

Consolidated report

Small mines- electrical engineering control plan review

August 2020 to January 2024



Published by the Department of Primary Industries and Regional Development

Title: Consolidated report – small mines – electrical engineering control plan review

First published: October 2024

Department reference number: RDOC24/183876

More information

Amendment schedule		
Date	Version	Amendment
October 2024	1.0	First published

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Executive summary

A crucial part of the 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 by evaluating the effectiveness of control measures in the mine’s safety management system
- priority programs – proactively assessing a topic that is an emerging risk throughout the industry, which is determined 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.

This planned inspection program assessed the electrical engineering control plan (EECP) at small mine sites.

The review of the implementation of the site EECP for the program included review of 44 criteria topics.

This report will consolidate assessment findings and provide analysis and recommendations for operators of small mines related to the EECP.

In total this consolidated report consists of 58 assessments reviewed from an overall assessment of 86 small mine sites. The types of sites reviewed in this report included:

- 7 large extractive construction material sites
- 44 small extractive construction material sites
- 3 small extractive industrial minerals sites
- 3 small metalliferous sites
- 1 gemstone or precious stones site

In summary, there were 2552 individual assessment findings and of those 398 assessment findings required enforcement action to be taken at the site. The assessment program was conducted between August 2020 and January 2024.

In summary, from the 58 assessments there were 117 compliance notices issued to 55 sites in total during the program including:

- 3 x WHSA s195 prohibition notices
- 70 x WHSA s191 improvement notices
- 44 x WHS(MPS)A s23 notice of concern

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

Assessment criteria

Forty-four criteria topics were identified by the Regulator and assigned to the planned inspection program.

A tabulation of the range of criteria topics included in the review of the EECF at small mine sites is provided in Table 1.

Table 1. Planned inspection program criteria topics for the small mines review of EECF

Criteria number	Criteria
01	Does the mine have high voltage equipment (greater than 1000 Volts AC or 1500 Volts DC) that it owns or is in control of?
02	Does the mine have installed more than 1,000 KW (Kilowatts) of connected power?
03	Does the mine have photo-voltaic systems with or without battery energy supply systems (BESS) installed?
04	If the answer to questions 1) and/or 2) above are 'yes', has an electrical engineer been nominated for the key statutory position as electrical engineer for the mine?
05	If the mine has nominated an electrical engineer, does he/she have the correct qualification?
06	Has the electrical engineer accepted the nomination?
07	Has the mine notified the Resources Regulator of the nomination of the person to the key statutory position of electrical engineer?
08	Verify that the electrical engineer is shown in the management structure
09	If the answer to questions 1) and 2) above are "no", has a qualified electrical tradesperson been nominated for the statutory position as qualified electrical tradesperson?
10	Has the electrical engineer/qualified electrical tradesperson been inducted?
11	What type of earthing system is used, including levels of earth fault limitation (if used)
12	Has the mine identified in the risk assessment the hazard of electric shock injury caused by direct or indirect contact with electricity?
13	Has the mine identified in the risk assessment the hazard of arc flash?
14	Has the mine identified in the risk assessment the hazard of injury to persons caused by working on electrical plant or electrical installations?
15	Did the mine include consultation with the workers during the risk assessment? (including the qualified electrical tradesperson or electrical engineer)
16	Has the mine developed and implemented an electrical control plan?
17	Was the control plan developed by the statutory electrical engineer or a person who is under the supervision of the statutory electrical engineer, or if there is no electrical engineer then by a competent person?
18	Have the controls identified in the risk assessment been documented in the electrical engineering control plan?
19	Does the mine have isolation and restoration of power procedures?
20	Does the mine have procedures for: <ul style="list-style-type: none"> • the use of electrical welding plant • the use of electrical test instruments • the treatment of electric shocks and electric burns.

