



# Specifications for Surface Earthmoving Equipment Surface Mobile Equipment Major Hazard Standard

MHS-11

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# Specifications for Surface Earthmoving Equipment

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## INTRODUCTION

These general specifications apply to all earthmoving equipment used in surface mines. They have been developed from the EOFT Standards and statutory requirements.

They do not apply to personnel transport vehicles and light vehicles.

Where compliance with any of the requirements of the specifications is not practical the manufacturer or supplier must show by means of risk assessment that the alternative arrangements provide control equal to that provided by compliance with the specification.

Where compliance with a statutory requirement is not practical the supplier must show that the alternative has been assessed and approved by the relevant Regulatory Authority.

## DETAILS

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### 1 General Requirements

Earthmoving equipment shall be designed and manufactured in accordance with relevant Australian Standards or equivalent for the class of equipment.

In addition to the above all equipment shall comply with the requirements of the WMC Resources Major Hazard Standards:

- SAF-MHS-07 Isolation
- SAF-MHS-08 Safe Working at Height
- SAF-MHS-11 Surface Mobile Equipment
- SAF-MHS-12 Surface Fires
- SAF-MHS-13 Machinery Safeguarding
- SAF-MHS-19 Tyres and Rims.

The manufacturer or supplier must show that the mobile equipment meets the requirements of relevant legislation. (In Western Australia this is Part Six and Part Ten Division 3 and Division 4 of the regulations pursuant to the Mines Inspection and Safety Act relevant to the Duty of Care of the designers and suppliers).

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### 2 Engine Systems

The engine shall be provided with a management system that will have an audible and visual alarms in the cab to alert the operator of at least the following conditions:

- Low engine oil pressure
- High coolant temperature
- Loss of coolant flow.

All hoses and pipes shall be routed so that in the event of a leak or a burst, flammable liquid cannot contact a hot surface. Where this is not practical all hoses shall be securely clamped and shielded so that any burst or leak will not contact a hot surface.

All pipes and or hoses shall be routed in a manner that will give them maximum physical protection and so they do not cross over electrical wiring.

All low-pressure fuel lines shall at least be fire resistant and single wire braided hoses.

All fuel tanks shall be fitted with non-leaking caps, which are effective irrespective of the attitude of the equipment.

A sealed fast fill system shall be fitted to the fuel tank.

Radiator caps for cooling systems should be fitted with a means of safely relieving pressure to prevent scalding personnel.

There shall be provided in the engine compartment an automatic fire suppression system that shall:

- Be pressurised so that if a leak occurs the engine will stop
  - Shut the engine off no longer than six seconds after a pressure drop in the system
  - Be provided with two manual actuation points, one located in the operator cab and the other accessible from the ground.
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### 3 Drive Train

The transmission shall be a full power shift planetary type unit.

The drive train shall be protected from impact damage by underside guards.

Articulation points and drive shafts shall be protected from rock damage.

The transmission shall be monitored for temperature and an over temperature warning device shall be provided in the operator's compartment.

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### 4 Hydraulics

Hydraulic hoses shall be fire resistant and meet the requirements of AS 3791.

The location and serviceability of tanks, piping and hoses shall be assessed for vulnerability to impact damage.

Hydraulic hoses are to be supported and or shrouded so as to eliminate wear through contact with other hoses and vehicle components.



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Where hoses pass through bulkheads they shall be either protected from wear by rubber grommets or have positive connection on either side of the bulkhead.

## 5 Pneumatic Systems

Hoses shall be fire resistant.

Where hoses pass through bulkheads they shall be either protected from wear by rubber grommets or have positive connection on either side of the bulkhead.

## 6 Electrical Requirements

Electrical systems shall, where appropriate, comply with:

- AS 4242
- AS 2956
- AS 1319
- AS 3000.

Where cables pass through bulkheads they shall be either protected from wear by rubber grommets or have positive connection on either side of the bulkhead.

Where the cables are associated with electrical power generated by the engine system they shall be installed to AS 4242.

All other cable and electrical installations shall comply with the requirements of AS 3000. All electrical circuits shall be protected against over current by circuit breakers.

Strapping of electrical harnesses to hydraulic and fuel lines is not permitted.

The battery shall be housed in a compartment that provides adequate clearance between the battery terminals and any lid. An insulating cover shall be provided on the under side of any cover which is over battery terminals. The battery compartment shall be located so that it does not form part of an access pathway or platform during maintenance.

Purpose designed jump-start provisions shall be provided in a location that encourages their use.

