



Prepublication DRAFT
Amendments No. 2 - MDG 15 March 2002

‘Guideline for Mobile and Transportable Equipment for Use in Mines’

1 February 2007

Summary

This amendment seeks to clarify industry safety issues that have arisen from:

1. The recent failure of several safety critical systems on mobile plant, refer SA06-12 *‘Maintenance of safety critical systems – Braking, steering & warning systems’*.
2. Recognition of the minimal stopping distances in the industry recognised braking standards, ISO 3450 and AS 2958.1 being only acceptable for grades up to 10%, refer SA06-13, *‘Braking standards for trucks may not be fit for purpose’*.
3. The need for clear information on safe grades of operation for mobile plant, refer SA06-14, *‘Information to be supplied on safe operating grades for mobile equipment’*.
4. The clarification of periodic in-service testing of brake systems.
5. The release of an applicable Australian standard on the fire protection of mobile and transportable equipment, refer AS 5062:2006, *‘Fire protection for mobile and transportable equipment’*.
6. Clarification on the use of operator protective structures and operator restraint devices.
7. Issues arising from with Roads and Traffic Authority (RTA) *‘plant registered’* equipment being used on mines, (mobile equipment that is not subject to regular inspections by an RTA authorised inspection station).
8. Requests from equipment manufacturers through consultation.
9. Requests from mines through consultation.

NOTES:

1. This amendment has not been a comprehensive review of MDG 15, a comprehensive review of the entire document is planned for late 2007. It is envisaged that MDG 15 will be segregated into:
 - Part 1 – *Design requirements*
 - Part 2 – *Operational requirements*
 - Part 3 – *Maintenance requirements*
2. Only those issues that require immediate consideration for the safe use of mobile and transportable plant in mines have been addressed.

This amendment applies only to clauses 1.1, 1.4a (new), 1.7, 2.3.6, 2.3.7 (new), 2.4.6 (new), 2.5, 2.7.5, 2.8 (new), 3.2.1, 3.7, 3.8, 3.13.1, 4.5(new) , 6.1, Appendix E (new)

It was distributed for industry consultation on the 31 October 2006 and was published in **February?** 2007.

The following requirements are to be considered to be incorporated into MDG 15 March 2002 from the date of publication of this amendment.

Amend. [1] Page 6 Clause 1.1 ‘Scope’

Insert the following note.

Note: Requirements for ‘plant registered’ NSW roads and traffic authority (RTA) equipment are included in Section 4.

Amend. [2] Page 6 New clause 1.4a ‘Occupational health and safety’

Insert the following:

The OHS Act 2000 and the OHS Regulation 2001 requires:

⇒ designers, manufacturers, and suppliers must ensure plant is safe and without risk to health or safety when properly used and to provide adequate information for the safe use of plant.

This requires designer to identify any foreseeable hazards that have potential to harm health or safety, assess the risks and take action to eliminate or control the risks

⇒ employers must ensure;

- workplace health and safety through a process of risk management and consultation,
- that plant provided for use is safe and without risk to health when properly used,
- that systems of work and the working environment is safe and without risk to health,
- that information, instruction, training and supervision as necessary to ensure health and safety is provided.

To effectively implement this guideline, designers, manufacturers, suppliers of plant and employers need to be aware of these requirements and have systems and procedures in place to apply them.

Designers, manufacturers and suppliers of plant and employers must consult the OHS Act 2000 and the OHS Regulation 2001, particularly Chapter 5 ‘Plant’, for details of these requirements.

The OHS regulation requires risks (that cannot be reasonably eliminated) to be controlled in the following order:

- a) Substitute the hazard for a hazard of lesser risk
- b) Isolate the hazard from people
- c) Minimise the risk by the use of engineering measures
- d) Minimise the risk by the administrative means, for example adopting safe work practices or providing appropriate training, supervision, instruction or information
- e) Use of personal protective equipment (PPE)

Amend. [3] Page 7 Clause 1.7 – DEFINITIONS – ‘New Definitions’

Insert the following new definitions into clause 1.7:

Alterations – means change in the design of, add to or take away from the mobile plant if the change may affect health or safety, but does not include routine maintenance, repair or replacement.

