NSW Resources Regulator

PLANNED INSPECTION PROGRAM

Fires on mobile plant at open cut coal mines

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Contents

Executive summary

This report summarises the findings of assessments undertaken at 25 open cut coal mines in relation to fires on mobile plant.

The findings of the assessments can be grouped into those that could be generally applied to risk management, interviews with workers and past performance, and those that are specific to the results found during inspections of plant.

All mines could provide documents to demonstrate a risk assessment had been conducted with respect to fire on mobile plant and the approach was found to be similar at all mines.

Risk assessments were almost exclusively facilitated and prepared by fire suppression system providers. These risk assessments claimed to follow the process defined for fire risk management in AS5062:2006[1], however the focus was on treating the fire once it had occurred rather than prevention. Consideration of previous fire events was limited, as was an understanding of fire prevention controls introduced by the original equipment manufacturer (OEM). Records of attendees at the risk assessment indicated a lack of consultation with operators and practising maintenance personnel from the mines and would generally not satisfy legislative requirements for consultation. The risk assessments themselves did not consider or identify site specific issues that may contribute to the potential increased likelihood of fire on mobile plant.

Risk assessments were generally high level. For example, controls identified such as site mechanical or electrical control plans and did not fit the definition of a control. Risk assessments should clearly identify all hazards applicable to the site and nominate specific risk controls rather than citing management plans and procedures as control measures.

Generally, mines did not review fire on mobile plant risk assessments and relied upon other safety management system processes to capture safety alerts and bulletins affecting plant at their site.

Mines need to review their risk assessments. Prepare by reviewing fire incident history, statistical reports, applicable standards and legislation and engage a person who is competent to conduct the particular risk assessment having regard to the nature of the hazard[2]. Determine fuel and ignition sources and develop controls to prevent them occurring and verify the controls are effective. As equipment is heavily reliant on maintenance to prevent fires, human and organisation factors will affect the overall performance of this control. OEMs need to develop ways to eliminate external ignition sources without introducing additional maintenance burdens, so far as is reasonably practicable.

It was also identified that mines have opportunities for improvement in preventing fires on mobile plant in the areas of design and maintenance of exhaust lagging. Similarly, the segregation and inspection of hoses in difficult to access areas can provide improvements in the prevention of fire caused by the escape of fluid. This can be achieved by the application of lagging to reduce exposed, hot surfaces, the verification of ignition source reduction using technologies such as thermography, the education of workers on site standards and supervisors enforcing site standards.

[1] AS5062:2006 Fire protection for mobile and transportable equipment

[2] Cl 9 (2) Work Health and Safety (Mines and Petroleum Sites) Regulation 2014

Scope

The scope of this assessment program included two elements:

- a desktop assessment of:
  - compliance against legislation with respect to the management of risks to health and safety associated with the prevention, detection and suppression of fires on mobile plant
  - controls the mine utilises to prevent and mitigate the risks to health and safety associated with the prevention, detection and suppression of fires on mobile plant
- a workplace assessment of the implementation of those controls though the inspection of plant and worker interviews.

Managing fires on mobile plant

A mine operator must prepare and implement a mechanical engineering control plan (MECP) in accordance with clause 26(4) of the Work Health and Safety (Mines and Petroleum Sites) Regulation 2014. The MECP must set out the control measures for the management of risks to health and safety for uncontrolled fires being initiated or fuelled by plant, taking into account matters set out in Schedule 2 (3) including notably (but not limited to);

- the acquisition and operation of any plant to ensure it is fit for purpose
- the operation, maintenance, repair and alteration of plant
- the inspection of safety critical components
- identification, assessment, management and rectification of defects that affect the safety of plant
- the risks associated with mobile plant
- the risks associated with pressurised fluids
- the risks associated with the storage of combustible liquids associated with the use of plant
- the prevention, detection and suppression of fires on mobile plant.