Criteria number	Criteria
21	Does the mine have a no live work policy?
22	Is the electrical installation work carried out as per AS/NZS3000 Wiring Rules?
23	Are electrical circuits tested as per the Wiring Rules before being either first energised, or first energised after recommissioning? and the operator or the electrical engineer is notified about that testing as soon as is reasonably practicable after the testing occurs?
24	Does the mine have plans of the following, and are they readily accessible to those who may need them, and are these plans and drawings maintained and up to date? (i) the location of each main electricity reticulation line, (ii) the location of all high voltage cables, aerials and switchgear, (iii) the location, rating, identifying label and purpose of each main isolator, substation and high voltage switchboard, (iv) any information required to perform switching programs, (v) the location of all known buried electrical services at the mine site
25	Does electrical equipment at the mine have a continuous and effective connection to earth?
26	Are isolated circuits arranged as per section 7.4 of AS/NZS3000?
27	Has earth fault protection been fitted to all distribution and control circuits? and Has earth leakage protection been fitted to all sub-circuits to minimise electric shock hazards?
28	Does the EECP require the fitting of signs to: <ul style="list-style-type: none"> • Warn of the presences of electricity, (e.g. a sign saying Danger 415 V) • The level of voltage in an enclosure or item of equipment; • Access to authorised person only • Isolate elsewhere before removing cover; • Resuscitation
29	Are there regular tests carried out on handheld electrical equipment and other equipment that is supplied from a socket outlet (240 volts)? Are these items of equipment listed on a register? Are these items of equipment tagged? Is AS/NZS 3760 referenced as the standard for these tests?
30	Are regular tests carried out on RCDs at the mine? and is there a register of RCDs installed on site?
31	Are field control circuits energised at extra low voltage i.e. less than 50Vac or 120Vdc?
32	Maintenance - What scheduled maintenance is in place for checking on installed electrical equipment?
33	Solar installations?
34	Electrical fault protection Is overload/short circuit installed? Are overload/short circuit devices correctly rated?
35	240 volt equipment - Checks on equipment supplied from a socket outlet i.e. test and tag?
36	RCD protection checks on RCD installations, where they are installed and where they should be installed (240V socket outlet circuits)?
37	Ingress protection - Environmental protection of electrical equipment (IP ratings)?

Criteria number	Criteria
38	Earth bonding - Earth equipotential bonding is fitted and is in good condition? (This looks at visible bonds, not those as installed in, for example cables)
39	Arc flash - Arc flash minimisation is in place?
40	Generators - If the site uses generators to provide electrical power to site, confirm generator is installed correctly, fit for purpose and well maintained. Generators used for backup power will need to be checked for changeover methods and procedures, and where the MEN link is located.
41	Welder - This includes welders owned and used by the mine, as well as welding contractors.
42	Mobile plant - Verify that mobile plant, e.g. loaders, trucks, graders etc are electrically maintained. This can be by the mine or by auto-electricians or mechanics. Check that the nominated electrical engineer or statutory electrical tradesperson is in control of the electrical work on mobile plant.
43	Transportable buildings - Verify that transportable buildings are installed correctly.
44	Solar- Verify that the installation is installed safely, short circuit potential on down leads is minimised, switches are DC rated, inputs and outputs from inverters are physically protected.

Assessment findings and overall ratings

In summary the assessment criteria findings were:

- 2552 individual findings
- 398 findings with enforcement action recorded
- 19 findings related to other matters with enforcement action
- 58 sites in the report out of 86 sites assessed
- A total of 117 WHSA compliance notices were issued in total to 55 of the 58 sites.

The overall assessment finding ratings were:

- 57% rating of documented and implemented
- 7% rating of implemented by not documented
- 2% rating of documented but not implemented
- 6% rating of not documented and not implemented
- 24% rating of not applicable
- 2% observed but not rated
- 2% not assessed

Figure 1 provides a summary of the overall assessment findings ratings.

