Government of **Western Australia**
Department of **Mines, Industry Regulation and Safety**
Resources Safety

Surface and underground operations with site deliveries audit – guide

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Introduction

This document was reformatted in November 2015. At this time no material changes were made to the content of the guide, which was originally published in October 2014 under the title *Guide to mobile equipment on mines high impact function (HIF) audit 2014 Part 3 – Surface and underground operations*. *Note: The Safety Regulation System (SRS) has replaced the AXTAT system and all reporting is done online through SRS.*

This audit document is designed to include operating standards associated with surface and underground mine operations and site deliveries.

The four 'mobile equipment' audit documents cover:

- traffic management (Part 1),
- mining operations and equipment selection (Part 2),
- surface and underground operations with site deliveries (Part 3), and
- management of mobile equipment maintenance (Part 4).

This document (Part 3) covers surface and underground operations with site deliveries. This part has seven elements and 63 individual standards.

Surface and underground operations with site deliveries (part 3) includes reference to a wide range of powered mobile equipment including haul trucks, water tankers, industrial lift trucks (forklifts), integrated tool carriers, elevating work platforms, mobile cranes, earthmoving machinery, surface miners, aircraft tugs, light vehicles and other vehicles fitting the title. It includes anything that can be driven or ridden on or in and excludes rail mounted equipment and equipment such as bridge and gantry cranes, stackers, reclaimers, ship loaders, locomotives and rolling stock and tethered mobile equipment (e.g. electric shovels, rope driven equipment).

This audit should be read and utilised in conjunction with the *Safe Work Australia's model code of practice for roads and other vehicle operator areas*.

This part contains a number of standards that may not be applicable to all mines. Standards that are not applicable should be ignored as they will not influence audit outcomes.

Where the term "verify" is used in the guideline intent, it implies there is a regulatory requirement for compliance with the standard. Where the term "ensure" is used, there is no mandatory requirement for compliance but the standard sets out a recommended practice, which, if followed, should minimise the risk of incidents.

Mobile equipment guidance material is available from the Department of Mines and Petroleum web site, www.dmp.wa.gov.au.

Further traffic guidance material is provided at:

- http://www.commerce.wa.gov.au/WorkSafe/Content/Publications/Index.htm
- http://www.commerce.wa.gov.au/WorkSafe/PDF/Bulletin/Safe_movement_vehicl.pdf
- http://www.dme.qld.gov.au
- http://dpi.nsw.gov.au
- Personnel access to heavy mining machinery – guideline

Glossary

MSIA	*Mines Safety and Inspection Act 1994*
MSIR	Mines Safety and Inspection Regulations 1995
MSB	DMP Mines Safety Bulletin
SIR	DMP Mines Safety Significant Incident Report
NSW SA	Safety alerts issued by the Department of Trade and Investment, New South Wales
NSW SB	Safety bulletins issued by the Department of Trade and Investment, New South Wales
QLD SA	Safety alerts issued by the Department of Natural Resources and Mines, Queensland

1 Quarry benches and sand pits

Quarry benches and sand pits

Point	Standard	Guideline
1.1	Quarry benches are of sufficient width to provide safe conditions for all vehicles, equipment and persons travelling in the area.	**Intent:** To verify that the mine quarry benches are of sufficient width to avoid traffic collisions, lengthy reversing cycles and/or pedestrian injury. **Personnel:** Registered Manager, Quarry Manager, Planning Engineer. **Method:** Inspect design documentation and the mine benches. Check that benches are of suitable width for the safe movement of traffic and pedestrians. Refer to MSIR r. 13.7(1).
1.2	The safe travelling width between any bench face and edge of the bench is adequately demarcated.	**Intent:** To verify that the quarry bench edges are adequately marked and/or windrowed to restrict vehicles and pedestrians from going near any edge. **Personnel:** Registered Manager, Quarry Manager, Planning Engineer. **Method:** Inspect design documentation and the mine bench edge demarcation. Check that benches have edge protection and/or delineation a minimum of two metres from the edge. Refer to MSIR r. 13.7(1) and NSW SB 08-06.
1.3	Bench surfaces are designed so as to enable the safe operation of mobile equipment.	**Intent:** To verify that the quarry benches are adequately graded and sheeted with suitable materials to provide a smooth level running surface. **Personnel:** Registered Manager, Quarry Manager, Planning Engineer. **Method:** Inspect design documentation and the mine bench surfaces. Quarry benches with coarse rock surfaces or having undulating and uneven floors do not meet this standard. Refer to MSIR r. 13.7(2).

