



The overall analysis by sector of assessment findings ratings all sectors were found to be documented and implemented assessed at surface 49% and underground 39%. Implemented but not documented assessed at surface 1% and underground 1%. The lowest category not documented and not implemented was found to be surface 1% and underground 0%.

The analysis of the overall assessment findings ratings by sector is summarised in Figure 4:

Figure 4. Overall assessment findings ratings by sector



Notices issued

Of the 30 sites assessed under the inspection program, 30 separate mines were given 61 notices relating to compliance with the fire and explosion – mechanical assessments, some mines were given notices in relation to other matters.

There were a significant number and types of compliance notices issued to all of the mine sites assessed.

The significance is that sector wide non-compliance was identified at all mine sites assessed.

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	31	26
s.191 improvement notice	28	2
S195 prohibition notices	2	2
Total	**61**	**30**
		Note: some mines issued multiple notices

Recommendations

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

- Surface and underground mines should review the potential threats of mechanically generated heat by friction and the adequate control of hot surfaces
- Surface and underground mines should review the threat of accumulated flammable material and the adequate control of flammable fluid containment
- Surface and underground mines should review the threat of managing hot work and the adequate management of fuel sources
- Surface and underground mines should review the site mechanical engineering control plan related to fire and explosion -mechanical hazards at metalliferous surface and underground mines and extractives surface mines specifically reviewing the concerns raised in compliance notices

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:

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