Figure 1. Overall assessment findings ratings

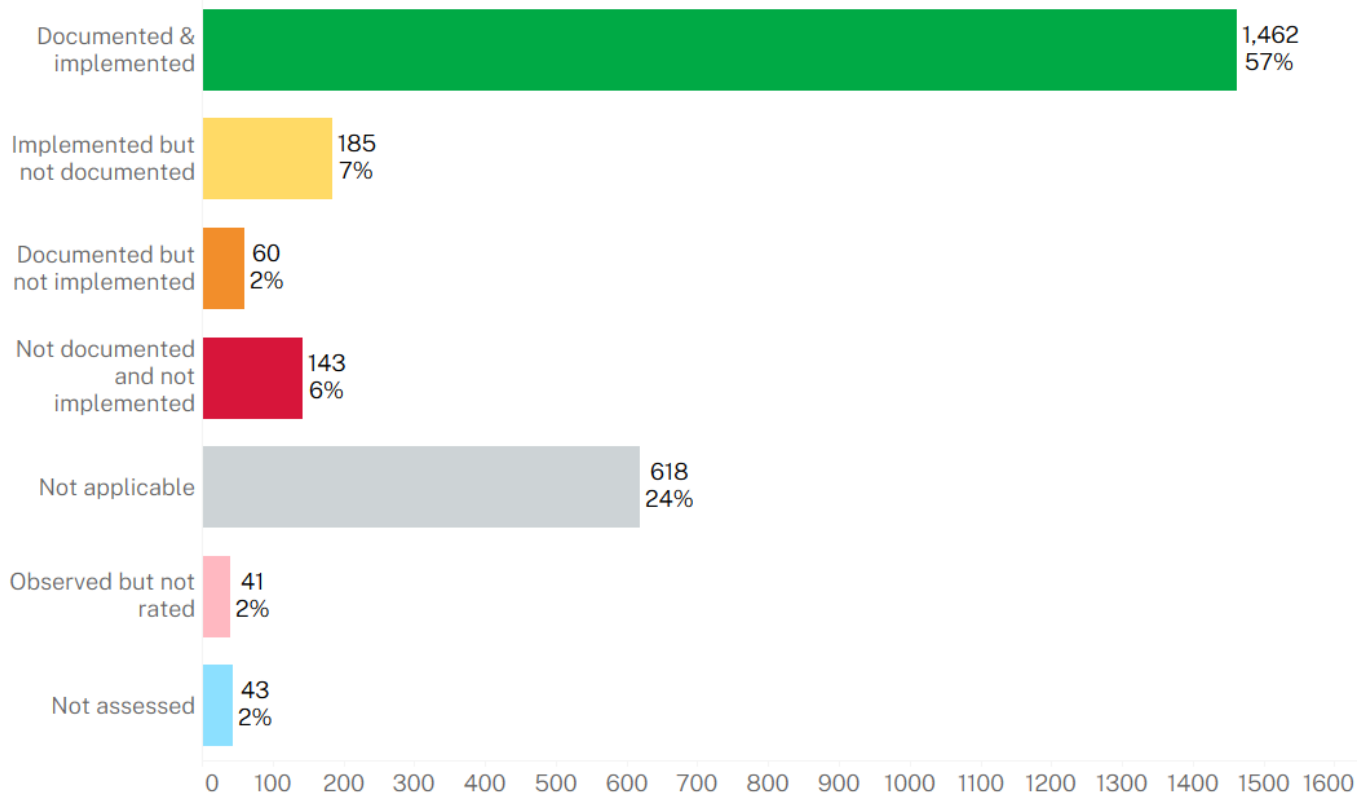
