February 2025

Quarry Vehicle Brakes Maintenance And Testing

Information Sheet



Brakes & Braking

Quarry vehicles are very large and can cause significant damage and injury if they cannot be brought safely to a stop or controlled during operation or when parked on an incline. The quarrying environment and operations can impact on a vehicles braking performance particularly when working on a gradient and where there are tight bends and turning circles. The design and layout of quarry roads should involve minimum gradients with gradual corners. Where possible, long-term haul roads should be hard surfaced and all other road surfaces should be regularly maintained.

Vehicle parking/service brakes should be capable of holding the vehicle on the steepest gradients that the vehicle is expected to negotiate when it is fully loaded.

Emergency Slip Roads

Emergency slip roads (i.e. gravel or sand traps) should be provided where they are necessary on long or steep declines or tight radius bends.

Brake Inspection & Testing

A suitable inspection scheme is required to ensure brakes are in good condition on all loading shovels, dumper trucks and other rubber tyred vehicles such as tractors operating in the quarry. Monitoring the braking capabilities of a quarry vehicle is an essential part of vehicle safety and is closely allied with brake maintenance. Any monitoring system must start with the participation of vehicle drivers, who should carry out a series of simple checks at the start of the working day or shift and record their observations in a daily vehicle inspection book or sheet.

Before commencing work with the vehicle:

1. Check brake fluid / air gauges are at the correct operating pressure
2. Check the service and emergency brakes when setting off and again when loaded
3. Check the parking brake when stopped and facing downhill near the bottom of the steepest incline in use
4. Report any defects immediately

Brake Maintenance

The driver's daily reports reflect the condition of the vehicle braking system at that moment in time and immediate action should be taken to rectify any faults brought to light by the driver.

The testing of the service brake only checks the effective use of the brakes. It may not identify other faults in the braking system. It is for this reason that maintenance of the whole of the braking system should be carried out in accordance with the manufacturer's recommendations.

Brake maintenance schedules will not only include adjustment, fluid levels, pressures etc., they will also contain the replacement of seals and other vital components in accordance with the manufacturer's recommendations.

Emergency steering and emergency braking systems should also be included in regular inspection and testing programmes. Contractors' vehicles working in quarries should be subject to the same brake testing schemes.

Information in this document is guidance and not a legal duty as other methods may also satisfy statutory provisions. The information must be interpreted in the context of the particular site and method of operation and modified to ensure the health and safety of persons involved.

HSA
An tÚdarás Sláinte agus Sábháilteachta
Health and Safety Authority

Brake Testing Area

The Operator should provide a clearly signposted Brake Testing Area where vehicles can be tested on a daily basis. The test area must have "Brake start" marker post and distance marker posts so that Operators have a clear indication of the stopping distance achieved during the daily test with a final post marking the limit of acceptable 'over-run' before adjustment or brake replacement is required. The test area should be selected with consideration given to safe stopping. Different acceptable stopping distances will be necessary for dumper trucks and loading shovels.



Electronic Brake Testing



Total reliance on the driver's daily check is not a sufficient control measure, it must be supported by regular instrumented tests completed by a competent person using an electronic brake efficiency meter. Quarries are difficult working environments and consequently brake performance will deteriorate in service. The braking ratio required for a vehicle depends upon the vehicle type and local conditions such as the gradient of the haul road, the condition of the haul road and any bends that the vehicle must negotiate. When travelling down a gradient the vehicle must overcome the weight acting on the gradient in addition to the normal braking effort in order to come to a stop.

Establishing the Expected Brake Ratio of the Vehicle

If it is a new vehicle then the manufacturer must provide adequate information including the expected brake ratio. For older vehicles where there is little or no information on braking efficiency then an electronic brake tester can be used to determine the optimum brake ratio by carrying out a number of tests following servicing of the braking system and obtaining an average value. Then a lower action level is determined at which the vehicle braking system will require further assessment or servicing.

Periodic Brake Testing Of Vehicles

Electronic brake testing is a procedure for periodically checking that a vehicles brakes are maintained (working) at a level that does not put people at risk. The electronic brake tester determines braking efficiency by measuring the rate of deceleration until the vehicle comes to rest. Electronic brake testing is recommended to be carried out every 500 hours of vehicle use or every three months, whichever comes first, and the results recorded to identify any deterioration or sudden reduction in braking performance*. Usually this means:

1. ideally that the level of performance has not significantly reduced below the expected brake ratio; or
2. at the very least, that the level of performance exceeds that required for safe working under the most onerous site conditions of speed, load and gradient.

Although electronic brake testing devices are self-compensating and have built in tolerances, results can vary with different testing surfaces and weather conditions. If possible, tests should be carried out on the same or a similar surface and comparable weather conditions.

The braking capabilities of a dumper truck or loading shovel should also take account of any arduous site conditions such as gradients, road layouts and the road surface that it may operate on.

The brake ratio values given in ISO 3450 are a minimum standard for manufacturers, not a maintenance standard and may be only 50% of the expected brake ratio of some vehicles and is not acceptable as generic pass or fail criteria.*

As a rule of thumb doubling the brake ratio halves the braking distance, doubling the speed increases the stopping distance by approximately 4 times.

*This augments the recommendations in the Safe Quarry Guidelines to the Safety, Health and Welfare at Work (Quarries) Regulations 2025

Further Information and Guidance:

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Use BeSMART, our free online risk assessment tool at **www.besmart.ie**
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