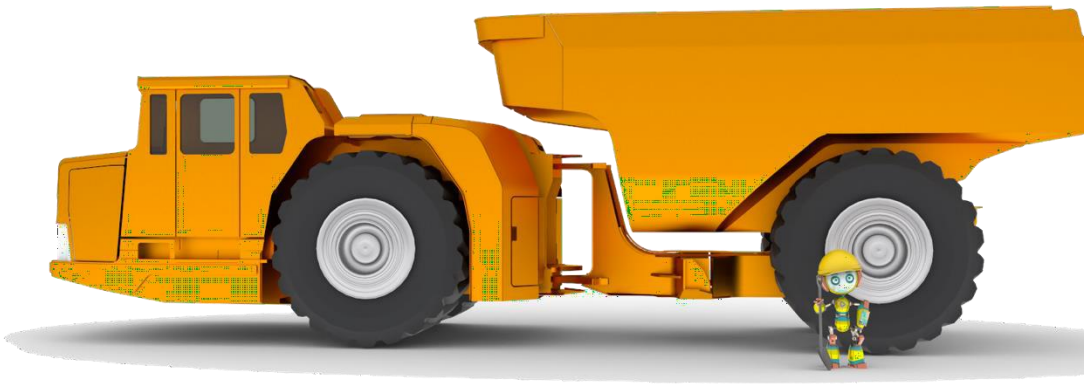
Worksafe SmartMove Certificate

Mining Industry Module
Study Guide



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Disclaimer

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Contact

SmartMove Coordinator

Department of Local Government, Industry Regulation and Safety (LGIRS)

303 Sevenoaks Street

CANNINGTON WA 6107

Telephone: 1300 307 877

Email: smartmove@dmirs.wa.gov.au

Contents

Mining Industry

Learning outcomes

In this module you will:

1. Learn about common hazards encountered in the mining industry
2. Understand how to prevent injuries from common workplace hazards
3. Identify existing and potential hazards at a workplace and learn how to record them
4. Learn how to eliminate workplace hazards and reduce risks

The mining industry offers many opportunities to young workers looking to create a career in the resources sector. Jobs in mining may involve handling heavy machinery, setting up work platforms and using power tools. There are many unique hazards in the industry that young workers may not be aware of.

Young workers in the mining industry work in a variety of roles including driller assistants and production operators.

Major hazards found in the mining industry are:

- working with or near machinery and equipment
- manual tasks
- falls
- hazardous substances
- electricity
- noise
- hazardous working conditions.

Machinery and equipment

In the mining industry, young workers work with a wide range of machinery, equipment and tools. The most common injuries to young workers are from:

- being hit or crushed by moving parts of machinery or equipment (e.g. booms or mechanical arms)
- being hit or struck by ejecting objects (e.g. parts, components, products or waste items)
- being hit, trapped or crushed by powered mobile plant, equipment and vehicles (e.g. earth movers, bulldozers and loading trucks).

> *Machine guarding can prevent or reduce access to dangerous areas of the machine. A guard may be any shield, cover, casing, or physical barrier intended to prevent contact between a hazardous machine part and any part of an operator or operator's clothing. A guard can perform several functions such as: protecting you from moving parts, containing ejected parts from the machine, and preventing emissions escaping.*

Let's have a look at how to stay safe

- Keep all guards on machinery and equipment in place. It is there to protect you from moving parts. Any guard removed during cleaning must be replaced by an authorised person before you use the machine.
- Use machinery and equipment correctly and safely. Follow safe work procedures. Ask your supervisor to show you if safe work procedures are not available.
- When first using machinery, equipment and tools, you must be supervised until you are competent. You may be buddied up with an experienced worker so skills, knowledge and experience can be shared.

- Don't work alone with machinery unless it has an emergency stop mechanism (or a dead-man switch).
- Reduce the risk of cuts by keeping cutting tools clean and sharp.
- Wear PPE given to you and wear clothing that won't get caught.

Examples of dangerous machinery and equipment

Powered mobile plant

A drill offsider was tramming a tracked vehicle when he left the vehicle to talk to the occupants of an approaching tracked vehicle. He strapped his vehicle's control levers position so the vehicle could move forward without him continuously holding the controls. After a brief conversation, the offsider returned to his vehicle that was still moving. He slipped and fell while trying to climb back into the vehicle and was subsequently run over by the vehicle. Fortunately, the ground was very soft, and the offsider was pushed down into the ground by the vehicle's track, receiving only minor injuries.

The offsider did not follow the vehicle's safe operating procedure. The vehicle's control levers (enabling devices or dead-man control levers) were modified and that also contributed to the accident.

Powered mobile plant (PMP) is a machine that is self-propelled and controlled by an operator. These include lift trucks, elevating work platforms, mobile cranes, integrated tool carriers, earthmoving machinery and tractors. PMP is associated with a number of accidents and injuries including falling from PMP; being crushed, run over or rolled-over by PMP; and being entangled in and trapped between moving parts of PMP.

Your employer must provide adequate supervision, training and assessment of competency for workers on site who use mobile plant, including the application of safe operating procedures. You must follow safe operating procedures.

Being hit by moving vehicles

A worker was pinned between a stationary integrated tool carrier (IT) and a moving long-hole drill rig at a high traffic area in an underground mine. The worker stood next to the IT and inspected its damaged man-basket. At the same time, the drill operator was turning a long-hole drill rig around to tram out of the level to the next drill location. The drill operator did not see the worker while turning his vehicle. The worker was seriously injured from being crushed when the drill rig's horseshoe made contact with the IT's basket.