1.4	An adequate maintenance programme has been established for material spillage clean up on benches.	**Intent:** To ensure that spillage does not pose a hazard to the safe operation of mobile equipment. **Personnel:** N/A **Method:** Inspect the method of identification, temporary control and rectification of spillage hazards on benches.
1.5	Signage and/or other devices to warn of any hazard and prevent incidents are used on benches.	**Intent:** To verify that warning signage and devices are used to assist in the safe operation of all vehicles. **Personnel:** Operators, Quarry Manager, supervisors. **Method:** Inspect the warning signage or devices in use. For example cones and flagging tapes. Refer to MSIR r. 4.10.
1.6	Sand mining operations are conducted taking into consideration the characteristics of the material mined from which the maximum height of a working face is determined.	**Intent:** To verify that safe mining operations are established at sand pits to prevent loading equipment being buried during loading operations **Personnel:** Operators, Quarry Manager, supervisors. **Method:** Inspect loading operations. Confirm if the face height is suitable based on the angle of repose, the size of machinery, material being mined and the ability to make the face safe at the end of each day. Refer to MSIR r. 13.14(1).
1.7	Each working sand face is advanced over as great a length as practicable and is sloped at the end of each working day.	**Intent:** To verify that loading operations are carried out in a safe manner to minimise the hazards from falling or slumping of materials at the working face. **Personnel:** Operators, Quarry Manager, supervisors. **Method:** Inspect loading operations. Verify that there is a uniform sand face and the face and walls are safely sloped at the end of each day. Refer to MSIR r. 13.14(3).

1.8	Each sand bench or series of benches is of sufficient length and breadth to provide safe working conditions.	**Intent:** To verify that sufficient space is available for mobile equipment to operate and minimise the hazards from falling or slumping of materials. **Personnel:** Operators, Quarry Manager, supervisors. **Method:** Inspect loading operations. Refer to MSIR r. 13.14(2).
1.9	Mine personnel are trained and made aware of keeping clear of the sand pit face and vehicle traverse area during loading operations.	**Intent:** To verify that all pit personnel and operators are aware of the hazards associated with sand faces and falling or slumping of materials. **Personnel:** Operators, Quarry Manager, supervisors. **Method:** Inspect procedures and loading operations.

2 Loading mined material

Loading mined material

Point	Standard	Guideline
2.1	There is a standard procedure for loading operations.	**Intent:** To ensure that loading operations are carried out in a safe and consistent manner. **Personnel:** Manager, supervisors etc. **Method:** Sight procedure.
2.2	The standard procedure defines the safe clearances and operating rules where multiple machines are moving in close proximity with each other.	**Intent:** To ensure that the danger of a vehicle collision is minimised and vehicle movement is managed in a safe consistent manner. **Personnel:** Operators, manager, supervisors. **Method:** Inspect procedures, SOP and loading operations.
2.3	The standard procedure specifies that the driver of the vehicle being loaded must not enter or leave the cabin of the vehicle during loading operations.	**Intent:** To verify that operators are aware, and avoid the danger of moving machinery and falling material. **Personnel:** Operators, manager, supervisors. **Method:** Inspect procedures and loading operations. Refer to MSIR r. 13.4(1).
2.4	The standard procedure prohibits the traversing of a bucket or implement over any truck or other vehicle cabin during the loading operation.	**Intent:** To verify that loader operators are aware of the danger posed to the truck driver by traversing over the truck cabin. **Personnel:** Operators, manager, supervisors. **Method:** Inspect procedures and loading operations. Refer to MSIR r. 13.4(2).

2.5	The standard procedure identifies the hazards of undermining the tracks of an excavator during loading operations.	**Intent:** To ensure that excavator operators are aware of the hazards of undermining the tracks of their equipment. **Personnel:** Operators, manager, supervisors. **Method:** Inspect procedures and loading operations. Confirm that the excavator operator does not undermine the tracks of the equipment during loading operations.
2.6	The standard procedure requires the provision of a safe bench access and egress when excavator top loading operations take place.	**Intent:** To ensure that a safe method of accessing and exiting the work area is provided when working on an elevated bench. **Personnel:** Operators, manager, supervisors. **Method:** Inspect procedures and loading operations. Confirm that the excavator operator has a safe access both for pedestrian entry and excavator retreat.
2.7	Mine personnel are made aware of keeping clear of the quarry face and the loading unit working area during loading operations.	**Intent:** To verify that all pit personnel are aware of the hazards associated with loading operations and falling materials. **Personnel:** Operators, manager, supervisors. **Method:** Inspect procedures and loading operations. Refer to MSIR r. 13.4(3).

