

Investigation report

Worker seriously injured during lifting activity

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Introduction

A worker suffered a left leg compound fracture when a 32-kilogram steel lifting plate, attached to an overhead crane, hit him within a workshop at the Tarrawonga Coal Mine at Boggabri, NSW on 13 November 2022.

An uncontrolled release of stored energy generated during the operation of the crane caused this incident. The plate was released after it became caught on the edge of the blower housing cut-out during its removal from an axle box of a rigid dump truck. In the moments before the plate's release, the worker's head and body were positioned directly in the line of fire while attempting to manoeuvre the plate through the cut-out.

The worker was exposed to a risk of suffering more serious impact injuries, or death, if the plate had hit the worker's head or other vulnerable areas. Furthermore, the worker was also at risk of potentially suffering crush and manual handling injuries, while working in a confined area and adopting awkward positions and postures to manoeuvre the plate, because the crane was in operation.

The mine

The Tarrawonga Coal Mine is an open cut coal mine about 42 kilometres north-west of Gunnedah, NSW. Whitehaven Coal Mining Limited is the mine operator of the Tarrawonga Coal Mine.

The incident

On 13 November 2022, a worker was using the crane in the mine's workshop to remove the plate from within the rear axle box assembly of a Hitachi EH4000AC2 rigid dump truck. The plate, which was manufactured from steel with a 10-ton rated original equipment manufacturer (OEM)-approved lifting lug, was attached to the crane. The worker was employed by a sub-contractor to the mine, Hitachi Construction Machinery Australia Pty Ltd.

Before the worker's shift, the plate had been inserted through the cut-out at the top of the axle box. The dimensions of this cut-out were smaller than the plate itself. The purpose of fitting the plate in the cut-out was to facilitate lowering and lifting the front of the rear axle box assembly, allowing workers to access and repair cracks in the truck's A-frame.

About 5.45 am, the worker (who was unassisted at the time) was attempting to remove the plate from the rear axle box assembly. The worker used one hand to control the crane using a cordless remote and the other to manoeuvre the plate. While positioned on the rear axle box assembly, the worker lowered the plate using the crane remote. The worker had crouched down and reached through the cut-out to take hold of the plate, positioning it perpendicular to the top of the axle box assembly.

After becoming uncomfortable in the crouched position, the worker released his grip on the plate and set the remote control aside to reposition himself. As the worker repositioned, the crane continued moving and the plate snagged on the edge of the cut-out. The momentum caused the plate to pull through the cut-out, catapulting it onto the platform next to the truck's operator cabin. As it released and propelled clear from the cut-out edge, it hit the worker's lower left leg resulting in a compound fracture.

Figure 1: The work area and blower housing cut-out that the worker was attempting to manually manoeuvre the lifting plate through