There was no communication from the drill rig operator before his vehicle made contact with the IT.

Serious incidents can occur when vehicles and PMP are being used at a workplace. Traffic management must be in place to address hazards. To avoid incidents, your employer should have a traffic management plan in place. This should include:

- clear communication between the vehicle or plant operators and all people on the ground (voice, radio and hand signals)
- traffic routes wide enough for the largest vehicle using them. They should be one-way (if possible) and have clearly signed traffic instructions
- clear signage, barriers and/or designated walkways defining the areas where pedestrians may have access
- marked reversing areas so drivers and pedestrians can see them easily
- fixed mirrors at blind corners
- management of vehicle speed
- requirements for people working around vehicles and mobile plant to wear high-visibility clothing so they can be seen clearly.

Using power drills

Injuries caused by using power drills are common in young workers. It's important to know that the power drill itself doesn't do the actual drilling. The drill bit itself goes through the wood, brick or other material you're using.

How can you avoid injuries when using power drills?

- Choose a proper drill bit to perform the task effectively and safely.
- Always keep drill bits sharp and do not use bent drill bits.
- Follow manufacturer's instructions, ask experienced workers or ask your supervisor to help select the proper drill bit.
- Wear appropriate PPE such as safety glasses or goggles.
- Don't use excessive force to drill into hard material. Reduce drill speed if possible.
- When working with small pieces, clamping the material so it will not twist or spin
- Don't drill with one hand while holding the material with the other.

Using angle grinders

Angle grinders are hand-held tools with a rotating disc used for grinding and polishing work. Angle grinders are designed for grinding, not cutting. The most common angle grinder injuries are from metal particles lodging in the operator's eye. The most serious injuries are from kick-back, where the disc is thrust back violently towards the operator.

How can you avoid injuries when using angle grinders?

- Make sure an angle grinder is correctly fitted with a guard that is in good condition. Replace damaged guards before using.
- Follow the manufacturer's manual for safe use.
- Ensure that the powered tool will not operate when unattended by checking the dead-man (constant pressure) switch.
- Wear appropriate PPE such as safety glasses or goggles to protect against flying particles.
- Do not use wheels that are cracked or those that excessively vibrate.
- Use both hands when holding the grinder.
- Keep the power cord away from the grinding wheel and the material being ground.

Quiz – Machinery and equipment

1. Guards are fitted to machinery to:
   a. protect you from moving parts
   b. contain ejected parts from the machine
   c. prevent emissions escaping
   d. all of the above

2. The most common angle grinder injuries are from:
   a. discs that shatter or explode
   b. kickback, where the disc is thrust violently away from the object it is grinding and back towards the operator
   c. metal particles lodging in the operator's eye
   d. electric shock

3. Which of the following is NOT a safe practice when working with power drills?
   a. When working with small pieces, clamping the material so it will not twist or spin.
   b. Wearing safety glasses or goggles.
   c. Using excessive force to drill into hard material.
   d. Keeping drill bits sharp.

4. Which of the following statements are part of a traffic management plan to prevent workers and pedestrians being hit by moving mobile plant or vehicles?

   a. Clear communication between the vehicle or plant operators and all people on the ground.

   b. The movement and speed of vehicles are managed to minimise the risk of injury to pedestrians and vehicle operators.

   c. Requirements for people working around vehicles and mobile plant to wear high-visibility clothing so they can be seen clearly.

   d. All of the above.

Manual tasks

Manual tasks are any activities or sequence of activities that require a person to use their physical body (musculoskeletal system) to perform work.

The most common injuries and health issues that can arise from performing manual tasks are musculoskeletal injuries.

Some examples of musculoskeletal injuries are:

- sprains and strains of muscles, ligaments and tendons (e.g. back strain)
- joint injuries
- disc protrusion or disc herniation of the back
- nerve injury or compression
- muscular and vascular disorders (e.g. carpal tunnel syndrome or repetitive strain injury)
- soft tissue injuries.

How does performing a manual task result in injury?

Contrary to popular belief, it's not just the weight of an object that creates the risk of musculoskeletal injuries. Workers are at risk of suffering injuries due to performing hazardous manual tasks involving:

- increased effort (force)
- awkward postures
- applying pressure on one part of the body
- performing the same action quickly and repeatedly
- lifting heavy objects.

Examples of hazardous manual tasks in the mining industry may include:

- operating powered mobile plant (PMP) for prolonged periods (e.g. sustained seated posture with concurrent exposure to whole-body vibration)
- lifting unassisted, particularly loading and unloading vehicles (e.g. working with high forces and handling loads that are unstable, unbalanced or difficult to grasp or hold, and lifting in awkward postures and in confined areas)
- repeatedly lifting and handling sample bags
- using hand-held power tools over head for prolonged periods of time (e.g. repetitive application of high force and sustained awkward postures, with simultaneous exposure to hand-arm vibration)
- working on valves in awkward postures (e.g. application of high force and sustained awkward postures)
- getting on or off PMP and machinery (e.g. jerky or unexpected forces following periods of sustained sitting and exposure to whole-body vibration).

What can your employer do to prevent injury from performing manual tasks?

- Your employer has a responsibility to provide and maintain a safe workplace. If you are about to perform hazardous manual tasks and you are unsure how to go about it, ask your employer or supervisor for assistance.

- Your employer should provide you with risk management* and *task specific training*** where hazardous manual tasks have been identified at your workplace.