Earth moving machinery – means an operator controlled item of plant used to excavate, load, transport, compact or spread earth, overburden, rubble, aggregate or similar material but does not include a tractor or industrial lift truck.

Major repairs - means repairs to equipment which is damaged or worn to the extent that its operation or condition is impaired and the risk to health or safety is increased.

Mobile Plant – includes mobile and transportable equipment

Must – indicates a legal requirement exist

Operator Protective Device - includes, roll over protective structures, tip over protective structures, falling object protective structures, operator restraining devices and seat belts.

Repair - means to restore mobile plant to an operational condition, but does not include routine maintenance, replacement or alterations.'

Roads and Traffic Authority (RTA) – includes similar authorities in other states

Safety Critical Systems - means those systems which are critical to the safe operation of the mobile plant such as braking, steering, warning systems, interlocks, operator restraints and operator protection.

Amend. [4] Page 12, Clause 2.3.6 DOCUMENTATION - ‘Safety Devices’

Delete the first sentence and replace with:

A comprehensive list of all safety critical systems and their functions shall be provided by the manufacturer to the end user. This list shall also include:

- a) The systematic and periodic examination and testing of all safety critical systems.
- b) Practicable maintenance instructions that will ensure all safety critical systems remain functional over the life of the mobile plant, if followed.

The end user shall assess and document safety critical systems against the above information and retained in the plant safety file.

Amend. [5] Page 12, New clause 2.3.7 DOCUMENTATION – ‘Plant Safety File’

A documented plant safety file should be initiated by the manufacturer/supplier, provided to the user/owner and should contain all information relating to:-

- (i) Hazard identification, risk assessments, risk control methods and any other information that is required by the user/owner for the safe operation and maintenance of the mobile plant
- (ii) Consultation records
- (iii) The purpose for which the mobile plant was designed (safe operating envelope)
- (iv) The identification of all safety critical systems, their functions
- (v) Testing or inspections to be carried out
- (vi) Installation, commissioning, operation, maintenance, inspection, cleaning, transport, storage and dismantling procedures and results
- (vii) Training/competency requirements for operators, supervisors, persons undertaking inspections and tests, and maintenance personnel
- (viii) Systems of work necessary for the safe use of the mobile plant
- (ix) Emergency procedures

The plant safety file should be maintained throughout the life of the mobile plant by the user/owner and should contain all information relating to:-

- (i) Any information provided by the manufacturer/supplier
- (ii) Training/competency records for operators, supervisors, persons undertaking inspections and tests, and maintenance personnel
- (iii) Any document relating to the testing and inspection of safety critical systems, including daily prestart safety checks
- (iv) Defect notification and rectification
- (v) Records of inspections by competent people
- (vi) Modifications and alterations
- (vii) Preventative maintenance activities
- (viii) Results of actions from periodic audits and reviews
- (ix) Accidents/incident and reviews

Amend. [6] Page 13 New Clause 2.4.6, SAFETY REQUIREMENTS – ‘Safety Critical Systems’

2.4.6.1 Integrity of Safety Critical Systems

The integrity of all safety critical systems shall be subject to a design risk assessment.

This design risk assessment shall be in the form which systematically analyses the failure modes and integrity of each safety critical system, associated warning devices and any relevant safety related instructions. This shall be carried out by the equipment manufacturer.

Note:

1. A Failure Modes and Effects Analysis (FMEA), fault tree analysis, quantitative risk assessment, or similar analytical systematic methods are suitable
2. Guidance can be found in AS 4024.1301 & AS 4024.1302 and the National Minerals Industry Safety and Health Risk Assessment Guideline

The appropriate integrity level or category level shall be applied to safety critical systems in accordance with AS 4024:1501 & 4024:1502, AS/IEC 62061, AS/IEC 61508 or other similar standards.

Note other relevant ISO or IEC standards may be available for guidance on earthmoving machinery. ISO 15998 ‘*Earth-moving machinery -- Machine-control systems (MCS) using electronic components -- Performance criteria and tests for functional safety*’ is under development.