Additional information and guidance on managing risks associated with fire on mobile plant is available from the published guidance listed in Appendix A.

Assessment findings

The findings of this assessment are grouped into two categories:

- **General findings** that can be used to inform all aspects of an operation's safety management and provide valuable information and insight across all sectors and operation types.
- **Specific findings** should be used to inform and improve safety management systems to address this principal hazard.

General findings

Risk assessments

Issue: Fire risk assessment documents for mobile plant had not been reviewed since the introduction of the plant to the site.

Response: Mine operators should review fire risk assessments for mobile plant against the requirements of AS5062:2016 and *MDG 15 Guideline for mobile and transportable plant for use at mine (other than underground coal mines)* to determine any gaps and develop a plan to address the gap.

Issue: Mine operators relied on the experience of workers in attendance at the risk assessment, but most did not review historical fire events during the risk assessment process. While site safety management systems may triage and treat safety alerts and bulletins from regulators and OEMs, they are not resulting in updates to risk assessments where they can be used for future procurement references or auditable compliance.[3]

Response: Risk assessments should clearly identify all foreseeable circumstances through a review of historical fire events and examination of equipment with the focus on preventing the fire by eliminating or minimising the risk using the hierarchy of controls. Mine operators should use (not limited to) data from the mine, the group of mines, the OEM and statistical reports from regulators regarding fire events and root causes. This information should be referenced in the risk assessment.

Issue: Generally, fire risk assessments are completed after procurement and after delivery of the plant. Time pressure to get the equipment into service and limited access to suitable workshop facilities and engineering resources leads to missed opportunities for a thorough fire risk assessment and the identification and implementation of risk minimisation actions.

Response: The fire risk assessment process should start before the finalisation of the procurement specification and form part of the equipment evaluation profile. The identification and implementation of specific risk controls facilitates compliance with legislation that requires mine operators to keep a record of control measures implemented to eliminate or minimise identified risks and demonstrate use of the hierarchy of controls. The risk controls nominated should be clearly defined rather than citing management plans, training and procedures as control measures.

Issue: Not all risk assessments included adequate records of attendees. Most risk assessments were prepared by a fire suppression system provider and included an OEM and maintenance engineering representative. Many risk assessments did not involve existing practising mechanical and electrical maintenance personnel and operators.

[3] Clause 9 WHS(MPS) Regulation

Issue: Operational considerations specific to the mine were not considered by the fire risk assessment.

Response: AS5062:2016 refers to several operational considerations that could cause or affect the likelihood of causing a fire. For example: human error when performing maintenance, overuse of the service brake with plastic wheel covers, gradients and type of material used on roads, the competence and supervision of contractors on site, the abrasiveness or flammability of dust in the work environment, potential for the wrong degreaser to be used etc. Operational considerations should be considered during the risk assessment process and identified from the fire event history.

Information, training and instruction

Issue: Interviews with mechanical maintenance workers revealed a good understanding of hose defects and the process for reporting, temporary repair or stand down and replacement of hoses despite only two mines having a formal procedure or a trigger action response plan (TARP). This was generally achieved by learning in the job or OEM training exposure. Few workers reported training to the standard required by clause 39 of the Work Health and Safety Regulation 2017.

Response: Mine operators should review information and training material provided to workers performing inspection and maintenance of fluid power systems to ensure consistency with the site standards of engineering practice and the management expectations as to the standard of maintenance to be upheld.

Issue: While interviews with mechanical maintenance workers revealed a good understanding of preventing fires through the prevention of the escape of fluids, most workers interviewed could not identify exposed ignition sources.

Response: Mine operators should develop suitable training materials and provide it in a way that is understood by any person who is required to inspect and maintain control of ignition sources. This could be in the form of guidance material identifying all ignition source controls, using photographs and descriptions of defects and should include the expectation for repairs.