> **Risk management* *is the steps required to manage workplace hazards, described as* ***SAMM*** *– Spot the hazard; Assess the risk; Make the changes; Monitor and follow-up.*
>
> ***Task specific training* *is the practising of actual tasks that will be performing during the course of work.*

Task specific training should be provided:

- during induction to the task
- as part of your refresher training
- when work tasks are about to be changed or introduced.

There are a variety of ways you can be trained. Methods include a buddy system, demonstrations, training by observation, training at staff meetings, toolbox talks and practice sessions.

After the training, you should be able to:

- recognise the risks and the sources of those risks and, in discussion with your employer or supervisor, decide the best way to minimise them
- prepare the workplace layout and surroundings to perform manual tasks safely
- prepare loads for manual handling, where applicable
- organise tasks and workflow to minimise the risk of injury
- use relevant mechanical aids and handling devices provided to you
- use tools or equipment provided to you.

> ***Be aware:***
>
> *Young and new workers are at a greater risk of lifelong injuries due to performing hazardous manual tasks. Speak up if you think the task is too much for you.*

Quiz – Manual tasks

5. The most common health problems that can arise from hazardous manual tasks are:
   a. musculoskeletal injuries
   b. cold and flu
   c. bone cancer
   d. food allergies

6. What types of injuries can result from performing hazardous manual tasks?
   a. Body stressing injuries
   b. Nerve injury or compression
   c. Muscular and vascular disorders
   d. All of the above

7. When should you receive task-specific training to perform manual tasks?
   a. During induction to the task
   b. As part of refresher training
   c. When work tasks are about to be changed or introduced.

d. All of the above

Falls

Falls are the most common cause of work-related injuries among young and new workers.

Falls from height

Falls from height are major workplace hazards in the mining industry. A mine worker may need to work at height during activities such as rise development, working in ladder ways or servicing plant. It is best to avoid or limit the need to work at height.

If working at height can't be avoided, your employer must provide safe systems of work including:

- providing fall injury prevention devices such as scaffolding, elevating work platforms (e.g. scissor lifts) or other types of safe working platforms for workers to access areas where is risk of a fall
- providing fall protection system such as fall-arrest systems (e.g. safety harness), safety nets and guard railing
- providing work position systems such as travel restraints which are designed to prevent workers from reaching an edge where they could fall
- providing ladders that are industrial-rated and well-maintained with no bent or broken parts and ensuring they are only used for light work or easy-to-reach places
- ensure that tools and equipment provided for working at height are appropriate for the tasks and in good condition
- providing information, training, instruction and supervision for you to use equipment and tools safely.

You must follow safe systems of work and use equipment and tools provided to you to prevent falling from a height.

Falls into openings or holes

An operator was driving a load haul dump (LHD) in an underground mine when it fell over the edge of an open stope. The LHD fell approximately 25 metres and the operator sustained fatal injuries. There was no physical barrier to prevent the LHD entering the slope. There were no effective visual wall markings or delineators to aid the driver in judging the distance to the open stope edge.

An underground mine worker may need to work in or near steeply inclined openings. It is best to avoid working near the openings. Where this is not possible, your employer must provide a safe system of work and implement appropriate controls including:

- Installing a physical barrier such as a rock bund, engineered steel or concrete barrier, or steel bollards to prevent entering open voids. The barrier should be positioned at an appropriate distance from the stope
- Erecting a physical barrier before an open stope is created or changed by firing, and maintaining it to prevent access
- Placing visual markings and/or delineators on the walls or backs to identify the distance to the stope edge

Holes which a person could fall into should be made safe immediately after being formed. If a cover is used as a control measure, it must be made of a material that is strong enough to prevent persons or objects falling through, such as embedded wire mesh, and should be securely fixed to prevent any dislodgement or accidental removal. Covers should be marked in clearly legible lettering with the words DANGER – HOLE BENEATH.

You must follow safe systems of work and be more vigilant when working near or around openings and holes.

Slip, trips and falls

Slips and trips resulting in falls are described as falls on the same level. They are a common cause of injuries in young workers. These types of injuries can result in serious harm and lengthy time off work.

Slips, trips and falls may cause injuries including:

- broken bones when colliding with an object or hitting the ground
- cuts, if it occurs near sharp objects
- sprains or strains.

What can your employer do to prevent slips, trips and falls?

- Allow safe movement in the workplace.
- Ensure floor surfaces are in good order, such as being free from holes and uneven surfaces.
- Provide adequate lighting for safe movement.
- Ensure sufficient space to work.
- Provide tools and equipment to assist you to work safely.
- Ensure workers wear suitable footwear with appropriate treads that are kept clean.
- Avoid any changes in floor surface level, or if this is not possible, highlight these changes.
- Restrict access to work areas identified as higher risk for slips and trips.

How can you prevent slips, trips and falls at work?

- Wear suitable shoes with treads that are kept clean – incorrect footwear can cause slips and trips.
- Clean up spillages straight away.
- Keep walkways clear of obstacles, especially during high traffic times.
- Carry items only at a height that you can safely see over to avoid trip hazards and bumping into things.
- Ensure that you have enough light to work safely - this may include portable task lighting.

Being hit by falling objects

A worker in a pit was conducting ground support activities from a work basket attached to a telehandler elevated about 12 metres above the ground. The worker was manually removing a rock from the face when the rock fell, striking the hydraulic check valve block of the telehandler which then tipped on to its side. The work basket became wedged against the wall, 6 metres above the pit floor, trapping the worker's legs. Work planning did not consider the potential for equipment to be struck by falling rocks outside the demarcation zone. The design of the work basket did not prevent the extension of body parts past the basket's edge protection during uncontrolled movement.