Figure 2: Location of the lifting plate after uncontrolled release

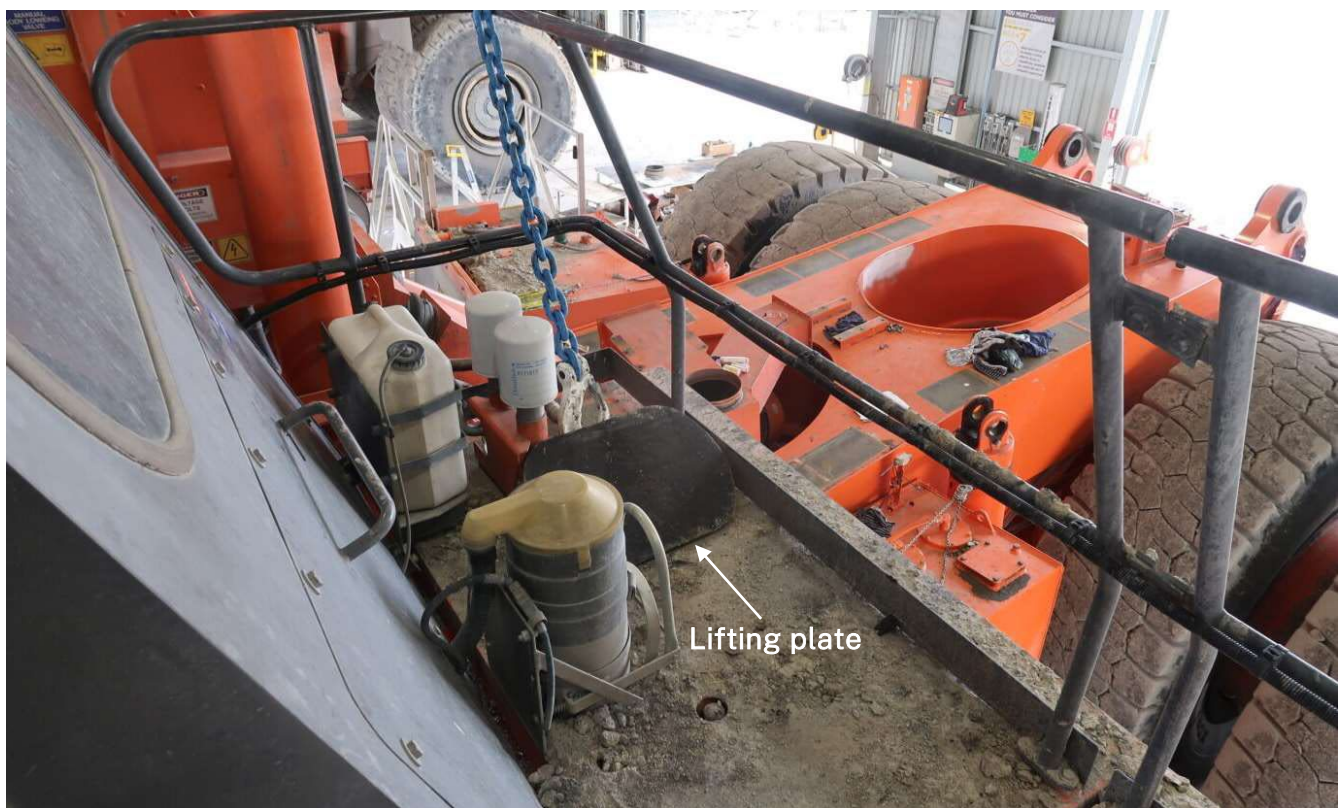
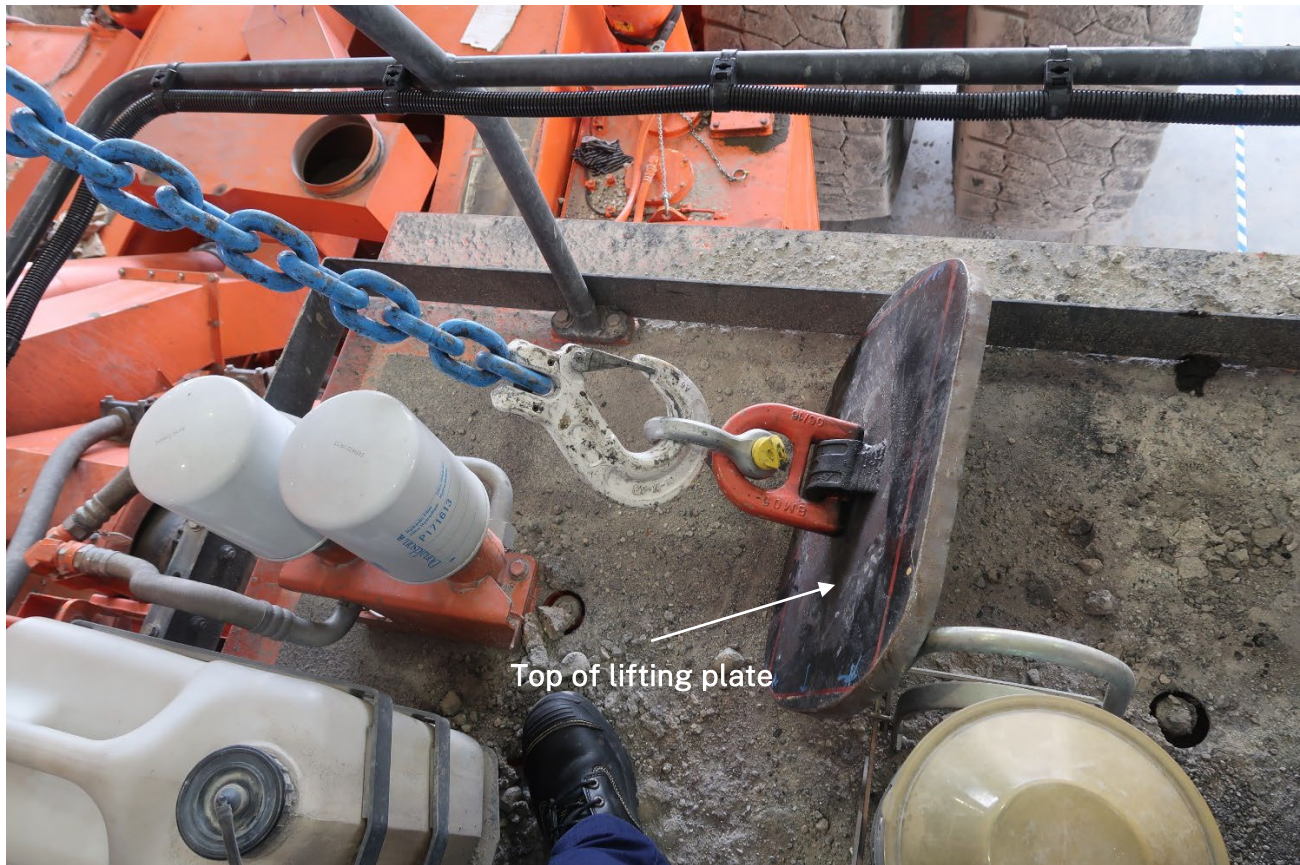