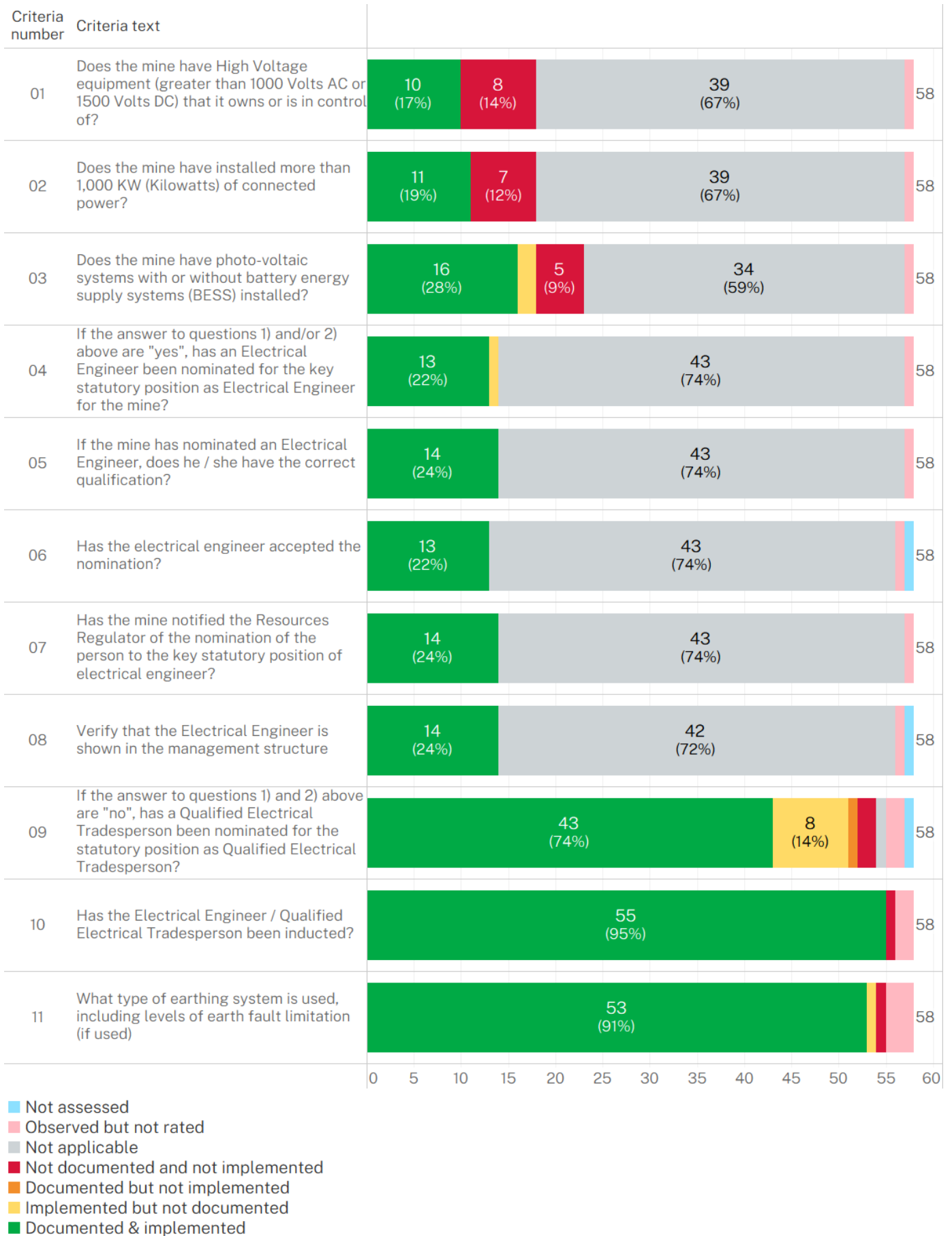