Objects have the potential to fall onto or hit people. Loose objects such as manual tools, hand tools, loose rock, debris and objects falling off conveyer belts can be accidentally dropped or projectile. Being hit by falling objects is a major cause of serious injuries in mining.

What can your employer do to keep you safe from falling objects?

- Conduct risk assessments (known as SAMM) on tasks associated with an object falling on a person prior to commencing.
- Have safe work procedures in place.
- Instruct and train workers on tasks associated with the risk of falling objects and ensure competency.
- Limit access to an area where there is a risk of an object falling.
- Provide you with equipment and tools to work safely.

How can you prevent being hit by falling objects at work?

- Follow safe work procedures.

- Report any hazards of objects falling to your employer promptly so risks can be managed before an incident occurs.
- Never place yourself or allow anyone else in the drop zone of an unrestrained load.
- When working with machines, conveyor belts or power tools that can produce flying particles, wear safety glasses, goggles or face shields.
- Secure all tools and materials to prevent them from falling on people below.
- Use appropriate personal protective equipment (PPE) provided, such as a hard hat when work is being performed overhead or when other work conditions call for it.

Quiz – Falls

8. Which of the following will reduce the risk of falls from heights?
   a. Using scaffolding or another type of work platform
   b. Using fall arrest systems (e.g. safety harness)
   c. Reducing the amount of time spent working at height
   d. Any of the above

9. What can your employer do to prevent slips, trips and falls at work?
   a. Provide adequate lighting for safe movement
   b. Maintain workplaces to keep them in a clean and tidy condition
   c. Ensure workers wear suitable footwear with appropriate treads that are kept clean.
   d. All of the above.

10. Which of the following statements will prevent you from being hit by falling objects? (Select three that apply)
    a. Never place yourself in the drop zone of an unrestrained load
    b. Wear a bucket hat for sun protection when work is being performed overhead.
    c. When working with machines or power tools that can produce flying particles, wear safety glasses, goggles or face shields
    d. Follow safe work procedures

Hazardous substances

A hazardous substance can be any solid substance, liquid, gas or dust that may cause harm. In the mining industry these include silica dust, mineral dust, asbestos, diesel fuel, acids and general cleaning products. These substances can be harmful if you:

- get them on your skin
- eat or drink them by mistake
- breathe them in
- mix substances so they become deadly
- mistake one substance for another.

How can you keep safe from products that are considered hazardous substances?

- Read the label - look for warning pictograms and signs. Always follow the safety warnings.
- Read the safety data sheet (SDS) for more information about a product and how to use it safely. Your employer must provide (or have available) safety information documents for any substances or products that are hazardous.
- Check the hazardous substance register at your workplace. It is a legal requirement that your employer keeps a current register of each hazardous substance that may be used or stored in the workplace.
- Don't eat, drink or smoke when you are using or near hazardous substances or dangerous goods.
- Don’t keep food near hazardous substances or dangerous goods.
- Always use the PPE and clothing provided by your employer.
- Know what to do and where to go if a substance affects you. If you don’t know, check with your employer.
- Keep ignition sources away from any chemicals that are potentially flammable.
- Maintain good housekeeping standards – declutter and avoid build-up of combustible materials like plastics, cardboard boxes and rags around any chemical storage.
- Use workshop eyewash stations in case of emergency – these should always be functional.

Examples of hazardous substances

Silica dust

Silica (or silicon dioxide – SiO2) is a very common mineral found in sand, stone, concrete, mortar and rocks (e.g. granite, slate, sandstone). Silica is most dangerous to health when dust is generated, becomes airborne and is inhaled by a worker. Performing some tasks in mining can lead to high silica exposure. These include abrasive blasting, earthworks, rock crushing, and mineral sample milling. Cumulative exposure to silica dust may cause serious and fatal health effects including silicosis, lung cancer and chronic lung conditions.

If you are working with material that may contain silica, your employer must provide you with information, training and instruction about the risks of exposure, the control measures at the workplace , the correct use and maintenance of RPE (respiratory protective equipment). Your employer must also provide you with health monitoring of workers.

Always use PPE and RPE given to you, for example, safety goggles suitable for dust protection and masks that cover your nose and mouth. RPE must be suitable and comfortable, be tested for fit, and be well-maintained.

Diesel fumes

Diesel fume exposure often occurs in underground mines from diesel powered mobile plant (PMP) used for drilling and haulage. Exposures to high concentrations of diesel fumes can be harmful to health, ranging from mild effects such as headaches, irritation and nausea, to serious effects such as respiratory disease and cancer. There is also the issue of chemical asphyxiation (suffocation) from carbon monoxide.

Your employer must conduct a risk assessment to manage and control the risk of workers’ exposure to diesel fumes. Control measures include the use of ultra-low sulphur and low-emission diesel fuel, engine selection and maintenance and mine ventilation. You must be given equipment and tools for you to work safely.

Quiz – Hazardous substances

11. Select three correct actions you would take to keep yourself and others safe from hazardous substances.
    a. Read the product label
    b. Read the product SDS
    c. Follow safe work procedures
    d. Smell the substance

12. Long-term exposure to silica dust can cause:
    a. musculoskeletal injuries
    b. back pain
    c. silicosis
    d. toothache

13. Breathing in high concentrations of diesel fumes can be harmful to health.
    a. True
    b. False

Electrical safety

A worker was performing wiring modifications to a low voltage motor control centre at a mine site. The power to the front compartment switchboard had been isolated but the busbars in the rear compartment remained energised. He noticed that the busbar cover panel inside the compartment was not positioned correctly. As he touched the cover panel to check if it was secure, it moved and there was an arc flash and blast. He received minor flash burns to his right forearm and left hand. The worker was not wearing personal protective equipment (PPE) that was adequate for the energy released in the arc.