Figure 3: The top of the lifting plate has red markings to indicate its correct positioning inside the axle box, relative to the blower housing cut-out



Functionality of the crane and the line of fire risk

The lifting system of work was inherently unsafe because it necessitated a worker positioning themselves in the line of fire of the 32 kilogram lifting plate that had the potential to release and catapult in an uncontrolled manner.

The risk to health and safety was increased further because of the crane functionality and the worker not being aware of that functionality:

1. The crane had 2 modes of operation:
 - a. Slow mode (achieved by depressing the remote-control button halfway to its first 'indent') during which the crane hook travelled slowly and stopped immediately when the remote-control button was released, and
 - b. Fast mode (achieved by depressing the remote-control button all the way to its second 'indent') during which the crane hook travelled faster and would not stop immediately when the control button was released but, instead, wind down before coming to a stop.
2. The consequence of the fast mode was that the crane hook (to which the lifting plate was attached) would continue to travel some distance before coming to a stop or 'run on'.
3. This could arise if a worker inadvertently or deliberately depressed the 'control' button to 'fast' mode.

4. The worker operating the crane did not know of the two-mode functionality and, in particular, that the crane hook would not come to an immediate stop or 'run on' when in fast mode.

Investigation

The Resource Regulator's Major Safety Investigation Unit investigated the incident to determine its cause and circumstances.