2.4.6.2 Monitoring of Safety Critical Systems

The failure of any safety critical system should give rise to a means of indicating the safety critical system failure to the operator, such as a warning light or alarm.

A system indicator should provide the operator notification of a failure of a safety critical alarm or warning device, where practicable.

Note: A self diagnostic test on start-up is considered to meet this requirement.

Amend. [7] Page 13, Clause 2.5 ‘MAINTENANCE’

Include the following to this clause:

Maintenance managements systems for mobile plant shall:-

- b) Identify and document all safety critical systems.
- c) Maintain, periodically check, test and verify all safety critical systems and warning devices to confirm functionality.

Note: Safety critical systems need to be maintained to be effective.

- d) Verify maintenance activities are in accordance with the equipment manufacturer's recommendations, unless varied by a competent person with consideration to site operational conditions.

Note: Some site conditions require more rigorous maintenance than that specified by the manufacturer due to the operating environment

- e) Confirm, operators, supervisors and maintenance people involved with mobile plant are familiar with all safety critical systems, trained, unimpaired and competent for the task at hand.
- f) Ensure a competent person inspects mobile plant periodically and verifies it is safe to operate. As a minimum this should occur annually.
- g) Ensure a competent person inspects mobile plant that has safety related defects or damaged prior to the mobile plant being placed back into service.
- h) Major repairs or alterations are carried out in consultation with the equipment manufacturers or verified by a competent person as safe.
- i) Operator/passenger restraint systems are supplied, correctly installed and maintained.
- j) Site maintenance practices are periodically audited against the documented mine safety management plan (MSMP) or mine mechanical engineering management plant (MEMMP).
- k) Any changes to the manufacturer's safety features or devices must be assessed by a competent person. The competent person must assess that the change in use does not present an increased risk to health or safety.

Note: The competent person should contact the equipment manufacturer when making assessment on the safety features.

Amend. [8] Page 14, Clause 2.7.5 LIMITS OF EQUIPMENT APPLICATION – ‘Brakes’

Delete current clause and replace with:

Adequate information shall be provided on the performance of braking systems (service, secondary and park brake), including:

- a) The maximum longitudinal grade and speed the service and secondary brakes are able to stop and hold a machine on at gross vehicle mass (GVM).

Note:

1. This should include following retarder or transmission failure.
 2. It is assumed there is sufficient traction between the haul road surface and the tyres or tracks of the mobile plant to transmit the required brake force without skidding.
- b) The maximum longitudinal grade the park brake can hold a machine stationary on at gross vehicle mass (GVM).
 - c) Operator information for descending and ascending a grade.

Amend. [9] Page 14, New Clause 2.8 ‘OPERATIONAL REQUIREMENTS’

Owners and users of mobile plant shall ensure that:

1. All foreseeable hazards associated with mobile plant becoming out of control have been addressed, including, but not limited to hazards associated with:-
 - (i) The potential failure of the primary retardation system, safety critical systems, or other safety related components and the safe operation of the mobile plant
 - (ii) Condition of roads including; line of sight for the operator, potential for impaired vision from fog, rain or other factors, signage and fit for purpose bunding or windrows
 - (iii) Site environmental conditions that may lead to loss of traction between the wheels/tracks and ground or skidding
 - (iv) Operator error such as incorrect gear selection
 - (v) Operator actions in an emergency
2. Mobile plant is used only for the purpose for which it was designed.
3. Mobile plant shall not be overloaded or operated outside the operational envelope as specified by the manufacturer.
4. Where safety features or warning devices are incorporated into plant, the features or devices are used as intended.
5. Daily prestart safety checks are carried out with all identified defects which affect the safe operation of the machine assessed by a competent person before the equipment is put to use.
6. Design haulage roads to grades of 10% or less wherever practicable. Review site haulage routes and identify all mobile plant travelling on grades in excess of 10% and verify the mobile plant can safely operate on that grade with the equipment manufacturer or by a competent person.