Electric shocks happen when a person becomes part of an electrical circuit and the current flows through their body. Electricity passing through the body can cause convulsions (involuntary contractions of the muscles), the heart to stop beating, and internal and external burns. It can also cause secondary injuries resulting from falls or collisions and fire hazards resulting from an electrical fault.

Incidents with electricity are usually caused by:

- broken equipment or dangerous working conditions such as frayed or broken power cords, plugs or power points
- installation and/or repairs being undertaken by an unqualified repairer
- absence of a residual current device* (RCD) and lack of testing of RCDs
- a lack of experience, training or supervision

> *A *residual current device (RCD) is a safety switch or life-saving device designed to prevent you from receiving an electric shock if you touch something live, such as a bare wire. If you are using portable electrical equipment and extension leads at work, they must have an RCD installed at the switchboard, built into a fixed socket or through a portable RCD outlet. The RCD must be regularly tested. This is a legal requirement.*

Lockout procedure

When cleaning, maintaining or adjusting machinery and equipment, a lockout procedure is required to safeguard the workers who carry out the tasks.

Lockout is a safety procedure to ensure that dangerous machines are properly shut off and are not able to be started up again prior to the completion of maintenance or repair work.

The lockout procedure is used when:

- servicing or repair work places workers in danger
- a machine guard is removed for servicing.

There are three steps involved in locking out machines and equipment.

Lock

This means the electrical circuits must be shut down and locked.

This is when a lock is put on an ON switch so the machine can't be turned on. Only the person who put it on can remove it. If that person isn't available, strict rules need to be followed to ensure it is removed safely.

There are a wide range of locks that can be used in this process. These can include:

- switches with a built-in lock
- chains
- jaws or hasps.

Tag

Tag refers to the information tag attached to a power source or piece of equipment warning others not to operate it. Tags have information about the name of the person working on the equipment, the time and date of the work and the equipment that's being isolated. Types of tags commonly used in the lockout procedure are danger tags and out of service tags.

Test

This means that all power sources need to be checked with proper test instruments to make sure everything is de-energised before going ahead with work.

Let’s have a look at how to stay safe around electricity

- Understand the lockout procedure. Do not operate or use machinery and equipment that has been locked and/or tagged.
- Use machinery and equipment properly. Regularly inspect wiring, cords, plugs and tools for obvious external damage and look out for shorting or sparking fittings.
- Report any breakdowns or faulty machinery or equipment to your employer. It is the responsibility of your employer to make sure they are in good working order.
- Leave repairs to the experts. When electrical repairs are undertaken by people who are not qualified, serious and fatal injuries can occur.
- Ensure all available power is RCD protected.
- Don’t overload power boards with lots of appliances. Only use power boards fitted with overload protection.
- Use weatherproof outlets and fittings in areas exposed to wind and rain. Avoid using electrical equipment outdoors in wet conditions.
- Wear suitable footwear and clothing when using electrical equipment.
- Be aware of the locations of all safety switches and what equipment they cover in case equipment needs to be switched off in an emergency. You may ask this question during your induction.

Quiz – Electricity

14. When cleaning, maintaining or adjusting machinery and equipment, a lockout procedure is required to:
    a. Safeguard workers
    b. Safeguard machinery
    c. Identify hazardous energy
    d. Finish work

15. There are three specific steps in locking out machinery and equipment. These steps are:
    a. lock, look and tag
    b. lock, tag and test
    c. tag, do and test
    d. lock, test and try

Noise

Noise can be a workplace hazard. Tasks in mining such as drilling, blasting, cutting, materials handling, ventilation, crushing, conveying and ore processing can produce high noise levels. The higher the dose of noise, the greater the risk to the worker's hearing. Noise-induced hearing loss remains common in the mining industry.

The noise dose is dependent on three factors:

- Intensity/Loudness: measured by a noise level meter and described in decibels (dB)
- Frequency: the number of sound vibrations in one second measured in hertz (Hz)
- Duration: the length of time workers have been exposed to noise

In Western Australia, the law sets a workplace exposure standard averaged over eight hours to be 85 dB(A) (e.g. the sound levels of a front-end loader), or a peak noise level of 140 dB (e.g. the impact noise of sledgehammering). Any noise exposure above 140dB can create almost instant damage to hearing.

As a general rule, If you have to raise your voice to be heard by someone standing 1 m away, the noise level is likely to be 85 dB(A) or more.

What can your employer do?

Where the exposure standard is exceeded, your employer must provide solutions to noise hazards such as:

- choosing quieter machinery and equipment
- keeping equipment in good working condition
- reducing machinery and equipment vibration, and muffling engine and compressed air noise
- placing a barrier between the noise source and the worker
- isolating the noise source in an insulated room or enclosure
- using job rotation and alternating noisy tasks with quieter ones
- providing you with hearing protection (e.g. earplugs and earmuffs) and fit testing to use along with all other control measures.

What can you do to protect your hearing?

To safeguard your hearing, you must wear the hearing protection that has been given to you. It might seem like there is nothing wrong with your hearing, but the damage is done without you noticing it.

Hearing protectors, like earplugs and earmuffs, should be regularly cleaned, repaired and stored near noisy areas.