3 Tipping mined material

Tipping areas covered by this section include crusher hoppers, ROM pads, underground tipping areas and waste dumps. Where tipping of mined material occurs refer to the tipping HIF audit 2008.

Point	Standard	Guideline
3.1	Traffic control measures have been devised and implemented at the tipping area.	**Intent:** To verify that traffic hazards are managed and written procedures or road rules are required. Control measures may include signage, light vehicle lanes, roundabouts, traffic lights, restricted access areas, one way systems, radio communication and on foot prohibitions. **Personnel:** Quarry Manager. **Method:** Visual inspection of tipping areas. Review written procedures, traffic management plan. Refer to MSIR r. 13.7(4).
3.2	Effective route marking, for use during either/both day and night, is provided to indicate the safe approach to, and exit from the tipping point.	**Intent:** To verify that truck operators are provided with adequate guidance on the safe route to and from the tipping point. The approach should be designed such that the truck driver has the best view possible of the tipping point. **Personnel:** N/A **Method:** Visual inspection of tipping areas. Look for route and tipping point demarcation with provision for night operation where applicable, entry and exit signage. Refer to MSIR r. 13.5(3).
3.3	Turning, reversing and tipping areas are of sufficient size to permit manoeuvring by the largest equipment that is intended to be used.	**Intent:** To verify that manoeuvring hazards are managed. **Personnel:** Quarry Manager. **Method:** Visual inspection of tipping areas. Review written procedures. Written operating procedures/rules are required where bulldozers and/or front end loaders will interact with dump trucks, especially Pits and ROM pads. Refer to MSIR r. 13.7(2).

3.4	Where dumping is carried out over an edge (dump or bin), an effective back stop has been provided, or a spotter is used.	**Intent:** To verify that dumping over an edge is carried out with minimum risk. A windrow or backstop should be half the height, and preferably higher, of the largest tyre in use and the windrow should not show signs of having being used for stopping mobile equipment. **Personnel:** Quarry Manager. **Method:** Visually inspect for adequacy. Refer to MSIR r. 13.5(2).

4 Stockpile or ROM pad operations

Stockpile or ROM pad operations

Point	Standard	Guideline
4.1	Signage requiring radio call up is located at all access points to the ROM pad.	**Intent:** To verify the ROM pad loader operator is made aware of vehicles entering the area. **Personnel:** N/A **Method:** Inspect the signage located at the ROM pad. Refer to MSIR r. 4.10.
4.2	Adequate precautions are taken with respect to a collapse or slump of a stockpile when material is being removed from the base of that stockpile.	**Intent:** To verify that mobile equipment operators are protected from the hazards associated with falling materials and stockpile instability. **Personnel:** Operators, supervisors, Quarry Manager. **Method:** Inspect procedures, dumping and loading operations. Confirm that stockpile face hazards are reduced when the face angle is approaching vertical or the face height is in excess of the loader bucket reach. Refer to MSIR r. 13.5(6).
4.3	There is a procedure and an authorisation process required for the use of earthmoving equipment on a surge stockpile.	**Intent:** To verify that when earth moving equipment is used on a surge stockpile the operation is carried out in a safe and consistent manner. **Personnel:** Operators, supervisors, Quarry Manager. **Method:** Inspect procedure, authorisation process and surge stockpile operations. Refer to MSIR r. 13.12.
4.4	There is a procedure and an authorisation process required for employees walking or climbing on a surge stockpile.	**Intent:** To verify that when employees walk or climb on a surge stockpile it is carried out in a safe and consistent manner. **Personnel:** Operators, supervisors, Quarry Manager. **Method:** Inspect procedures and surge stockpile operations. Refer to MSIR r. 13.12(1).