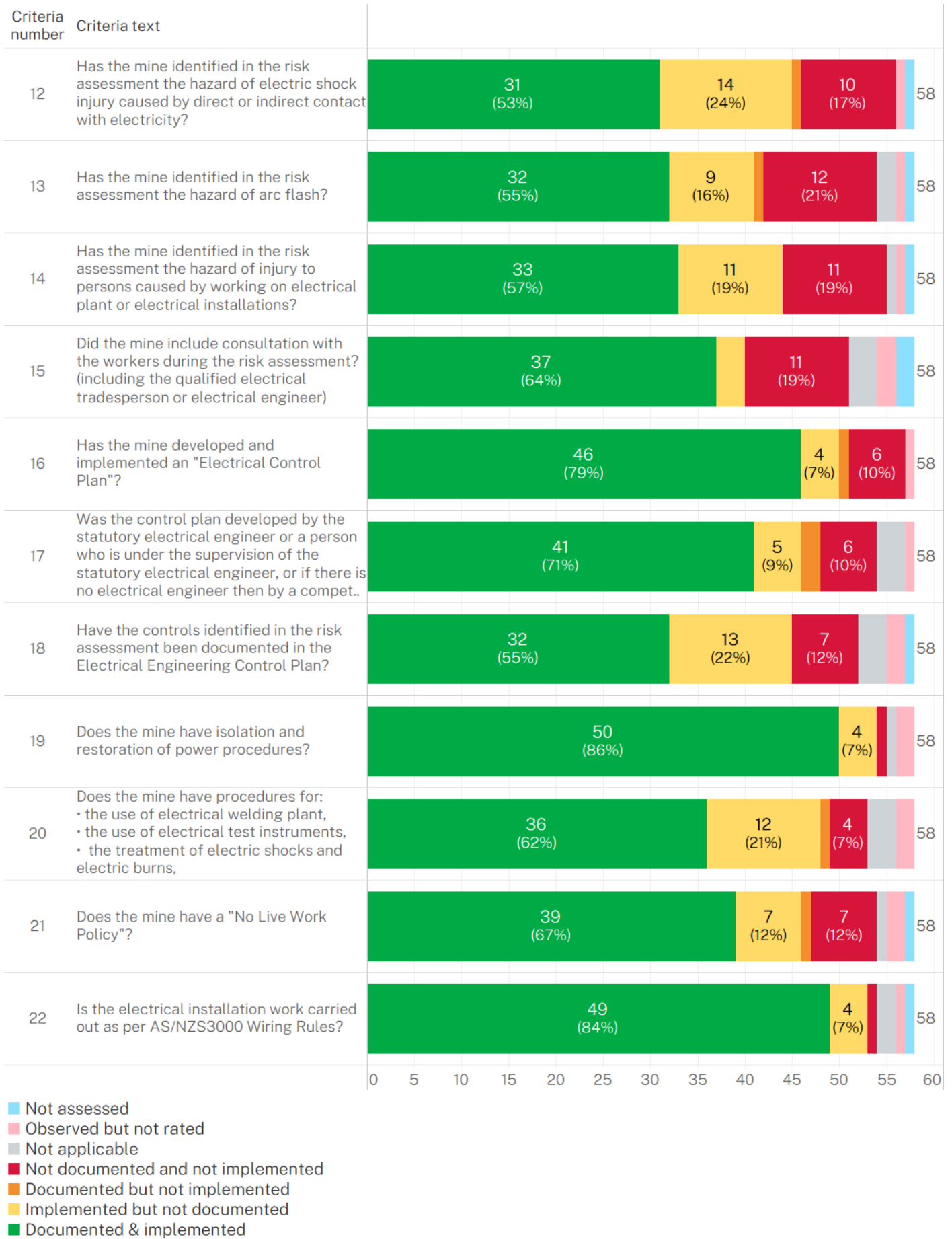
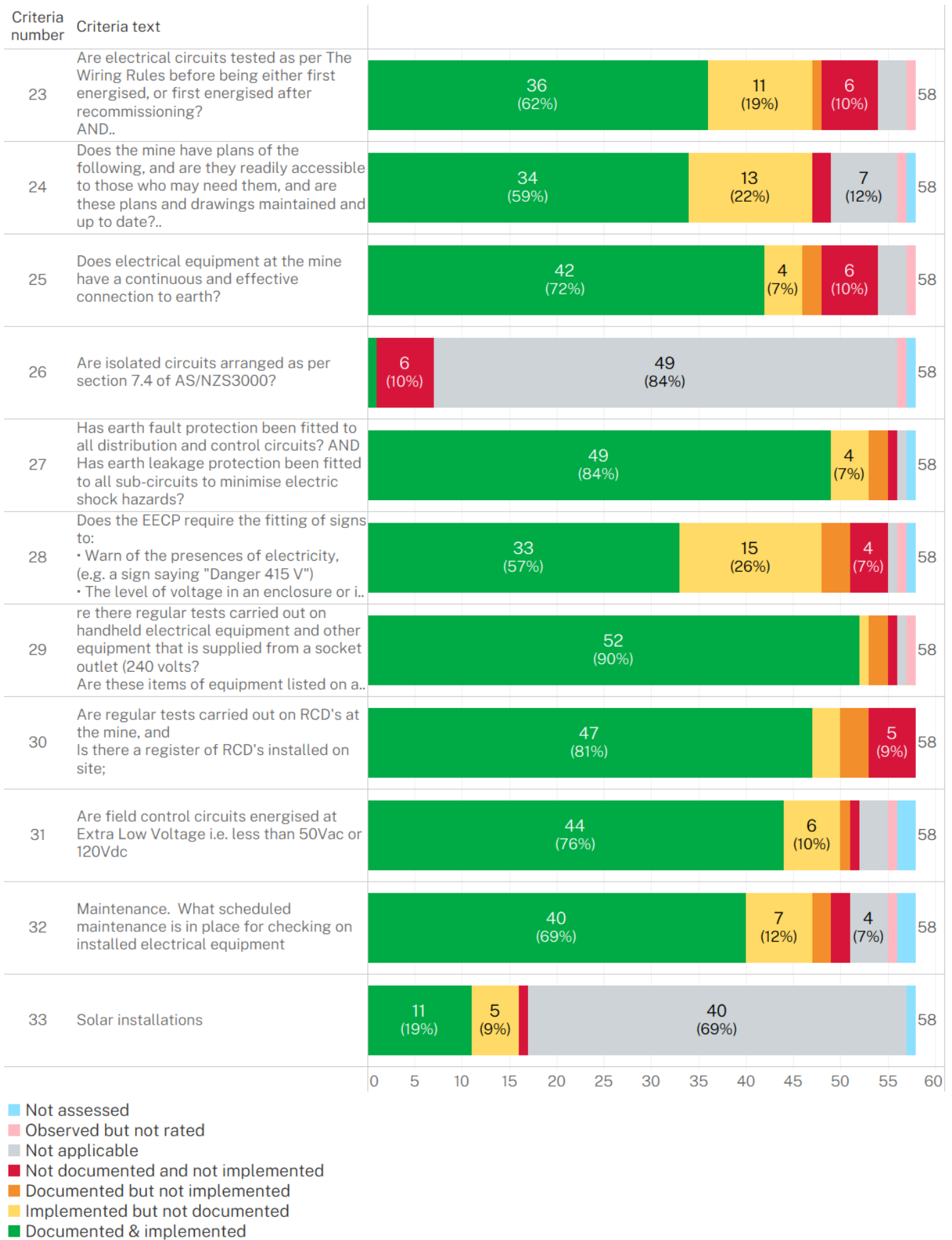