Fire safety performance

Issue: Although complete asset loss does occur, most fires on large surface earth moving equipment do not result in injury or substantial amounts of damage. This is perhaps the driver behind a lack of focus towards addressing the problem. It would also seem that most mines are not reviewing their year on year performance to drive a reduction in fires on mobile plant. For the range of equipment

offered to the market at the time of writing, there appears to be a heavy dependence on maintenance to avoid the chance of a fire. This in turn relies on people and systems.

Issue: Analysis found approximately 70% of fires on mobile plant come from the escape of liquid fuel (oil, diesel or coolant) contacting turbocharger or exhaust system components. Most mines have standards of engineering practice for hydraulic hosing and exhaust lagging installation. However, exhaust lagging does not provide complete protection and maintenance is heavily reliant on the competence of the maintainer and availability to conduct the maintenance. Human and organisational factors affect this result considerably.

Response: Until the surface temperature of exposed components is reduced by design, mine operators must look beyond changing the failed hose to prevent fires on mobile plant. Mine operators should ensure that mobile equipment is available for additional time to allow mechanical maintenance workers to access those difficult areas to inspect.

Mine operators should consider whether there are other preventative measures that can be taken other than just adding exhaust lagging. Mine operators should find ways to implement improved physical barriers to reduce the human factors burden through well managed engineering change protocols. This may be in the form of complete fire walls or special shields for exhaust systems.

Specific findings

Issue: It was identified that liquid fuel load estimates were well estimated. Electrical and high surface temperature ignition sources were considered at a high level only. Temperature estimates of surfaces were provided in some circumstances. An accurate measurement of surface temperatures before and after treatment by lagging or dual skinned exhaust were not performed to ensure effectiveness.

Response: Thermography or temperature measurements should be used to establish a base temperature profile of the hot surfaces for hazard identification. At risk electrical circuits must also be identified. Both of these hazards must be controlled so far as is reasonably practicable and the control verified as effective and that the control remains effective over the lifecycle of the plant. For example: exhaust lagging or shielding remains in place in a fit-for-purpose condition when subject to rigours of operation, removal and refit for cleaning, servicing and repairs. Similarly, for routing or shielding of cables or hoses design to prevent earthing or arcing or fluid release or the prevention of released fluid to make contact with the ignition source. Fire risk assessments failed to consider such detail in the evaluation of preventative measures.

Visible fuel sources

Inspections looked for accumulations of oil, diesel and grease, coal dust, rubbish, paper and other combustibles and machine washdown before return to service. Most mines performed well in this regard.

Issue: Areas of concern were - housekeeping in the operator's cabin with loose rags and paper towels used for window cleaning, rags found on the floor or behind seats, paper towels washed down into areas adjacent to engines on dozers, grease around centralised grease pumps on excavators, minor miscellaneous oil leaks.

Response: Ensure windscreen washing facilities provided by the OEM are serviceable in the first instance. Cleaning liquids should be non-combustible. Waste containers for cleaning materials should be provided for in-cabin. Paper products should be collected before washdown. Grease spills should be cleaned up at the first available opportunity.

Hydraulic hoses

Inspections looked for hoses to be securely clamped and segregated, in good condition, not rubbing on metalwork or other hoses, firewalls present and in good condition. Excavators were generally well managed in this regard.

Firewalls between the pump room and engine room on excavators showed deterioration over time.

Haul trucks had deterioration of hoses in areas less likely to cause a fire around the under chassis.

Dozers scored poorly with respect to hose management particularly in the area under the operator's cabin known as the 'hell hole'. A condensed network of hoses showed common occurrences of rubbing of mainly hydraulic lines but diesel fuel lines as well. Rubber barriers between the engine compartment and under cabin area were found damaged and split.