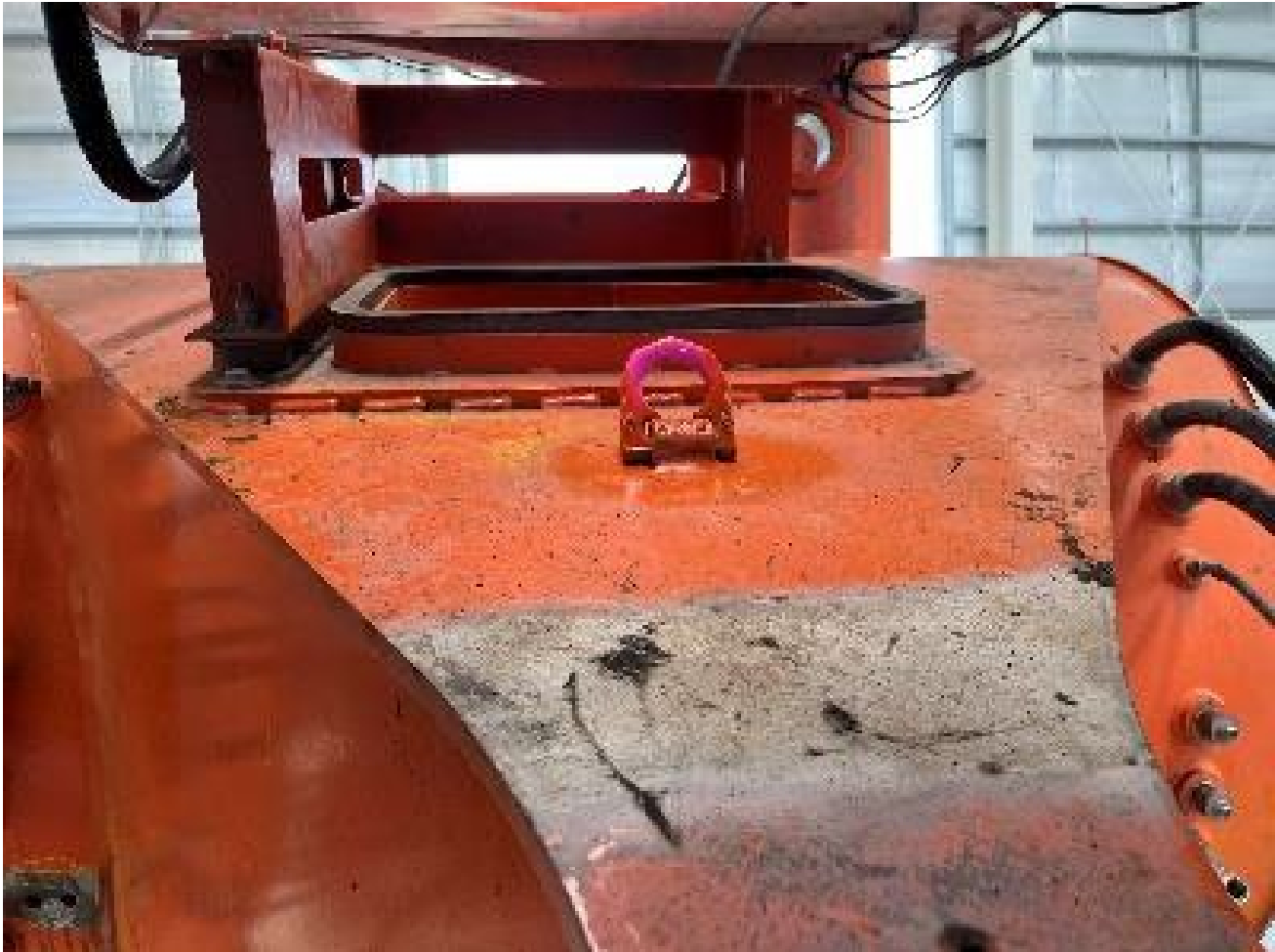
The investigation found several factors contributed to the worker being exposed to risks to health and safety, including:

