



Mines Safety Bulletin No. 170

Subject: Braking Performance of Relocation Systems for Heavy Mining Equipment

Date: 30 January 2020

Background

Relocating heavy mining equipment within surface mining areas and on mine roads is a common task in the industry. Due to their large size and weight, tracked excavators in the 400-500 tonne class present particular issues when they require relocation. These issues include:

- excavators are not designed to tram significant distances using their own track drives and their relocation may require the use of a towing system
- low loader type towed trailers designed for highway use may not be fit for purpose in an off-the-road mining environment
- the braking systems on some excavator towing systems may not be designed for a mining environment or meet a recognised brake performance standard
- any loss of control event during towing operations may have serious consequences due to the large masses and energies involved.

A potentially serious incident recently occurred at a mining operation in Western Australia where a rigid haul truck made contact with a 400 tonne excavator while it was being towed, highlighting the need for appropriate engineering controls when planning and executing such activity.

Summary of hazard

Towing heavy mining equipment may require negotiating significant uphill and downhill grades. Any loss of control due to failure or under-performance of braking or retarder systems may have potentially serious consequences. It is foreseeable that such loss of control events can cause a run-away, jack-knifing, running off a bench, rollover, or contact with other vehicles.

Contributory factors

- There are no mandatory standards for brake performance of surface mining equipment under the current mines safety legislation.
- Low loader type towed trailers designed for highway use generally use highway type trucks as their prime mover. Their braking systems are designed to ADR 35/05 and/or ADR 38/00 which may not always be fit for purpose in a mining environment.

- Low loader type trailers designed for off-the-road use generally use modified mine haul trucks as their prime mover (either articulated or rigid type). Although the original haul truck braking systems may have been designed to ISO 3450, when used as the prime mover for towing a low loader, the same brake performance standard is not always achieved.
- Non-conventional towing arrangements do not always comply with any recognised braking standards.
- If the brake performance of a towed arrangement does not comply with a recognised standard and is not tested to that standard, then its performance may be unpredictable. This can make effective risk assessment difficult when planning the relocation of heavy mining equipment.
- Using a prime mover as part of a towing system without appropriate risk assessment can result in the performance envelope of its dynamic retarder system being exceeded.
- Braking systems are not always adequately maintained sufficiently to achieve the designed/required braking system performance.
- A lack of a positive mechanical connection between the towing and towed vehicle may lead to unpredictable vehicle behaviour during braking, particularly emergency braking.

Actions required

Regulation 13.2(1) of the Mines Safety and Inspection Regulations 1995 requires that any motor vehicle used in a mining operation, including towed arrangements, must be "equipped with suitable brakes capable of effectively stopping and holding the vehicle fully loaded under any conditions of operation when driven in accordance with the manager's instructions". This includes emergency braking conditions.

The ability of braking systems to effectively stop and hold the vehicle should be measured against a recognised and appropriate brake performance standard, such as:

- ISO 3450 Earth-moving machinery – Wheeled or high-speed rubber-tracked machines – Performance requirements and test procedures for brake systems
- AS 2958.1 Earth-moving machinery – Safety Wheeled machines – Brakes
- Vehicle Standard (Australian Design Rule 35/05 – Commercial Vehicle Brake Systems) 2013
- Vehicle Standard (Australian Design Rule 38/00 – Trailer Brake Systems) 2006.

In an off-the-road mining environment ISO 3450 is generally considered to be the most appropriate standard for wheeled heavy mobile equipment.

When planning to relocate heavy mining equipment using any form of towing system the following actions are recommended:

- ensure the combined braking system for towed vehicle arrangements meets or exceeds an appropriate, recognised brake performance standard so that the brake performance is known and can be tested to ensure it meets the standard
- ensure the selected brake performance standard is appropriate for the operating environment.
- ensure the braking systems are adequately maintained, inspected and periodically tested by competent persons to demonstrate that they comply with the selected standard
- ensure that the planned route is adequately risk assessed by competent persons to ensure that the braking systems are capable of effectively stopping and holding the vehicle fully loaded under any foreseeable conditions, including emergency braking

- ensure that operators of towed arrangements are adequately trained and assessed as competent, including that they fully understand the performance limitations of the braking systems
- ensure Original Equipment Manufacturer (OEM) requirements are considered with regard to modifications, maintenance, operation and training.

Further information

Visit www.dmirns.wa.gov.au/ResourcesSafety for information on occupational safety and health in the resources sector.

This Mines Safety Bulletin was approved for release by the State Mining Engineer on 30 January 2020