Response: In complying with clause 9[4], mine operators must manage risks to health and safety associated with uncontrolled fires being initiated or fuelled by plant.[5] Mines should implement rigorous processes to verify the effectiveness of all risk controls, including inspections for hydraulic hose installations. Inspections and maintenance must be carried out in accordance with manufacturers recommendations. Additional time for inspections of difficult to access areas and quality oversight by supervisors is required for areas known to be common causes of fuel sources resulting in fires. Haul

[4] WHS(MPS) Regulation 2014

[5] WHS (MPS) Regulation 2014, Schedule 2, 2, 2(f)

trucks with fastened engine covers are also difficult to access areas where hose failures have caused fires.

Inspections found many instances of incorrectly sized P-clamps or P-clamps, which had degraded plastic coatings allowing hose movement and damage.

Response: Hose segregation and security is a recognised control measure for the prevention of hose failure. Mines should make a range of P-clamps readily available for maintenance personnel to access to maintain the effectiveness of this control measure. Refresher training of workers should be used to reinforce the importance of correct selection and fitment of P-clamps.

Electric cables and wiring harnesses

Inspections looked for cables to be mechanically protected, securely clamped, segregated from hydraulic hoses, batteries secure with cables in good condition, with terminal covers fitted.

Areas of concern include terminal covers missing from alternators, starter motors and some battery positive terminals. Battery cover support stays were often found to be unserviceable.

Mechanical protection conduits for low voltage control cables for fire suppression systems were found cracked and broken.

Cable glands pulled out of plastic junction boxes compromising cable protection and ingress protection (IP) rating.

Response: When developing control measures for fires initiated of fuelled by plant, electrical ignition sources must be considered. Mine operators should ensure protection devices against short circuit and arcing, or sparking are maintained in a fit for purpose condition. This includes boots over positive and negative battery terminals and other full current demand devices. Workers should be encouraged to use defect reporting systems for safety devices such as stays to prevent crush injuries from heavy panel doors or covers.

Turbocharger and exhaust Lagging

Inspections looked for correct fit of lagging, minimising exposed surfaces, springs and ties secure, condition of material and overlapping to prevent ingress of liquids or atomised fuels.

Most mines include lagging to exhaust manifolds, turbochargers and non-dual skinned exhaust pipes as part of the identified preventative risk controls.

At most sites, examples of exhaust lagging in a non-fit for purpose condition could be found. Evidence of existing or repaired exhaust leaks could be seen at joints in the lagging. Lagging removed for service or repairs had not been re-installed correctly leaving exposed hot surfaces or was not designed for full concealment of the ignition source so far as is reasonably practicable.

Metal 'barbeque' plates over engines were not evaluated for surface temperature but, as the name suggests, appear to get quite hot and may be an ignition source in themselves.

Response: When developing control measures for fires initiated of fuelled by plant, high surface temperature ignition sources must be considered. Hot surfaces on engines or components driven by the engine should have their maximum operating temperature measured.[6] Metal covers or shields installed to act as a barrier between hot surface should be evaluated for surface temperature to ensure a new hazard has not been created. Insulated lagging type controls should provide the most complete coverage possible. Thermography or similar temperature measurement should be used to verify control effectiveness after installation as new and during the products lifecycle. Mine operators should provide detailed information for maintenance to maintain lagging in a fit for purpose condition and to allow defects to be recognised and actions to apply.

Fire suppression systems

Inspections looked for fire suppression system to be installed, activation points to be readily accessible, inspection tags present and in date, delivery hoses in to be good condition, trip wires or tubing to be supported correctly and nozzles installed with caps.

Areas of concern include:

- → deterioration of suppression fluid delivery hoses and from engine bay heat or exposure to harsh sunlight.
- → routing of suppression fluid delivery hoses over sharp metal objects or edges

[6] MDG15, clause 4.6.1 Fire Risk Assessment

- → securing fire trip wires or loss of pressure signal tubing with cable ties and routing through conduit or spiral wrap
- → inspection tags missing on external activation points
- → accessibility and legibility of gauges.