1. An appropriate risk assessment was not undertaken when the approved safe work procedure for the task was developed, or before the introduction of the lifting plate at the mine.
2. As a result of the above, there was a failure to identify the relevant risks to health and safety associated with removing the plate including:
 - a. the uncontrolled release of energy in circumstances where a worker was positioned in the line of fire
 - b. crush hazards arising from stationary and moving parts intersecting in circumstances where a worker was required to place his hands at the intersecting point
 - c. hazardous manual handling arising from manoeuvring the plate while adopting awkward positions and postures including bending, crouching and reaching below waist level.
3. The approved safe work procedure for the task was inadequate, lacking essential information and critical details pertaining to the steps required to safely remove the lifting plate.
4. Workers were not given specific instruction or training in relation to the safe installation and removal of the lifting plate or the specific design and functionality of the crane.
5. There was a failure to provide adequate supervision to ensure only trained and authorised workers operated the crane at the mine.
6. There was no system in place to adequately audit or verify that only trained and authorised workers operated the crane at the mine.
7. During the task, it was an accepted work practice for workers to be positioned on the axle box adjacent to the cut-out while the crane was connected to the plate and in operation.
8. As a result of the above, workers were positioned in the direct line of fire, adopting awkward positions and postures, that included bending, crouching and reaching below waist level, to reach down into the axle box through the cut-out to remove the plate.
9. There was a failure to identify and implement reasonably practicable higher order controls for lowering and lifting the front of the rear axle box assembly, that would have eliminated the use of the lifting plate and/or crane or minimised the possibility of workers being positioned in the line of fire. Such controls included:
 - a. installing a lifting lug directly onto the axle box assembly whereby the crane could be directly connected and/or disconnected to the axle box while it was not in operation, without workers having to reach below platform/working level, handle heavy componentry or remain in line of fire while engaging or removing a lifting plate. This

method was implemented post-incident at the mine as depicted in figure 4 below.

- b. implementing the use of lifting jacks installed underneath the axle box to lower it from the truck and then utilising a telehandler or similar mobile plant to move the axle box clear of the area.
- c. implementing the use of a chain come along or hand winch to manually lower and raise the lifting plate into and out of position by attaching it to the crane's lifting chain. Such method would have permitted workers to be positioned out of the line of fire and clear of pinch point zones while manoeuvring the plate during its installation and removal.

Figure 4: 4T - VLBS load ring welded to the axle box as an alternative to use of the plate



Recommendations

Mine operators and contractors must:

- conduct an appropriate risk assessment to identify potential hazards associated with lifting and suspending loads. This includes evaluating the weight, shape, and stability of the load, as well as the environment in which the lifting will take place.
- identify reasonably foreseeable hazards that could give rise to risks to health and safety, including, but not limited to, the line of fire, crush and manual handling risks associated with lifting activities

- ensure workers are not positioned in the path of moving loads or equipment and performing work in the line of fire when undertaking lifting activities
- develop and implement safe work procedures that detail the required steps and precautions for safely lifting and suspending loads. These procedures must incorporate the use of suitable lifting equipment and techniques and include appropriate higher order controls where practicable, to mitigate the hazards and risks associated with line of fire, crush, and manual handling
- ensure that all workers involved in lifting operations are adequately supervised, trained and competent in using lifting equipment and safe work procedures.

Workers must:

- ensure they are not positioned in the path of moving loads and equipment, or perform work in the line of fire when undertaking lifting activities
- only operate lifting equipment they have been trained and authorised to use.

For further recommendations, refer to information published by the Regulator:

- Resources Regulator code of practice – Mechanical engineering control plan
- SafeWork NSW - code of practice - Managing the risks of plant in the workplace
- SafeWork NSW - code of practice - How to manage work health and safety risks
- [Safety Bulletin SB22-05 Crane incidents on the rise](#)
- [Safety Alert SA22-04 Dangers of lifting and pulling activities revealed](#)
- [Safety Bulletin - Dangerous lifting equipment incidents increase](#)