5 Specific situations

Specific situations

Point	Standard	Guideline
5.1	Procedures have been developed and implemented which document the safe methods of work to be followed for mobile crane lifting operations.	**Intent:** To ensure that crane operations (slewing and or pick and carry) are carried out in a safe and consistent manner **Personnel:** Crane operators, doggers, riggers, trainers, supervisors. **Method:** Inspect procedures for area preparation and set up, ground stability controls, presence of buried services and avoidance of cross gradients. Confirm that crane operators are aware of the above hazards. Refer to Mines Safety Bulletins No. 70 and 77 and Mines Safety Significant Incident Report No. 104.
5.2	Mobile equipment used for ground clearing of areas where trees are present is fitted with adequate safety equipment to protect the operator from falling limbs and trees.	**Intent:** To ensure that the operator is protected from the hazards associated with the clearing of trees. **Personnel:** N/A **Method:** Inspect the mobile equipment utilised for the clearing of trees. Confirm that the mobile equipment is equipped with a ROPS/FOPS canopy designed to AS 2294 or equivalent, cabin window protection and a tree pushing arm of a size dependent upon the size of the trees. Refer to Mines Safety Significant Incident Report No. 143.
5.3	Standard procedures have been developed and implemented which document the safe methods of work to be followed for scraper operations.	**Intent:** To ensure that scraper operations are carried out in a safe and consistent manner. **Personnel:** Operators, supervisors, Quarry Manager. **Method:** Inspect procedures for area preparation and set up, restriction of access, avoidance of cross gradients and provision of stockpile profiles with an inward V shape, edge protection and demarcation. Confirm that scraper operators are aware of the above hazards. Refer to Mines Safety Significant Incident Report No. 116.

5.4	Standard procedures have been developed and implemented which document the safe methods of work to be followed for autonomous vehicle operations.	**Intent:** To ensure that autonomous vehicle operations are carried out in a safe and consistent manner. **Personnel:** Operators, supervisors, manager. **Method:** Inspect procedures for area preparation and set up, restriction of access and vehicle collision avoidance systems.
5.5	All workplaces on the surface are illuminated at night.	**Intent:** To verify that adequate workplace lighting is provided where employees undertake work at night. **Personnel:** Employees, supervisors. **Method:** Inspect workplace lighting standards. Confirm that adequate lighting is provided in vehicle parking areas, walkways, workshop areas, process plant areas, open pit working areas, storage areas, storage sheds etc. Refer to MSIR rr. 13.5(4) and 13.6 and AS 1158 *Lighting for roads and public spaces*.
5.6	Adequate precautions are taken when entering an unilluminated area of the mine.	**Intent:** To verify that adequate portable lighting is provided where employees undertake work in an unilluminated area at night. **Personnel:** Employees, supervisors. **Method:** Inspect workplaces for the availability of portable lighting. Refer to MSIR r. 13.6.
5.7	Standard procedures have been developed and implemented which document the safe methods of work to be followed for remotely controlled mobile equipment operations.	**Intent:** To ensure that remotely controlled equipment operations are carried out in a safe consistent manner. **Personnel:** Manager, supervisors. **Method:** Inspect procedures for area preparation and set up, barricading and vehicle safety controls. Confirm that the operations pose no risk to personnel.

5.8	Where there is a risk of coarse material impacting the cabin of mobile loading equipment provision has been made for guarding.	**Intent:** To ensure that mobile equipment is provided with devices to contain or prevent materials injuring or pinning occupants. **Personnel:** N/A **Method:** Inspect a sample of mobile equipment to verify that structures and devices are installed to control any spillage. Verify that loaders are fitted with a bucket catch rail and where practicable a front windscreen mesh is installed.
5.9	Standard procedures have been developed and implemented which document the safe methods of work to be followed for the retrieval of mobile equipment.	**Intent:** To ensure that the retrieval of mobile equipment is carried out in a safe consistent manner. **Personnel:** Maintenance personnel, equipment operators. **Method:** View the mobile equipment recovery procedure document which should include checking the load parameters of the towing unit and equipment to be recovered (SWL). Interview maintenance personnel and equipment operators. Refer to Mines Safety Significant Incident Report No. 136.
5.10	The equipment used for the retrieval process has been designed and selected for that purpose.	**Intent:** To ensure that the equipment used for the recovery of mobile equipment is safe and fit for the purpose. **Personnel:** Maintenance personnel. **Method:** View recovery equipment. Confirm tow connection points are rated and identified.