> ***Remember:***
>
> *The most important factor in the effectiveness of hearing protection is wearing it.*

Quiz – Noise

16. What controls at your workplace can reduce noise exposure?
    a. Keeping equipment in good working order
    b. Choosing quieter machinery and equipment
    c. Using sound absorbing material
    d. All of the above

17. The most important factor in the effectiveness of hearing protection devices is:
    a. style
    b. appearance
    c. colour
    d. wearing it

18. To prevent hearing loss at work, the law sets a workplace exposure standard averaged over eight hours to be _____dB(A)
    a. 85
    b. 95
    c. 140
    d. 200

Hazardous working conditions

Working in hot conditions

Two field technicians were conducting reconnaissance mapping on an exploration tenement in a remote area. On their first day in the field, after driving over an hour to the tenement, the technicians parked the vehicle and walked about 16 km in temperatures reaching 36°C. They returned the next day, parked up, and walked about 18 km in around 7 hours, with the temperature peaking at 37°C. While returning to their vehicle, one of the field technicians collapsed and became unconscious.

His colleague contacted emergency services and provided treatment but, within a short time, the unconscious field technician stopped breathing and could not be resuscitated.

Working in hot environments can put workers at risk of impaired performance, heat illness and heat stroke. Impaired performance may result in unsafe acts and heat may also make accidents more likely due to sweaty palms or impairment of vision through fogging of safety glasses.

Mine workers are also at risk of heat stress and sunburn from exposure to solar ultraviolet (UV) radiation. Sunburn can cause permanent skin damage and is a major risk factor for developing melanoma.

The effects of heat may be encountered during:

- hot climate conditions
- work in confined workplaces without adequate ventilation
- heavy physical work in moderately hot and humid conditions (e.g. in some underground mines)
- work performed in the vicinity of hot sources such as furnaces, heaters and ovens
- radiant heat from the surroundings such as shed walls and hot ground surfaces
- work where heavy PPE must be worn
- any combination of these factors.

What is heat stress?

Heat stress occurs when your body cannot cool itself enough through sweating to maintain a healthy temperature. Symptoms of heat stress include:

- cool, moist skin with goose bumps
- heavy sweating
- dizziness
- fatigue
- weak, rapid pulse
- low blood pressure upon standing
- muscle cramps
- headache.

What is heat stroke?

Heat stroke is much worse than heat stress. Heat stroke symptoms include:

- body temperature above 40ºC
- hot dry skin
- irritability
- speech problems
- confusion
- convulsions
- unconsciousness
- *cardiac arrest.

> **Cardiac arrest is a life-threatening condition that requires immediate first aid (cardiopulmonary resuscitation – CPR) and medical treatment.*

What can your employer do to keep you safe?

- Have in place heat stress management plans and procedures which include addressing risk factors, acclimatisation, frequency and duration of exposure and medical conditions.
- Know the weather forecast and assess how to organise the day's tasks to avoid the risk of heat stress and heat stroke.
- Make shade available.
- Rearrange tasks and lighten the work in extreme heat.
- Provide workers with information on heat stress and skin cancer and ways to prevent both.
- Supervise workers to ensure they are working safely and that they are not exposed to extreme heat.
- Ensure there is a supply of cool, clean drinking water available at the site.

What can you do to be safe?

- Undertake a risk assessment for daily tasks (SAMM) before commencing work, and review if conditions change.
- Wear protective clothing – all outdoor workers should be covered to elbows and knees or wear long sleeves and long pants. Also, wear a hat with a brim and safety glasses with UV protection.

- Apply sunscreen (SPF30+) 20 minutes before sun exposure. Make sure the back of your neck and arms are covered. Reapply as necessary.
- Drink approximately 250ml of water every 15 to 20 minutes during hot working conditions. Keeping well hydrated is a critical factor in avoiding heat illness.
- Take regular breaks. Know your limits. Practice self-pacing when working in hot conditions.
- Inform your employer if you have an underlying health condition (e.g. heart disease, high blood pressure, diabetes) or are taking medication that may increase your risk of heat illness.
- Maintain a healthy lifestyle, including a healthy diet and regular exercise. If you are feeling tired, dizzy or weak or you're having trouble concentrating, tell your supervisor. Rest in a cool, well-ventilated area, remove excess.

What should you, your employer or workmates do if someone has heat stroke?

- First, call 000 for an ambulance.
- Apply first aid as required which may include:
  - Lay the person down.
  - Cool the person down by applying cold packs or wrapped icepacks to neck, groin and armpit areas.
  - Use a wet towel, sheet or clothing to cover the person.
  - If the person is fully conscious and able to swallow, provide water. Encourage them to take sips rather than large gulps.

> ***Remember:***
>
> *Urgent medical attention must be sought if the person becomes unconscious or has a seizure. In the case of cardiac arrest, CPR is required immediately and should continue until the paramedic arrives (ambulance). If available, attach an automated external defibrillator to the person as soon as possible and follow the step-by-step instructions.*
>
> *A first aid officer is trained to perform CPR in your workplace.*

Quiz – Working in hot conditions

19. _____is the most serious form of heat stress.
    a. Heat rash
    b. Heat exhaustion
    c. Heat stroke
    d. Heat waves

20. What should you do in the first instance when you suspect that your workmate is experiencing heat stroke?
    a. Call 000 for an ambulance
    b. Lie the person down
    c. Cool the person down by applying cold packs or wrapped icepacks to neck, groin and armpit areas
    d. Use a wet towel, sheet or clothing to cover the person

Working alone

A driver of a service vehicle was travelling along a haul road to a satellite pit to deliver fuel. The area had experienced overnight rain, and the driver lost control of the loaded vehicle. The vehicle mounted a verge and rolled onto its roof. The vehicle's radio aerial was damaged in the rollover and the driver, who was unable to walk due to serious injuries, could not raise an emergency call. There was no back-up communication system. The injured worker was discovered two and a half hours later by a passing worker who raised the alarm.