Note: the mine safety management plan (MSMP) should assess the maximum safe operating grade of all mobile plant and prohibit the use of mobile plant without adequate braking capacity on grades greater than 10%
7. Operators are trained in the safe operation of the mobile plant and in particular the correct gear, speed and use of retarder to descend a grade. Other factors such as visibility, traffic and weather may need to be considered.
8. Operator/passenger restraint systems are used.
9. In the design of mine haul roads, the mine safety management systems and transport management plans considers the recommendations in the following documents:
 - *'Haul Road Inspection Handbook PH99-I-4'*
 - *'Design of Surface Mine Haulage Roads - A Manual'*

Amend. [10] Page 16, Clause 3.2.1 BRAKES - 'General'

Delete the item a) and item b) and insert the following new clause:

3.2.1b Braking Standards

All braking systems shall be designed and tested in accordance with ISO 3450:1996 or AS 2958.1:1995 and the requirements as specified below.

All repaired brakes should be tested in accordance with the manufacturers instructions and the in service brake performance testing as outlined below.

Notes:

1. This section is intended to apply to equipment manufacturers and new equipment being supplied to mines. For existing equipment in use at mines, a gap analysis should be carried out. The gap analysis should identify the hazards, assess the risk and implement appropriate interim risk controls.
2. These requirements are necessary due to inadequacies detailed in SA06-12, SA06-13 and SA06-14.

a) Machine Test Mass

(refer clause 3.4 ISO 3450 or clause 4.2 AS 2598.1)

All brake 'type' testing by the manufacturer shall be carried out at the:

- (i) gross vehicle mass (GVM) with payload to determine worst brake performance, and
- (ii) lightest machine combination to determine maximum deceleration rates applied to the operator/passenger(s).

Note: This does not apply to periodic in service dynamic brake testing.

b) Maximum Operating Grade

The maximum longitudinal operating grade in which;

- a) the service and secondary brakes are able to pull up and hold the mobile plant stationary on, and
- b) the park brake is able to hold the mobile plant stationary on,

at maximum gross vehicle mass (GVM) shall be:

- (i) stated by the manufacturer,
- (ii) not less than 10%, and
- (iii) calculated in accordance with the formulae below.

Note: It is assumed there is sufficient traction between the haul road surface and the tyres or tracks of the mobile plant to transmit the required brake force without skidding.

c) Failure of a Single Components

(refer clause 5.2 ISO 3450 or Clause 5.1.2 AS 2598.1)

The failure of a single component shall not prevent the mobile plant from being able to stop and hold stationary on the maximum operating grade.

The mobile plant shall be able to meet the secondary performance stopping criteria after the failure of any component, including a common control device such as a lever, foot pedal, microprocessor, etc.

Where a combined system uses a common control device to activate more than one system, the secondary braking system must be able to be directly applied by the operator. This manual activation shall be independent to the common control and should be in the form of an emergency stop, where practicable.

d) Brake Control Integrity

The integrity of all safety critical systems shall be subject to a design risk assessment.

This design risk assessment shall be in the form which systematically analyses the failure modes and integrity of each safety critical system and associated warning devices.

Note:

1. A Failure Modes and Effects Analysis (FMEA), fault tree analysis, quantitative risk assessment, or similar analytical systematic methods are suitable
2. Guidance can be found in AS 4024.1301 & AS 4024.1302 and the National Minerals Industry Safety and Health Risk Assessment Guideline

The appropriate integrity level or category level shall be applied in accordance with AS 4024:1501 & 4024:1502, AS/IEC 62061, AS/IEC 61508 or other similar standards.

e) Alarms and Warning Devices

A system indicator should provide the operator notification of a failure of a brake circuit safety alarm or warning device, where practicable.

f) Automatic Application of Brakes

Secondary braking systems relying on stored energy shall be automatically applied before the secondary system loses stored energy capacity necessary to pull up and hold the machine on the maximum operating grade, refer b) above.

When automatic brake applications are provided then they shall comply with the following:

- (i) the braking system is designed to be applied at the vehicle speed at the time of application, and
- (ii) the operator is made aware of the automatic application, and
- (iii) if the braking system is only able to be operated on one occasion then a system is provided to prohibit further use of the mobile plant until the brake is repaired, and
- (iv) the deceleration applied by the automatic application will not cause injury.