6 Site deliveries (including solid or liquid consumables and plant and equipment)

Site deliveries (including solid or liquid consumables and plant and equipment)

Point	Standard	Guideline
6.1	Vehicle operators are protected from the hazards associated with the loading and unloading of materials, supplies and equipment.	**Intent:** To ensure that the hazards associated with material transfer operations and falling materials are managed in a safe consistent manner. **Personnel:** Transport vehicle operators, supervisors. **Method:** Inspect procedures and site material transfer operations. The driver is required to remain within the transport vehicle cabin during the loading or unloading of materials where falling object, moving machinery, or pinch point hazards are present. Alternatively the driver is required to vacate the cab and move to a safe location. Refer to Mines Safety Significant Incident Reports No. 49 and 59.
6.2	At areas where the transport driver is required to leave the vehicle to load or unload materials, the ground surface where the vehicle parks is level and even.	**Intent:** To ensure that the hazards associated with vehicles rolling away are minimised. **Personnel:** Transport vehicle operators, supervisors. **Method:** Inspect transfer facilities including elevated hoppers for underbelly trailer unloading, refuelling areas, chemical transfer points, lime silos and stockpile areas. Observe methods used to alight from vehicle.
6.3	In sloped areas, vehicle restraint humps or other effective devices are provided to control any unintended movement when the driver is outside of the vehicle, or where the centre of gravity of the vehicle is altered during the loading/unloading operation.	**Intent:** To ensure that engineering controls are utilised at all transport vehicle loading/unloading facilities to minimise the hazards associated with vehicles rolling away. **Personnel:** Transport vehicle operators, supervisors. **Method:** Inspect transfer facilities including elevated hoppers, refuelling areas, chemical transfer points, lime silos and stockpile areas.

6.4	Standard procedures are developed where mobile equipment is weighed at a weighbridge.	**Intent:** To ensure that mobile equipment operators are not exposed to hazards during weighbridge operations. **Personnel:** Transport vehicle operators, supervisors. **Method:** Inspect procedures and weighbridge facilities. Confirm that where the driver has to leave the vehicle, the weighbridge has exit platforms with handrails and barriers installed to prevent personnel walking on the I-beam of the weighbridge. Refer to NSW SA 00-15.
6.5	Standard procedures are developed for the checking of loads plus the loading, securing, release and unloading of loads.	**Intent:** To ensure that loads are secure, employees are not injured during the loading, securing, release or unloading of loads and overhanging loads are clearly identifiable. **Personnel:** Transport vehicle operators, supervisors. **Method:** Inspect procedures and transport vehicle facilities. Confirm that precautions are being taken to ensure loads do not become unstable when the load binders are released and materials are being unloaded. Refer to Mines Safety Bulletin No. 48 *and Load Restraint Guide* published by the National Transport Commission.
6.6	Loading and unloading operations are carried out in an area away from passing traffic, pedestrian areas and other people not involved in the loading/unloading activity.	**Intent:** To ensure that persons are not injured during the loading, securing, release or unloading of vehicles. **Personnel:** Transport vehicle operators, supervisors. **Method:** Inspect procedures and transport vehicle facilities. Confirm that precautions are being taken to exclude non-essential persons from hazard areas and essential persons are required to stand clear of vehicle movements.

6.7	There is provision for quarantining any vehicle that has arrived with an unstable load in a safe area.	**Intent:** To ensure that there is procedure to safely deal with inadequately restrained loads or unstable loads. **Personnel:** Transport vehicle operators, supervisors. **Method:** Inspect procedures and transport vehicle facilities. Confirm that precautions are being taken to exclude non-essential persons from hazard areas while a competent manager/team assesses the risks and devises a safe system of work for dealing with the situation.
6.8	Procedures are in place to prevent unexpected movements of vehicles during loading, unloading operations and coupling and uncoupling between vehicles and trailers.	**Intent:** To ensure that the risk of injury during loading, unloading and coupling of vehicles and trailers is minimised. **Personnel:** Equipment operators and maintenance personnel. **Method:** View written procedures and observe arrangements. Use of chocks.
6.9	Procedures are in place to ensure trucks are not driven away while still being (un)loaded.	**Intent:** To ensure that the hazards to personnel which present during the movement or positioning of vehicles in connection with loading or unloading are managed. **Personnel:** Transport vehicle operators, supervisors. **Method:** Inspect procedures and transport vehicle facilities. Confirm that precautions are being taken to exclude non-essential persons from hazard areas.
6.10	Procedures are developed and utilised where mobile equipment is loaded onto, or unloaded from a flat bed or low loader trailer.	**Intent:** To ensure that mobile equipment is loaded or unloaded in a safe manner. **Personnel:** Transport vehicle operators, supervisors. **Method:** Inspect procedures and transport vehicle facilities. Confirm the stability of low loaders not attached to the prime mover, that the low loader is of adequate width for the equipment being loaded or if secured side platforms are attached and seat belts and/or elevated work platform harnesses are worn. Refer to Mines Safety Significant Incident Reports No. 39 and 112.