1. Delivery hose deteriorated by sun exposure

2. Delivery hose contacting sharp metal edges

3. Fire wire cable tied to delivery hose wit spiral wrap providing thermal insulation

4. Nozzle cap not fitted leading to poor spray performance

5. Activation point with tag and button missing at rear of dozer

6. Poor access to read gauge leading to unserviceable fire suppression system going undetected

Response: When developing control measures for the detection and suppression of fires fuelled by plant, reliability of the system to perform as intended must be considered. Mine operators must ensure maintenance, inspection and where necessary testing is carried out of fire suppression system hardware for the earliest possible detection and suppression of fires. This should include;

- → the routing of fluid delivery hoses away from heat and direct sunlight so far as is reasonably practicable.
- → the inspection and replacement of fluid delivery hoses made unserviceable engine bay heat or exposure to sunlight.
- → routing and securing of fluid delivery hoses away from sharp metal edges or abrasive objects which could result in failure of the hose

- → support and routing fire trip wires or loss of pressure signal tubing with the appropriate stand-off bracketry to eliminate the use of spiral wrapping or conduits which could affect the earliest possible detection of fires
- → gauges need to be readily accessible with a clear lens for operators to conduct pre-use inspections effectively.

Fire extinguishers

Inspections looked for fire extinguishers to be present, inspection tags fitted and in date, clamps secure, the extinguisher to be protected from the harsh environment but readily accessible in case of fire. Most mines were consistent in approach to fire extinguishers.

Main areas of concern were:

- → plastic bags preventing ease of gauge inspection
- → two extinguishers found under charge pressure (of about 180 checked)
- → opaque lens
- → third party inspections were less than adequate

Response: When developing control measures for the suppression of fires fuelled by plant, mines should implement processes to verify the effectiveness of controls including fire extinguishers. For example: inspections to verify the service provided by fire safety sub-contractors or safety observations of pre-use inspection performed by operators. Consideration should be given to the suitability of simple plastic protect bags for externally mounted fire extinguishers in dusty environments.

Areas of good practice

- Generally, all plant inspected had a fire suppression system fitted that appeared to be appropriately sized for the task. Most mines had strong representation from fire system providers who had representatives at their sites either constantly or most days performing inspections and upkeeping firefighting-related equipment.
- It was commonly found that that areas of difficult access proved to be the hiding place for rubbing wear on high pressure hydraulic and diesel fuel hoses, such as under the cabin floor of bulldozers. One mine showed that fire potential from fluid release resulting from failure due to poor segregation is through close supervision of the sub-contractors during rebuilds. By simplifying the hydraulic hoses (system and routing) where possible and being very diligent in the placement of high quality P-clamps and hose separating devices, hose rubbing can be greatly reduced. Furthermore, placement of suppression system distribution lines and manifolds clear of access ways for inspection can make the inspection task more efficient and likely to find defects.


EXCAVATOR MANDATORY FIRE PREVENTION INSPECTION.

FIRE

1 FIRE WALLS

2 FIRE & DELUGE SYSTEM

3 ENGINE OIL HOSING

4 HP HYDRAULIC HOSING

ALL URGENT REPAIRS MUST BE COMPLETED BEFORE THE EXCAVATOR IS RETURNED TO WORK.

All none-urgent repairs must have work order numbers raised.

- Some mines recognised the build quality of OEM wiring harnesses are not up to the duty of the work environment in which they operate. Complete replacement with aftermarket harness offering better quality insulation, sheaths, connectors and mechanical protection has improved reliability and reduce the potential for fires.
- One mine had introduced a fire specific safety inspection (image) for the “Tier 1” class assets – large excavators. This appeared to target areas with known history or high potential for release of oil and shielding to prevent the contact with ignition sources.
- Workers generally reported confidence defect management systems in that if a defect was reported it would be fixed. One mine had introduced a sub team to look after defects to ensure they were fixed while the regular service work was done by a separate team.