Park brakes may only be applied automatically at speed if they are designed stop the mobile plant at the speed at the time of application for at least one application.

A design risk assessment should be used to determine the appropriate maximum decelerations of the lightest mobile plant combination. Verification testing with the lightest mobile plant combination should be conducted.

Note: The worst case condition for this is with the lightest weight travelling up the steepest grade.

g) Service Brake – Recovery Test

(refer clause 7.2 ISO 3450 or Clause 5.2.1 AS 2598.1)

For the service brake recovery test the engine speed control shall be set to 75% of the maximum rated engine speed (rpm).

Note: Current requirement in standards is maximum engine speed

h) Secondary Brake Performance

(refer clause 5.4 ISO 3450 or Clause 5.3.2 AS 2598.1)

Secondary brake performance testing shall be able to be achieved after the following events occur simultaneously:

- (i) a failure of the retarder, and
- (ii) a failure of a single component of the braking system that provides the worst condition for braking as identified by the design risk assessment, refer d) above, and
- (iii) after the system pressure reaches alarm level and/or the operator becomes aware of the fault, and
- (iv) following five applications of the operator's brake foot pedal

Retarders shall not be used during the secondary brake performance test.

i) Secondary Brake - Energy Storage Capacity

(refer clause 7.3 ISO 3450 or Clause 5.3.1 AS 2598.1)

The braking system shall be disabled to simulate the worst case failure as identified by h) above.

Then, the energy (pressure) remaining in the reservoir after five brake pedal applications shall not be less than that required to meet the secondary brake stopping requirements specified below.

Note: This test requires the storage capacity of the secondary system to be sufficient to stop the machine on the maximum operating grade on the sixth application of the foot pedal with one brake circuit disabled.

j) Holding Test

(refer clause 7.5 ISO 3450 or clause 5.4 AS 2598.1)

With the power train disengaged the service, secondary and park brake systems shall be capable of holding the mobile plant at GVM motionless on the maximum operating grade in both the forward and reverse directions.

This test should be carried out with the brakes adjusted to the worst acceptable condition (i.e. lower limit) as specified by the designer/manufacturer.

Brake holding performance tests may be carried out either:

- a) At a test site with the specified slope; or
- b) On a tilt platform with a slip-resistant surface; or
- c) By applying a pulling force to the stationary machine with the brake applied and with the transmission in neutral on a test course with no more than a 1 % slope in the direction of travel. The pulling force shall be applied horizontally near the ground to achieve a minimum force equivalent to the maximum operating grade

For testing as specified in a) and b) above the mobile plant shall be loaded to tare mass plus 120% of the manufacturer's specified payload.

For testing as specified in c) above the following formula shall be used:

$$\begin{aligned} \text{Force (N)} &= mg \sin \tan^{-1} \left(\frac{\beta}{100} \right) \\ &= mg \left(\frac{\beta}{\sqrt{100^2 + \beta^2}} \right) \end{aligned}$$

where

β = maximum designed operating grade (%)

m = tare mass plus 120% of payload (kg)

g = 9.81 (m/s²)

k) Service and Secondary Brake Performance

(refer clause 7.6 ISO 3450 or Table 2 of AS 2598.1)

This test should be carried out with the brakes adjusted to the worst acceptable condition (i.e. lower limit) as specified by the designer/manufacturer.

The measured deceleration of the machine on the test slope, when tested in accordance with AS 2985.1 or ISO 3450, shall be greater than the following:

$$a_{\text{brake-test}} = (a_{\text{safe-nett}} + g(D - T))$$

where

$$D = \frac{\beta}{\sqrt{100^2 + \beta^2}}$$

$$T = \frac{\alpha}{\sqrt{100^2 + \alpha^2}}$$

$a_{brake-test}$ = the mean minimum acceptable deceleration for the vehicle when measured along the test grade (m/s^2)

P = percentage reduction in braking force, such as change in brake application pressure (required for secondary calculations on pressure systems)

g = acceleration due to gravity (ms^{-2})

β = maximum design grade as a percentage, e.g. $\beta = 15$ for a 15% grade

Note: β must not be less than 10

α = test grade as a percentage

$a_{safe-nett}$ = the mean minimum safe nett deceleration to pull up the machine in the safest and shortest practicable time. (m/s^2).