6.11	Loading/unloading ramps that are fixed structures are equipped with the appropriate safety devices.	**Intent:** To ensure that fixed loading/unloading ramps are constructed to reduce the hazards associated with collisions and open edges. **Personnel:** N/A **Method:** Inspect any ramps. Confirm the ramp is of adequate width with ramp edge protection, open edge barrier chains or gates and has a rubber bumper stop or backstop. Refer to Mines Safety Bulletin No. 11.
6.12	Ramps that are attached to mobile equipment are of sound engineering design and equipped with the required safety devices.	**Intent:** To ensure that the ramps provided on mobile equipment are designed and equipped to carry out the loading/unloading task safely. **Personnel:** N/A **Method:** Vehicle ramps should be of sound engineering design, of adequate width, secured to prevent detachment and where too large for manual handling should be hinged and spring assisted or ram operated. Ramps should be strong enough to carry the weight of the mobile equipment and any load and be positively restrained during transport. Refer to Mines Safety Bulletin No. 11.
6.13	Procedures are developed where bulk and hazardous materials such as acids, cyanide, fuels and lime are being transferred from or into mobile equipment.	**Intent:** To verify that bulk and hazardous materials are transferred in a safe consistent manner. **Personnel:** Transport vehicle operators, supervisors. **Method:** Inspect procedures and transport vehicle facilities. Check for wind socks, sentries and etc. Refer to the *Dangerous Goods Safety Act 2004* and *Dangerous Goods Safety Regulations 2*007.

6.14	The facilities for loading and unloading of hazardous materials are suitably protected against accidental vehicle contact.	**Intent:** To verify the risk of injury is minimised where infrastructure may be damaged through poor judgement or misalignment of mobile equipment. **Personnel:** Transport vehicle operators, supervisors. **Method:** Inspect loading /unloading facilities. Confirm that precautions are being taken to ensure vehicles cannot damage infrastructure. Check bollards, armour rail and pipe or hopper connection points. Refer to the *Dangerous Goods Safety Act 2004* and *Dangerous Goods Safety Regulations 2007*.
6.15	Engineering controls are in place to prevent fall potential to operators where climbing to from elevated position is required (i.e. top of tanker).	**Intent:** To verify that fall prevention engineering controls are established wherever falls from the top of mobile equipment are possible. **Personnel:** N/A **Method:** Inspect elevated work areas on mobile equipment. Refer to the Dangerous Goods Safety Act 2004 and Dangerous Goods Safety Regulations 2007.
6.16	At all transfer points of bulk and hazardous materials, spillage containment controls are provided.	**Intent:** To verify that all load transfer facilities have the required controls to manage the hazards associated with material spillage. **Personnel:** Transport vehicle operators, supervisors. **Method:** Inspect transfer facilities including elevated hoppers, refuelling areas, chemical transfer points, lime silos. Spillage containment controls such as closed drainage, impervious bunding and spill kits are provided. Refer to the *Dangerous Goods Safety Act 2*004 and *Dangerous Goods Safety Regulations 2007*.

6.17	A safety shower, with an operational usage alarm, is provided at locations where hazardous materials are being transferred.	**Intent:** To verify that persons have immediate access to a safety shower, in the event of being splashed with a hazardous material and an alarm is raised automatically when the shower is operated. **Personnel:** Transport vehicle operators, supervisors, emergency services personnel. **Method:** Inspect transfer facilities including fuel delivery areas, chemical transfer points and lime silos. Refer to AS 4775 *Emergency eyewash and shower equipment*, *Dangerous Goods Safety Act 2004* and *Dangerous Goods Safety Regulations 2007*.

