

SAFETY BULLETIN

DATE: MARCH 2019

Workers injured by high pressure fluid

This safety bulletin provides safety advice for the NSW mining industry.

Issue

The risk of serious injury and potential death to maintenance workers being struck in the face and body by high pressure fluid releases has been highlighted in recent incidents reported to the NSW Resources Regulator.

Circumstances

The incidents involved experienced contract maintenance workers undertaking a variety of tasks on hydraulic systems. High pressure fluid release was not an intended outcome of the task. The hierarchy of controls relied upon to control high pressure fluid release failed to prevent the maintenance workers from being struck and injured. The consequences caused serious and high potential injuries to workers.

Figure 1: Shirt damaged by high pressure fluid release



Figure 2: Facial injury caused by high pressure fluid release



Incident investigations

12 March 2019 – Incorrect pressure information on roof support

During a longwall changeout a contract maintenance worker isolated a roof support and checked the pressure gauge on the maingate leg which appears to have indicated zero pressure. The worker then loosened retaining bolts on the double check valve on the roof support leg. The stored pressure in the support leg released and tore the workers shirt and caused abrasions to his chest.

The pressure gauge was later tested as operational; however, the cover was cracked. A face audit identified that three out of 680 pressure gauges on the longwall face were also incorrectly indicating zero pressure.

Figure 3: A pressure gauge on the longwall face



12 March 2019 – Failure to install plugs during roof support recovery

During a longwall changeout a maintenance worker restored hydraulic pressure to a set of 20 roof supports for removal. A power take-off plug had not been replaced on one roof support in the set of 20. A release of high pressure fluid occurred from a power take-off port when the roof supports were re-pressurised. The high pressure fluid release put another maintenance worker at risk of being struck by the fluid. The mine investigation identified that another power take-off plug was also missing on another support. However, that support had not been re-pressurised in the set of 20 supports.

10 March 2019 – Hydraulic fittings release fluid under pressure

A contract maintenance worker was performing live hydraulic pressure testing to obtain pressure decay data from a hydraulic hoist on a large haul truck. The fitting connecting the hydraulic hose to the test meter released fluid under pressure and the worker was struck in the face by high pressure fluid.

5 March 2019 – Failure to identify stored pressure

Contract maintenance workers were dis-assembling a large excavator base pod. The confirmation of the isolation undertaken earlier by other workers had failed to identify an accumulator holding stored pressure. Upon disconnecting the hose fitting a worker was struck in the face and body by high pressure fluid.

Figure 4: Simulation of the location of the injured person in relation to the hydraulic fittings connecting to the hydraulic pressure testing equipment

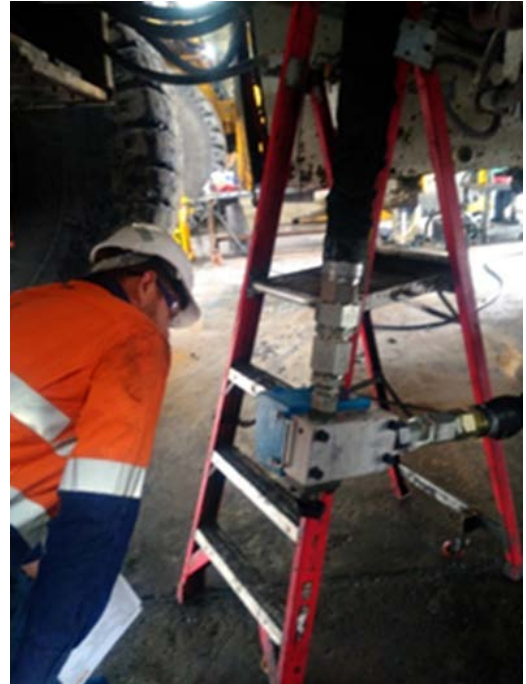
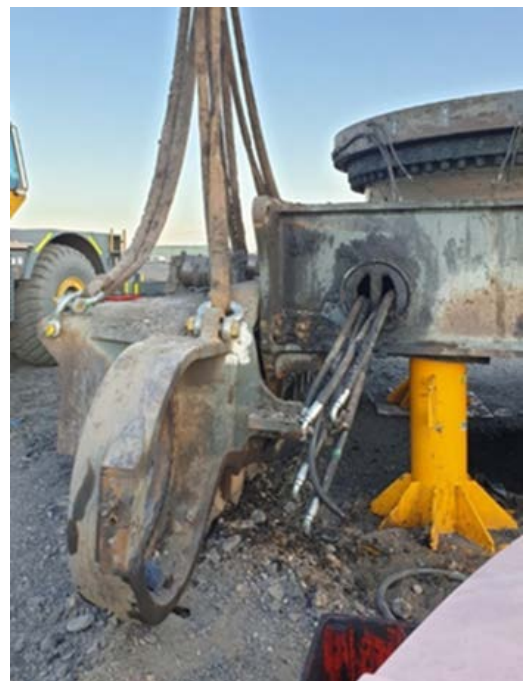