A person is described as an isolated worker when they are performing work tasks alone, cannot be seen or heard by another person, and do not expect a visit from another worker or member of the public for some time.

If hazardous conditions exist at any workplace, no one is to work alone, and a worker must be within sight of another worker.

There is a legal requirement for an underground worker working alone (an isolated worker) to be inspected, visited or communicated with at least every **two** hours.

Let's have a look at how to stay safe

When you are required to work alone, you need to take reasonable care of your own safety. You need to clearly understand and follow procedures and take reasonable care to not put yourself in danger.

Your employer has responsibilities to provide and maintain a safe workplace. Your employer must have a working alone procedure in place which includes:

- making a means of two-way communication available (e.g. mobile telephones, two-way radios)
  - providing a secondary communication device or system in case of loss of primary communication system or in the event of an emergency
  - regular contact with an isolated worker
  - supervisors and other workers being trained in what action to take in the event that contact cannot be made with the isolated worker.
- providing you with adequate information, instruction and training to ensure that you understand the hazards that may be associated with the tasks when working alone, and the procedures that should be followed to reduce risk.
- providing you with the means of communication, personal protective equipment (PPE), safe machinery, equipment and tools for you to do your job safely. Training for the use of two-way radios, satellite phones and other means of communication is to be given by your employer.

> ***Remember:***
>
> *When working alone, carry a communication tool with you at all times. You might need it to call for help.*

Quiz - Working alone

21. What is an isolated worker?
    a. A worker who works alone, cannot be seen or heard by another person and does not expect a visit from anyone for some time.
    b. A worker who works independently to others in the office.
    c. A worker who likes to be on their own.
    d. All of the above.

22. A working alone procedure may include:
    a. A means of two-way communication being made available (e.g. mobile phones, two-way radio)
    b. A secondary communication device or system being available in case of loss of primary communication system
    c. Supervisors and other workers being trained in what actions to take in the event that contact cannot be made with the alone worker
    d. All of the above

Working in confined spaces

A confined space is an enclosed or partially enclosed space that is not intended or designed primarily for human occupancy, is at atmospheric pressure during occupancy, and has restricted means for entry and exit. Many tasks in mining may occur in a confined space.

Examples of potential confined spaces are:

- storage tanks and bins
- process vessels
- boilers
- sumps and pump hoppers
- pipes
- abandoned tunnels or shafts
- degreasing pits
- wells
- excavation holes and trenches.

Why you are at risk?

Confined spaces can pose serious safety and health risks to workers. There is a risk of one or more of the following:

Suffocation (Asphyxia)

Asphyxia is caused by a lack of oxygen in air resulting in deficiency of oxygen in the blood. When present in high concentrations, common gases (e.g. nitrogen, carbon dioxide, helium, and propane) can displace oxygen in the air, especially within a confined space. Inhaling too much of common gases can cause dizziness, disorientation, abnormal heart function, unconsciousness and even death.

> ***Be aware!***
>
> *Most asphyxiant gases are colourless and odourless so their presence in high concentrations may not be noticed.*
>
> *There is also a risk of being engulfed by any liquid in which a person can drown including oil or water, or any solid including fly ash, grain, sawdust or sand that can flow and form a temporary cavity or bridge, which may collapse and surround a person, cutting off their air supply. This may result in suffocation.*

Toxicity

Toxicity is the degree to which a toxic substance can damage an organism. In a confined space, a concentration of toxic gases or fumes (e.g. hydrogen sulphide in tanks of decomposing organic material) may cause impairment and loss of consciousness.

Flammability and explosion

Flammable atmospheres in confined spaces may result from the evaporation of a flammable residue, flammable materials used in the space, a chemical reaction (e.g. the formation of methane in sewers), or from the presence of combustible dust (e.g. dust in flour silos). If an ignition source, such as a sparking electrical tool or static on a person, is introduced into a space containing a flammable atmosphere, an explosion is likely to result.

Electrical shock or electrocution

Electrical hazards may cause electric shock, burns or electrocution, and can arise from cables, transformers, capacitors, relays, exposed terminals and wet surfaces where electrical circuit and electrically powered plant are used in a confined space.

Falls from height

There is a risk of falling when descending into or ascending out of the designated confined space.

Other environmental factors

These may include noise, extremes of temperature, poor lighting and radiation.

What do you need to know?

When working in a confined space, your employer needs to provide additional measures to conduct work safely including:

- Providing you with an observer when working in a confined space. It is a legal requirement that a person must be on standby in the immediate vicinity outside the designated confined space.
- Providing means of communication between you and the observer. As the person on standby has to remain outside the confined space, it is not always possible for them to keep the person/s working inside the confined space in sight at all times. Continuous communication with the worker/s inside the confined space must be maintained. Communications may be achieved using:
  - voice
  - radio (an intrinsically safe one if used in flammable conditions)
  - mobile phone (not to be used if flammable gas or vapour is present in sufficient concentration to cause explosion or fire)
  - hard wired communications.
- Conducting a risk assessment before work in a confined space begins. A competent person must carry out the risk assessment. It must be in writing and take account of the hazards involved. A safe work procedure should be developed following the risk assessment.
- Arranging for emergency response procedures including rescue, first aid and resuscitation. All necessary equipment that may be required in an emergency (such as harnesses, respirators and stretchers) must be available and serviceable.
- Ensuring the relevant members of the emergency response team required to use the equipment are trained in its use. The standby person may form part of an emergency response team by acting as the coordinator but must remain outside the confined space.