7 Underground operations

Underground operations

Point	Standard	Guideline
7.1	A method is established to inform underground vehicle operators of the availability of primary ventilation prior to entry underground.	**Intent:** To verify that underground vehicle operators do not operate mobile diesel equipment when the primary ventilation is not operating. **Personnel:** N/A **Method:** Inspect the method utilised to immediately warn underground vehicle operators of stoppage of the primary ventilation. Refer to MSIR rr. 9.20 and 10.52.
7.2	An underground warning system and procedures are established for vehicles and pedestrians when there is an interruption to the primary ventilation.	**Intent:** To verify that mobile equipment operators and underground personnel are informed when there is an interruption to the primary ventilation. **Personnel:** N/A **Method:** Inspect the warning system established underground. Confirm if an indicator light system and/or a leaky feeder system is installed to advise vehicle operators and pedestrians of a primary ventilation interruption. Refer to MSIR rr. 9.20 and 10.52. Note: Air Flow 2.5 m/s
7.3	Portal entry lighting is provided.	**Intent:** To ensure that the danger of vehicle collisions arising from contrasting levels of light are managed. **Personnel:** N/A **Method:** Inspect the portal entry and start of the underground pit ramp for transition lighting.

7.4	Flammable materials or explosives are not stored within 50 metres of any portal entry to the mine.	**Intent:** To verify that the access and egress to the underground mine is maintained in a safe condition. **Personnel:** N/A **Method:** Inspect the portal entry and start of the underground pit ramp for the prohibited storage or presence of explosives and/or flammable materials. Refer to MSIR r. 4.37.
7.5	Call up procedures are utilised when vehicles are entering the portal and operating in restricted roadway systems underground.	**Intent:** To ensure that the hazard of vehicle collision is managed. **Personnel:** N/A **Method:** Inspect the call up procedure and ensure vehicle operators are conforming to the rules underground.
7.6	Permanent or fixed installation lights are provided in applicable working locations.	**Intent:** To verify that suitable permanent or fixed lighting is provided and functional. **Personnel:** N/A **Method:** Inspect sites and suitability of the installations. Refer to MSIR rr. 8.7 and 10.14(1).
7.7	Flicker lights, reflective barriers and/or signs are placed at a suitable distance from any haulage area when under repair or with subject to a temporary obstruction.	**Intent:** To verify that the haulage areas under repair or any other temporary obstructions are adequately delineated to warn vehicle drivers of the hazard. **Personnel:** N/A **Method:** Inspect sites and availability of lights, barriers and or signage. Refer to MSIR r. 10.14(2).

7.8	Vehicles are parked safely when left unattended.	**Intent:** To verify that the hazards associated with unattended vehicles are managed. **Personnel:** N/A **Method:** Inspect a sample of the vehicle operating procedures and training documentation for each category. Verify vehicle operators are conforming to the rules underground. Verify that the engine of an unattended vehicle has been switched off, the park brake is applied, buckets or implements are lowered to the ground or tyres chocked, flashing lights where fitted are left on, the vehicle is turned into the sidewall and where possible is electrically isolated when left unattended. Refer to MSIR r. 10.41 and Mines Safety Significant Incident Report No. 98.
7.9	A procedure has been developed for the recovery of mobile equipment broken down in the underground decline.	**Intent:** To ensure that the recovery of vehicles underground is managed. **Personnel:** N/A **Method:** Inspect the recovery procedure. Verify the procedure requires that vehicles broken down on the underground decline are made secure by bunding, turned into a wall or blocked by a second vehicle prior to working on the equipment, or releasing the vehicle brakes.
7.10	A procedure has been developed for mobile equipment which is on fire to be parked off the underground decline.	**Intent:** To ensure that the decline will not be blocked by a burning vehicle. **Personnel:** N/A **Method:** Inspect procedure for dealing with vehicle fires underground.

7.11	Edge protection bunds or devices are provided where traffic has access to stope entry points or other vertical openings.	**Intent:** To verify the risk of vehicles falling down into a vertical opening is managed. **Personnel:** N/A **Method:** Inspect the edge protection provided at stopes and vertical opening entry points. Refer to MSIR r. 10.35, Mines Safety Significant Incident Reports No. 110 and 149.
7.12	Falling object protective structures (FOPS) are fitted to all trackless underground mining equipment that is fitted with operator controls on the machine, including drills, trucks, loaders, bulldozers and excavators and all service units which are operated in stopes and in the mining of development headings.	**Intent:** To verify appropriate measures are in place to prevent the driver and other vehicle occupants from being struck by falling objects. **Personnel:** N/A **Method:** Review documentation and a sample of mobile equipment to verify compliance with AS 2294 *Earth-moving machinery— Protective structures Part 1: General*. Refer to MSIR r. 10.46.