Figure 5: Disconnected hydraulic lines exiting from the excavator pod. The accumulator is hidden from view inside the base pod



20 February 2019 – Incorrect isolation verification

A contract maintenance worker was changing rock burst (yield) valves on longwall roof support cylinder legs.

The system of work required that protection covers were removed to expose both hydraulic control valves on the cylinder legs for isolation purposes.

The worker isolated the tailgate side cylinder and attempted to remove the yield valve. The worker left the area and on return went to the non-isolated maingate side cylinder yield valve and attempted to remove the valve. The worker removed a staple on the maingate side valve block and was struck in the face by high pressure fluid.

19 February 2019 – Over-pressurisation of equipment

A contract maintenance worker was pre-commissioning a haul truck recovery power pack. The power pack was started without being connected to a host machine or testing equipment. When the worker started the power pack an over-pressurisation occurred, and a hose burst at a fitting. The worker was struck by high pressure fluid.

Figure 6: A worker located adjacent to an exposed hydraulic valve on a cylinder leg



Figure 7: The failed hydraulic hose on the recovery power pack

**Hierarchy of controls for high pressure fluid applications**

The hierarchy of controls provides a PCBU with guidance on the best practicable means of how to effectively minimise the risks of injury from high pressure fluids to workers.

In considering the circumstances of each of these events, it is apparent the hierarchy of controls to reduce the exposure of workers to high pressure fluid **have not been applied effectively**. In particular the elimination of the risk by failing to identify residual pressure, and to bleed this pressure off appropriately.

It is apparent that the use of isolation barriers to disperse, deflect and diffuse fluids when an unintended release occurs **have also not been effective**.

Isolation barriers could include temporary movable protective coverings and shielding devices that are located between the worker and the pressurised equipment during the task.

Personal protection barriers could include pressure resistant wearable clothing to protect limbs, body and neck, and full face-covering devices.

Recommendations

1. Mine operators should review the effectiveness and reliability of safety management system controls for risks associated with unintended release of high pressure fluids.
2. Mine operators should review isolation procedures to ensure effective isolation of hydraulic systems. *Refer to MDG41 Fluid Power Safety Systems at Mines: Chapter 3 – Design and Manufacture and Chapter 7 - Inspection, Maintenance and Repair.*
3. Mine operators should review the training and competency of workers undertaking high pressure fluid power system tasks.
4. Mine operators should review the specific exposure of workers undertaking high pressure fluid tasks, provide isolation barrier devices, and improve personal protection equipment standards to prevent high pressure fluid injuries.
5. Mine operators should review contractor management systems to ensure contract maintenance workers have appropriate competencies, are provided with reliable task related information and are supervised for compliance with the site's safety management systems.

Published resources

- [MDG-41-Fluid-power-systems.pdf](#)
- [NSW-Resources-Regulator-Mines-and-Quarries-Book-Complete-v6.pdf](#) - pages 268 to 272
- [SB18-19-Isolation-issues-identified-at-coal-mines.pdf](#)
- [Two-workers-suffer-serious-fluid-injuries-in-separate-incidents.pdf](#)
- [SB13-01-Fluid-injections-result-in-surgery.pdf](#)
- [SB12-03-Fluid-power-isolation-failures.pdf](#)
- [SA09-04-Hydraulic-injection-near-miss.pdf](#)
- [SA06-16-Fatal-High-Pressure-Hydraulic-Injection-v2.pdf](#)

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Disclaimer: The information contained in this publication is based on knowledge and understanding at the time of writing (March 2019). However, because of advances in knowledge, users are reminded of the need to ensure that information upon which they rely is up to date and to check currency of the information with the appropriate officer of the NSW Department of Planning and Environment or the user's independent advisor.

DOCUMENT CONTROL

CM9 reference	DOC19/241471
Mine safety reference	SB-19 - 04
Date published	26 March 2019
Authorised by	Chief Inspector Office of the Chief Inspector