- One excavator manufacturer provided covers over hydraulic valves and hoses to direct oil released to ground rather than to hot engine surfaces (photo).
- Some mines are using training days to reinforce standards of engineering practice in the area of fire prevention. This has included specific inspection guidelines including photos showing examples of all forms of damaged that may occur to hydraulic hoses for example. Similarly, for wiring harnesses. Example photographs of damage to wiring harness braided covers and connector plugs, correct support and clamping, routing etc is shown.

- Two mines had begun a review of mobile plant fire risk assessments before the assessment. The outcome will have only improved due to the one-on-one interaction and engagement resulting from the assessment.
- One mine made improvements in material specification of coolant hoses and protection of turbo oil feed lines apparently to good effect. Another has taken extra time at overhaul to drive high standards of hose segregation under the operator's cabin of a dozer with lasting benefits.

Compliance

Notices were issued by assessment teams in response to the following identified compliance issues.

Notice	In relation to
Improvement notices, s 191 Section 191, *Work Health and Safety Act 2011*	→ Exhaust manifold and turbocharger lagging not providing effective protection of the ignition source, in poor condition, not secured, gaps etc → Mechanical protection for electrical cables damaged → Protective boots to positive battery terminals, starter motors and alternators missing or damaged → Fire risk assessments did not directly address hazards and controls → Fire risk assessments did not utilise cross section of workforce whose health and safety are affected by fires on mobile plant → Fire risk assessments did not consider previous fire events

	→ Rubbing between high pressure hydraulic hoses with significant wear near ignition sources → Poorly maintained or ineffective fire wall (segregation) between the pump room and engine room on excavators. → Heat affected (stiff/brittle) fire suppression system delivery hoses on excavator in engine room → Rubbing between diesel fuel hoses with significant wear near ignition sources → Oil leak at top of hydraulic tank → Fire suppression system nozzle caps not in place → Fire extinguisher and fire suppression system inspection tags missing → Fire suppression system delivery and signal hoses cracked, rubbed or deteriorated. → Fuse panel cover missing → Battery lid support not functional → Fire extinguishers found with tags exceeding inspection period → Sound attenuation material degraded and falling off the walls presenting combustible material hazard → Minor oil leaks and accumulations of grease → Bend radius of hose tight and under stress → Exhaust leaks → Fire suppression system and extinguisher gauges opaque or positioned where it could not be checked → Access to the 'hell hole' area was restricted due to the location of fire suppression hose installation → Loose rags on the floor of the operator's cabin and dozer engine compartment → Coolant leak from brittle header tank hose.
Notices of concern, s23 Section 23, *Work Health and Safety (Mines and Petroleum Sites) Act 2013*	→ The excavator, haul truck and dozer fire risk assessments may not have identified all fire risk controls by not following all the recommendations by AS/NZS5062:2016 - Fire protection for mobile and transportable equipment. → Exhaust leaks may be occurring and are not being rectified where hidden by exhaust lagging. → Exhaust lagging 'butt' jointed rather than over lapped may provide ingress points for liquid fuel. → Hydraulic oil or diesel fuel hose rubbing failures under dozer cabin floors (the hell hole area) can lead to fires on dozer plant.

- Risk assessment documents for the plant did not record the use of previous fire event data as recommended by AS/NZS5062:2016 - Fire protection for mobile and transportable equipment clause
- Risk assessment documents for the plant did not record the engagement of key stakeholders
- Risk assessment documents for the plant did not consider of operational conditions to potentially increase fire risk
- Soot was found between adjacent sections of exhaust lagging on the haul truck
- Fire extinguisher was missing in operator's cabin of the excavator
- Loose combustible materials were found on the floor of the excavator cabin (paper, window cleaner)
- P-clamps used for segregation of hoses on the haul truck were found to be incorrectly sized
- Temperature of ignition sources (engine cover plate) in excavator had not been evaluated as recommended by MDG15
- Fire risk assessments have not been reviewed for more than five years
- Combustible materials, such as paper towel were found under body areas, near potential ignition sources of the dozer.