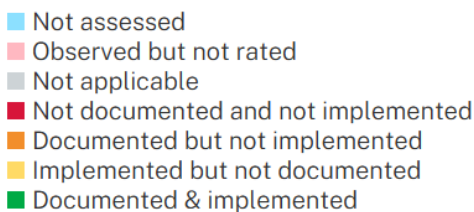
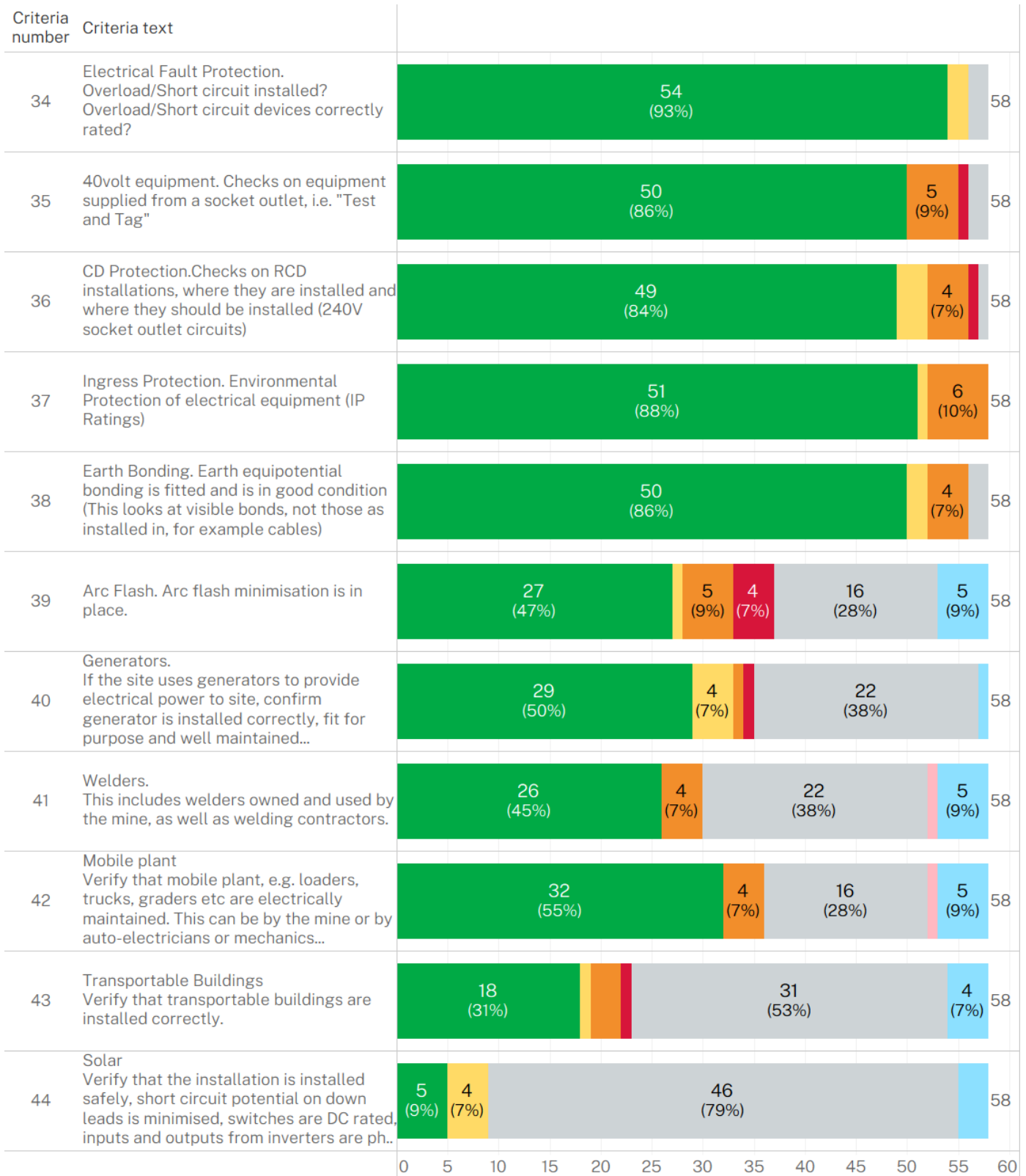
Figure 2 provides a summary of the overall assessment findings ratings for each criteria topic.