## 7 Brakes

The brake system shall comply with the design and performance requirements of AS 2958.1.

## 8 Operator's Compartment

The internal dimensions shall meet the requirements of AS 2953.

The operator's compartment shall be provided with ROPS and FOPS which as a minimum comply with AS 2294.

A suspension seat shall be provided for the operator to reduce vibration to the lowest practical level when measured in accordance with AS 2955.6.

The seat shall also allow the operator to be restrained by a seat belt. The seat is to be adjustable (or self-compensating) for operator body weight and incorporate height and fore/aft adjustments and useable by operators as detailed in AS 2953.2.

A retractable seat belt for all persons who may ride in the vehicle shall be installed in accordance with AS 2664.

The lay out of the controls shall follow sound ergonomic principals and minimise operator fatigue. They shall as a minimum comply with the requirements of AS 2956.5 and be identified in accordance with AS 2956.4.

The sound level inside the operators control area shall be below that required to ensure the drivers are not subject to a sound dose of greater than unity. In measuring this consideration shall be given to the effect of an operator working 12-hour shifts.

The operator field of view shall meet the criteria specified in ISO 5006.1 Test Method, ISO 5006.2 Evaluation Method, and ISO 5006.3 Acceptance Criteria. Where necessary optical aids or other means should be provided to assist in this.

Access shall meet the requirements of AS 3868 and AS 2953.1.

There shall be provided two means of egress from the operator's compartment.

There shall be no sharp edges or intrusions that could cause injury to the operator from accidental contact.

The cab shall be air-conditioned and the air filtered to reduce airborne contaminants to the lowest practical levels.

Windscreens shall be:

- laminated glass or other shatter-proof material
- provided with windscreen wipers, washers and demisters.

Fire extinguishers shall be provided as per the SME standard and are easily accessible to the operator.

The equipment shall be designed to prevent uncontrolled movement when the engine is started.



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### 9 Pressure Vessels

Pressure vessels shall comply with AS 1210.

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### 10 Reversing Alarms

Earthmoving equipment shall be provided with automatically activated reversing alarms.

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### 11 Isolation Requirements

Two Master Power switches shall be installed, one is to be located adjacent to the battery and one accessible from ground level. The circuitry is to be designed and installed so that the opening of either switch will stop the engine.

The isolation device shall have provisions to allow it to be locked off.

All components which store energy and as such require procedures for isolation, or discharging, prior to maintenance shall be marked with appropriate warning signs.

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### 12 Safe Work at Heights

Where operators or maintenance personnel can, during their normal operations, fall for a distance of two metres there shall be provided, where practical, suitable working platforms.

Where platforms are not practical there shall be provided anchor points for restraining devices.

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### 13 Documentation

The manufacturer shall supply documentation which at the least:

- Allows for the development of a comprehensive operator-training program
- Provides evidence of compliance with the provisions for satisfying the Duty of Care (Risk Assessments). In WA, Part Six of the Regulations pertaining to the Mines Inspection and Safety Act.
- Provides evidence of compliance with the provisions of this specification relative to compliance with Australian Standards and the WMC Resources Major Hazard Standards
- Provides evidence of compliance with the specification relative to sound levels in the operators control area
- Allows for the development of a comprehensive maintenance system.



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## APPENDICES

### A Australian Standards Referred to in this Document

AS 4242	Earthmoving Machinery for Use in Mines-Electrical Wiring Systems at Extra Low Voltage
AS 3791	Hydraulic Hose
AS 2956	Earthmoving Machinery Instrumentation and Operator Controls
AS 2956.2	Operating Instrumentation
AS 2956.4	Symbols
AS 1319	Safety Signs for the Operating Environment
AS 3000	SAA Wiring Rules
AS 2958.1	Earthmoving Machinery – Safety-Wheeled Machinery-Brakes
AS 2953	Earthmoving Machinery – Human Dimensions
AS 2953.1	Minimum Access
AS 2953.2	Physical Dimensions of Operators and Minimum Operator Space Envelope
AS 2294	Earthmoving Machinery Protective Structures
AS 2955.6	Earthmoving Machinery Operator Seat Transmitted Vibration
AS 2664	Earthmoving Machinery Seat Belts and Seat Belt Anchorage
AS 2836	Earthmoving Machinery – Guidelines for Access Systems
AS 1210	Pressure Vessels
AS 4240	Remote Controls for Mining Equipment
ISO 5006	Fields of View for Operators of Earthmoving Equipment