The minimum values for $a_{safe-nett}$ when the machine is being **operated in service** are:

- (i) Service brake application = $0.60 m/s^2$
- (ii) Secondary brake application = $0.30 m/s^2$

For type testing of a new machine, there needs to be a tolerance above these figures to allow for wear and variations between machines from manufacturing.

This tolerance should be 125% of the minimum acceptable.

The minimum values for $a_{safe-nett}$ values for when a **new machine is type** tested are:

- (i) Service brake application = $0.75 m/s^2$
- (ii) Secondary brake application = $0.40 m/s^2$

Where decelerations are not measured then the stopping distance shall be based on the following formula:

$$s = \left(\frac{V^2}{25.92[a_{safe-nett} + g(D - T)]} \right)$$

where

V = machine speed in km/hr

s = stopping distance in meters

l) Manufacturers Information and Decals

(refer clause 7.7.3 ISO 3450 or clause 7 AS 2598.1)

The manufacturer shall specify:

- (i) Practical maintenance instructions that if followed will ensure all braking systems and brake warning lights or alarms will remain functional over the life of the machine.
- (ii) The minimum acceptable in service performance limits of each braking system, such as mean deceleration rates, stall tests, brake pressure application delay, etc.
- (iii) Frequency and procedures for in service inspection and testing of all braking systems

Retarder decals should only identify grades in which the braking systems can safely stop and hold upon, following failure of the retarder or transmission.

Amend. [11] In Service Performance Brake Testing

(refer clause 6 AS 2598.1)

In service performance brake testing should be carried on all mobile plant periodically as recommended by the manufacturer. Testing should be carried out on all braking systems in accordance with the manufacturer's recommendations.

As a minimum, dynamic braking of the mobile plant shall be carried out after repair or modification of the service brake and annually using the formula below.

Stopping distances should not increase by more than 125% and mean brake decelerations should not decrease by more than 125% from those result obtained during type test unless the manufacturer has carried out further brake testing to confirm a larger variance is safe to use.

$$a_{brake-test} = (a_{safe-nett} + g(D - T)) \left(\frac{m_{GVM}}{m_{actual}} \right)$$

$$s = \left(\frac{V^2}{25.92[a_{safe-nett} + g(D - T)]} \right) \left(\frac{m_{actual}}{m_{GVM}} \right)$$

Where,

$$\left(\frac{m_{GVM}}{m_{actual}} \right) = \text{ratio of gross vehicle mass to actual mass of the machine} = 1 \text{ for type testing}$$

m_{GVM} = gross vehicle mass of the machine

m_{actual} = actual mass of the machine being tested

The minimum values for $a_{safe-nett}$ when the machine is being **operated in service** are:

- (i) Service brake application = 0.60 m/s²
- (ii) Secondary brake application = 0.30 m/s²

Maximum operating grade

The following formulae may be used to calculate the maximum operating grade:

$$\beta = 100 \tan \sin^{-1} \left[\frac{\left(\left(\frac{m_{actual}}{m_{GVM}} \right) (a_{brake-test}) - a_{safe-nett} \right)}{g} + T \right]$$

Note: Stopping distances may be used to calculate decelerations.

Amend. [12] Page 20, Clause 3.7, 'FIRE CONTROL SYSTEMS'

Inset the following into this clause:

A fire risk assessment shall be carried out on all mobile plant in accordance with AS 5062, '*Fire protection of mobile and transportable equipment*'.

When required by the risk assessment, fire protection (detection and suppression) systems shall be designed, manufactured, tested, commissioned and maintained in accordance with AS 5062.

Amend. [13] Page 22, Clause 3.8 '*FLUID SYSTEMS*'

Insert the following into this clause:

Fluid systems should comply with MDG 41, '*Guideline for fluid power system safety at mines*' as applicable.