Figure 2. Overall assessment findings ratings by each criteria topic









Compliance notices issued

In summary, there were 117 WHSA compliance notices issued in total to 55 sites from the 58 assessments. Some sites were issued more than one compliance notice.

Table 2 details the compliance notices issued by type and number to small mines sites during the program

Table 2: WHSA compliance notices issued by type and number for small mine sites

NOTICE TYPE	TOTAL ISSUED	NUMBER OF SITES
s.195 prohibition notice	3	3
s.191 improvement notice	70	50
s.23 notice of concern	44	43
Total	117	55

Note: some mine sites were issued multiple notices

Note: Some compliance notices issued concerned items not related to the assessment topic. Some notices issued covered more than one topic.

Recommendations for small mine sites

Based on the findings outlined in this report and with respect to the significant numbers of notices issued (117 compliance notices issued) and the types of compliance notices issued (including 3 x s195 prohibition notices) during the assessment of the EECP review at small mine sites, it is recommended that the following should be reviewed by mine operators:

- review the site EECP to ensure the risks at the site are controlled by:
 - EECP is adequately documented for the electrical risks at the site
 - risk assessments to identify the risk controls for the EECP
 - implementation and monitoring systems of the EECP are effective
 - defect management systems of the EECP are effective
 - information and training in the site EECP provided to workers and site supervisors
- review the site EECP for implementation of the assessment review findings (red colour findings with a greater than 10% finding of ‘Not documented and Not implemented’) as a minimum requirement:
 - has the mine identified in the risk assessment the hazard of electric shock injury caused by direct or indirect contact with electricity?
 - has the mine identified in the risk assessment the hazard of arc flash?
 - has the mine identified in the risk assessment the hazard of injury to persons caused by working on electrical plant or electrical installations?

- has the mine included consultation with the workers during the risk assessment? (including the qualified electrical tradesperson or electrical engineer)
- have the controls identified in the risk assessment been documented in the electrical engineering control plan?
- does the site have a no live work policy?

Further information

For more information on safety assessment programs, the findings outlined in this report, or other mine safety information, please contact the 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	Resources Regulator 516 High Street Maitland NSW 2320

Appendix A – Assessment criteria rating

Each assessed criteria is rated from one to 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				
	<table border="1"> <tr> <td>4</td> <td>3</td> </tr> <tr> <td>2</td> <td>1</td> </tr> </table>	4	3	2	1	
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 Compliant	4	4
Implemented but not documented Improvement needed	3	2
Documented but not implemented Significant improvement needed	2	1
Not documented and not implemented Non compliant	1	0
Not applicable (N/A)		

Findings results (points) with colours assigned as follows:

- Green (=100%)
- Yellow (>= 80% and <100%)
- Orange (>= 65% and <80%)
- Red (<65%)
- Not applicable