Where to now

This assessment program has identified issues around the approach taken by sites to manage the prevention of fires on mobile plant and some installation and maintenance related issues to detection and suppression systems.

It also highlighted broader issues that are common across all open cut mine sites associated with the process of developing, implementing and reviewing risk assessments, management plans and procedures.

Operations should not just strengthen traditional methods but strive to be innovative in prevention of fires. The detection and suppression systems are mature, so the focus needs now to shift to prevention. Mine operators should also ensure they have robust systems in place to verify the effectiveness of their risk control measures.

Manufacturers and suppliers of plant need to review their product offerings to prioritise a design review regarding the prevention of fires. Current design is inherently reliant on inspections and maintenance to prevent exposure of combustible liquids and materials to ignition sources.

Inspection and maintenance regimes are subject to human and organisational factors which contribute to the occurrence of fires.

The focus for further planned inspections regarding fires on mobile plant will now shift to underground metalliferous operations. The potential for harm in underground operations is further increased due to toxic products of combustion entering the mines ventilation system. The outcomes of these planned inspections will provide information that will be used to inform the regulator's ongoing education and compliance efforts.

Issued by

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Further information

For more information on targeted assessment programs, the findings outlined in this report, or other mine safety information, please contact the Resources Regulator's Mine Safety branch. You can find the relevant contact details below.

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Appendix A: Legislative requirements and published guidance relating to the management of fire on mobile plant

The following is a list of certain legislative requirements for the management of fires on mobile plant referred to in this report as provided by the Work Health and Safety (Mines and Petroleum Sites) Regulation 2014 and Work Health and Safety Regulation 2017.

Legislation, section/clause	Legislative requirements
WHS Act 2011 No. 10 S47	Duty to consult workers
WHS (MPS) Regulation, clause 9	Management of risks to health and safety
WHS (MPS) Regulation, clause 10	Review of control measures
WHS (MPS) Regulation, Clause 26, sub-clause 4	Division 3 Principal control plans, clause 26 Principal control plans, sub-clause 4 Mechanical engineering control plan
WHS (MPS) Regulation, Clause 104, sub-clause 2a	Duty to provide information, training and instruction
WHS (MPS) Regulation, Clause 121, sub-clause c	Duty to consult with workers
WHS (MPS) Regulation, Schedule 2, clause 2	Schedule 2 Principal control plant— matters to be addressed, clause 2, Mechanical engineering control plan
WHS Regulation, clause 36	Hierarchy of control measures
WHS Regulation, clause 359	Fire protection and firefighting equipment

The following published guidance material may assist mine operators to manage risks associated with fires on mobile plant;

MDG 15 – Mobile and transportable plant for use on mines and petroleum sites (NSW Resources Regulator)

MDG 41 – Fluid power safety at mines (NSW Resources Regulator)

MDG 1032 - Guideline for the prevention, early detection and suppression of fires in coal mines (NSW Resources Regulator)

Investigation information release, Mt Arthur Mine, Serious burns while refuelling mobile plant (NSW Resources Regulator)

Safety Bulletin 15-03: Fires ignite while refuelling mobile plant with quick fill fuel systems (NSW Resources Regulator)

Safety Alert: SA15-05: Fire destroys water truck (NSW Resources Regulator)

Safety Alert: SA04-02: Fire traps truck driver (NSW Resources Regulator)

The following published reports may assist mine operators to manage risks associated with fires on mobile plant;

Analysis Report: In-service fires on mobile plant (NSW Resources Regulator)

Fires on Mobile Plant - Quarterly reports (NSW Resources Regulator)

Mines safety bulletin no. 158: Fixed plant and mobile equipment fires on surface coal mines (QLD Mines Inspectorate)

The following published Standards may assist mine operators to manage risks associated with fires on mobile plant;

AS 5062:2016 (incorporating amendment No.1) – Fire protection for mobile and transportable equipment (Standards Australia)