

COMPLIANCE PRIORITIES OUTCOMES

Drill rigs in metalliferous mines

Drill rigs – isolation versus immobilisation

Issue: Incident and injury statistics^{1,2} show that workers have suffered fatalities and serious injuries due to interactions with hazardous moving drill rig components. The risks associated with the operation of drill rigs in underground mines are of concern to the NSW Resources Regulator as workers carry out tasks within the movement zone of the machinery.

Drilling operations at underground mines involve drill rig operators and, in some cases offsiders, performing tasks around the booms, mast, drifters and drill rods within a hazardous zone. Operational tasks include the changing of consumables involving high exertion, repetition and difficult postures. The physical nature of these tasks and the difficult work environment present significant risks to those workers.

The results of a recent drill rig assessment program conducted by the NSW Resources Regulator at five underground mining operations show that some mine operators are using a form of immobilisation, rather than isolation, as a means of control for protection of workers on their drill rigs. It was found that in some cases, the immobilisation methods had failed or were not being used, and that in every case, the risk of harm to workers had not been reduced to as low as is reasonably practicable.

What we did

The compliance priority program was conducted by NSW Resources Regulator inspectors at five large underground metalliferous mines in the central and far west regions of NSW.

Participating mines were notified before the planned inspections.

The NSW Resources Regulator assessed the risk controls and specifically considered:

- whether those mines have developed safe systems of work for drill rigs that include full isolation of energy
- what level of control implementation was found

¹ MDG 35 provides a list of historical fatal drill rig incidents that occurred between 1955 and 2004 here:

www.resourcesregulator.nsw.gov.au/data/assets/pdf_file/0003/368319/MDG-35-Drill-rig-fatal-incidents.pdf

² www.resourcesregulator.nsw.gov.au/data/assets/pdf_file/0008/805895/SA18-05-Offsiders-nose-and-cheek-broken-in-incident.pdf

- whether or not workers were trained in these controls
- what is done to ensure the safe systems are and remain effective.

The inspections began with an audit to understand the site definition of effective isolation, and a review of procedures designed to manage the safety of workers during drill rig operations. This was followed by an underground inspection of Jumbo drill rigs and supplemented with interviews of operators and offsiders.

Information was collected detailing how mine operators controlled the risks to workers when the workers were operating within the hazardous zone (forward of the front levelling jacks).

What we found

The documentation review identified that mine operators had misapplied or used a conflicting application of the word 'isolation' in their drill rig procedures. In several cases, this confusion lead to inconsistencies and non-compliances with isolation (as a control) as referenced in other site standards.

Mine operators had appropriate:

- definitions for isolation standards on their site that required workers to identify all energy sources, then to apply locks, tags and test for effectiveness.

In contrast with these definitions and with regards to safe systems for drill rigs, mine operators had fitted:

- manual switches that operated a hydraulic solenoid valve to prevent boom movement or

- manual switches that shut down the power packs to immobilise the hydraulics of the drill rig booms or
- fitted laser curtain technology that was designed to automatically control power to the drill rig booms like the function of the manual switches. The laser switching activated when workers broke the beam, and required a manual reset and restart of the rig to repower up, or
- a combination of these.

None of these latter systems were classified as a circuit breaker and none were lockable.

Laser curtain systems

Inspectors found two different laser systems in use on Jumbo drill rigs.

In one instance there was an original equipment manufacturer (OEM)-fitted laser, and it was found to be operating according to the design.

The other five examples being used were of an aftermarket laser curtain system. In all five cases these systems were found to be faulty and not operating as required.

OEM system

This system projects laser beams between the front levelling jacks and the side wall of the drives. It requires the operator to initiate the laser protection system after ensuring that no person is forward of the laser beam. The laser system reset switch is positioned alongside a manual switch, this switch was fitted by the OEM at the request of the mine operator. Mine procedures require a system reset by offsiders after they retreat to safety.

The mine that was operating the OEM system had a procedure that directed the manual switch to be used as a primary safeguard and the laser to be used as a back-up. But in practice the operator and his offsider were relying solely on the laser system for their safety.

After-market laser system

This system projects a laser curtain forward of the front levelling jacks. This system continuously scans for objects within the hazardous zone. If workers enter the laser curtain it immobilises the hydraulics to the boom. This is referred to by the supplier as a block.

The system counts the number of people entering the hazardous zone and does not allow a reset until the same number of workers have retreated to safety. This system requires a manual reset, the switch is located inside the operator's cabin.

Sites that used this system relied solely on the laser curtain to immobilise power to the hydraulics as protection of persons when working forward of the front levelling jacks.

Outcome

Because of the program, the Resources Regulator issued a safety bulletin on 6 November 2018:

- [SB18-18 Drill rig safety](#)

Mine operators have been relying on fallible control devices and fallible procedures and have not been using effective isolation to control the hazards associated with operating drill rigs.

Mine operators were issued notices relating to issues including:

1. The Jumbo drill rig is stopped and made safe. The prohibition required the Jumbo operator and the trainee operator to be provided with appropriate information, training, instruction and supervision to operate the Jumbo rig in a manner that lowers the risk of harm to workers to as low as is reasonably practicable.
2. A control switch to immobilise the hydraulics of Jumbo drill rigs had been fitted by the OEM without the mine conducting change management, risk assessments and developing risk controls or updating procedures.
3. Risk assessments for the introduction of a laser curtain Jumbo guard system on Jumbo drill rigs on site did not include participation of mine management or employees.
4. Contractor change management indicated an update to procedures dated 17 October 2017. The procedure provided at the time of the assessment was dated 12 October 2017 (i.e. before the change management) therefore it did not contain updated information as described by the change management process.
5. The contractor Jumbo drill rig operator was not given training on the laser curtain system before he operated the drill rig.
6. Staff and supervisors were not aware that laser curtain systems had not been working for over two weeks on Jumbo drill rigs.
7. A hydraulic hose was replaced on a Jumbo drill rig by an operator who had not been trained and deemed competent to carry out the task, and the operator did not follow site procedures for effective

isolation of the drill rig when performing this task.

8. The manual control switch for immobilisation of the booms had been removed and replaced with emergency stop switches on either side of the drill rig but this change was not updated in the training module for operators and offsiders.
9. Effectiveness of manual control switches and effectiveness of laser systems to immobilise rigs were not included in prestart checks.

Further observations

Although only Jumbo drill rigs were assessed at the five mine sites, the principles of safety apply equally to long-hole drilling rigs, and potentially to a range of other drilling equipment.

Next steps

Mine operators have been relying on fallible control devices and fallible procedures and have not been using effective isolation to control the hazards associated with operating drill rigs.

Although only Jumbo drill rigs were assessed at the five mine sites, the principles of safety apply equally to long-hole drilling rigs, and potentially to a range of other drilling equipment.

Given the high potential for injury to operators and offsiders when operating drilling rigs, mine operators should review their risk controls.

Recommendations

Mine operators should: -

- Undertake risk assessments to identify hazards and implement effective controls to protect the safety of workers when performing drill rig operations.
- Continue to develop safer systems of work for drill rigs that include a level of isolation that will reduce the risk of harm to workers to as low as reasonably practical.
- Ensure the training of workers include all identified hazards and the implementation of risk controls when operating drill rigs.
- Include testing of the effectiveness of risk controls in prestart operations to ensure that they are working correctly.
- Work with all stakeholders including OEMs and after-market product developers to discuss, develop and implement processes for the effective isolation or effective immobilisation of drill rigs to ensure the safety of workers in hazardous areas.

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