> ***Notes:***
>
> *You must follow the safe work procedures and use appropriate personal protective equipment given to you.*

Quiz: Working in a confined spaces

23. A confined space _____

    a. is an enclosed or partially enclosed space that is not intended or designed primarily for human occupancy
    b. is at atmospheric pressure during occupancy
    c. has restricted means for entry and exit
    d. all of the above

24. Confined spaces can pose serious safety and health risks to workers. There risks are:

    (Select **five** that apply)

    a. Suffocation
    b. Toxicity
    c. Electric shock
    d. Flammability and Explosion
    e. Hunger
    f. Falls from height

25. Do you need an observer when working in a confined space?

    a. Yes, you need an observer that always has sight of you when in a confined space
    b. No, an observer is not always needed when in a confined space
    c. Yes, an observer is needed that can maintain continuous communication with you (√)
    d. No, as long as someone can contact you on a radio or mobile phone, you don't need an observer

Spot the hazards

Yangibana Civil and Mining Engineering

Hazard notebook

There are 6 hazards in this area. Try to find them all.

#	Spot the hazard	Assess the risk	Make the change	Monitor and follow-up
1	PMP reversing and in danger of hitting a person behind it	Critical	Immediately ask the driver to stop and advise both the driver and pedestrian of the danger	Report it to the supervisor and check whether a traffic management plan is available. This information should be available to and understood by all workers
2				
3				
4				
5				
6				

Mining industry module - Knowledge quiz

1. Guards are fitted to machinery to:
   a. protect you from moving parts
   b. contain ejected parts from the machine
   c. prevent emissions escaping
   d. all of the above

2. The most common angle grinder injuries are from:
   a. discs that shatter or explode
   b. kickback, where the disc is thrust violently away from the object it is grinding and back towards the operator
   c. metal particles lodging in the operator's eye
   d. electric shock

3. Which of the following is NOT a safe practice when working with power drills?
   a. When working with small pieces, clamping the material so it will not twist or spin.
   b. Wearing safety glasses or goggles.
   c. Using excessive force to drill into hard material.
   d. Keeping drill bits sharp.

4. Which of the following statements are part of a traffic management plan to prevent workers and pedestrians being hit by moving mobile plant or vehicles?
   a. Clear communication between the vehicle or plant operators and all people on the ground.
   b. The movement and speed of vehicles are managed to minimise the risk of injury to pedestrians and vehicle operators.
   c. Requirements for people working around vehicles and mobile plant to wear high-visibility clothing so they can be seen clearly.
   d. All of the above.

5. The most common health problems that can arise from hazardous manual tasks are:
   a. musculoskeletal injuries
   b. cold and flu
   c. bone cancer
   d. food allergies

6. What types of injuries can result from performing hazardous manual tasks?
   a. Body stressing injuries
   b. Nerve injury or compression
   c. Muscular and vascular disorders
   d. All of the above

7. When should you receive task-specific training to perform manual tasks?
   a. During induction to the task
   b. As part of refresher training
   c. When work tasks are about to be changed or introduced.
   d. All of the above

8. Which of the following will reduce the risk of falls from heights?
   a. Using scaffolding or another type of work platform
   b. Using fall arrest systems (e.g. safety harness)
   c. Reducing the amount of time spent working at height
   d. Any of the above

9. What can your employer do to prevent slips, trips and falls at work?
   a. Provide adequate lighting for safe movement
   b. Maintain workplaces to keep them in a clean and tidy condition
   c. Ensure workers wear suitable footwear with appropriate treads that are kept clean.
   d. All of the above.

10. Which of the following statements will prevent you from being hit by falling objects? (Select three that apply)
    a. Never place yourself in the drop zone of an unrestrained load
    b. Wear a bucket hat for sun protection when work is being performed overhead.
    c. When working with machines or power tools that can produce flying particles, wear safety glasses, goggles or face shields
    d. Follow safe work procedures

11. Select three correct actions you would take to keep yourself and others safe from hazardous substances.
    a. Read the product label
    b. Read the product SDS
    c. Follow safe work procedures
    d. Smell the substance

12. Long-term exposure to silica dust can cause:
    a. musculoskeletal injuries
    b. back pain
    c. silicosis
    d. toothache

13. Breathing in high concentrations of diesel fumes can be harmful to health.
    a. True
    b. False

14. When cleaning, maintaining or adjusting machinery and equipment, a lockout procedure is required to:
    a. Safeguard workers
    b. Safeguard machinery
    c. Identify hazardous energy
    d. Finish work

15. There are three specific steps in locking out machinery and equipment. These steps are:
    a. lock, look and tag
    b. lock, tag and test
    c. tag, do and test
    d. lock, test and try

16. What controls at your workplace can reduce noise exposure?
    a. Keeping equipment in good working order
    b. Choosing quieter machinery and equipment
    c. Using sound absorbing material
    d. All of the above

17. The most important factor in the effectiveness of hearing protection devices is:
    a. style
    b. appearance
    c. colour
    d. wearing it

18. To prevent hearing loss at work, the law sets a workplace exposure standard averaged over eight hours to be _____dB(A)
    a. 85
    b. 95
    c. 140
    d. 200

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d. Heat waves

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