Note: MDG 41 is in final draft format and is expected to be published shortly.

Amend. [14] Page 28, Clause 3.13.1 '*ROPS, FOPS and TOPS*'

Delete the existing clause and insert the following:

An appropriate combination of operator protective devices must be provided, used and maintained if there is a risk of:

- a) mobile plant overturning, or
- b) an object falling on or coming into contact with the operator, or
- c) an operator being ejected from the seat

Earth moving machinery (plant) designed to have a mass of 700kg or more, but less than 100,000 kg must be provided with a protective structure that conforms to AS 2294.1, AS2 294.2 and AS 2294.3.

For earth moving machinery (plant) that was manufactured prior to 1989, alternative protective structures may be provided where a structure conforming to AS 2294 is not available. Such alternative structures must be designed by a suitably qualified engineer having regards to the performance requirements of AS 2294.

For all other mobile plant, a risk assessment must be carried out to determine;

- the risk of unintended overturning, an object hitting the operator or a falling object coming into contact with the operator, and
- the required operator protective devices

For example, overburden drills operating near high walls, should be provided with a falling object protective structure.

All passengers must be provided with the same zone of protection as that afforded to the operator.

Amend. [15] Page 32, New Clause 4.5 '*RTA Plant Registered Equipment*'

All RTA 'plant' registered equipment shall be subject to an inspection by a competent person prior to the mobile plant operated on a mine site. As a minimum the competent person shall inspect for the following:

- a) Mobile plant has been maintained and is in a fit for purpose condition to enter the mine site.
- b) All safety critical systems are functional.
- c) A structural inspection is carried out of the undercarriage, body, suspension, brakes and all other structural areas.
- d) The tyres on the mobile plant are in a good condition.

An in service performance brake test should be carried out to verify the (mobile plant) is capable of stopping on the maximum grades for use.

Note:

1. RTA, plant registered equipment, such as backhoes, water trucks, tractors, etc. are not subject to regular authorised maintenance inspections like other commercial trucks. As such there have been several incidents with this type of plant on mines, where the safety critical systems on the equipment have not been maintained in a satisfactory condition.
2. There may be other methods to confirm the performance of the braking system.

Amend. [16] Page 40, Clause 6.1 ‘APPENDIX A – ASSOCIATED STANDARDS’

The following standards are to be included into this table:

AS 4024.1301	Safety of Machinery - Risks assessment - Principles of risk assessment Specifies principles for the procedure of risk assessment by which the knowledge and experience of the harm related to machinery is gathered together to aid in assessing risks during all phases in the life of machinery. Guidance on the information necessary to allow risk assessments to be carried out is provided, as is a brief outline of some of the techniques available.
AS 4024.1302	Safety of Machinery - Risks assessment - Reduction of risks to health and safety from hazardous substances emitted by machinery - Principles and specification for machinery manufacturers Provides principles for controlling risks to health resulting from the emission of hazardous substances from machinery.
AS 4024.1501	Safety of Machinery - Design of safety related parts of control systems - General principles Provides safety requirements and guidance on the principles to be used in the design of the safety related parts of machinery control systems. Categories are specified and the characteristics of the safety functions are described.
AS 4024.1502	Safety of Machinery - Design of safety related parts of control systems - Validation Specifies the conditions and procedures to be followed for the validation by both analysis and testing of safety functions provided and category achieved by the safety related parts of control systems using the design rationale provided by the designer. When validating programmable electronic systems, this Standard does not provide complete requirements and can require the use of other Standards such as the AS 61508 series.
AS 62061	Safety of machinery - Functional safety of safety-related electrical, electronic and programmable electronic control systems
AS 61508	Functional safety of electrical/electronic/programmable electronic safety-related systems - General requirements
AS 5062	Fire protection for mobile and transportable equipment

Amend. [17] New Appendix E, ‘Brakes and Safety Critical Systems’

Appendix E1 – ‘New Brake Formulae and Examples’

Insert document attached, ‘ISO 3450 DPI New brake formula.pdf’