GOVERNMENT OF WESTERN AUSTRALIA

WorkSafe Western Australia

WorkSafe SmartMove

WorkSafe SmartMove Certificate

Electrical Industry Module
Study Guide

Disclaimer

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Electrical Industry

Learning outcomes

In this module you will:

1. Learn about common workplace hazards encountered in the electrical industry
2. Gain basic trade safety knowledge and become aware of the dangers involved in working with electricity
3. Identify existing and potential hazards in a workplace and learn how to report and record them
4. Learn how to eliminate workplace hazards and reduce risks

Electrical work is dangerous. There are four basic rules you must remember.

1. Only licensed electrical workers can legally perform electrical work.
2. Apprentices and trainees must be supervised by a qualified electrical worker at all times.
3. You must be properly trained and given clear instructions on how to work safely.
4. Your employer should make sure that equipment is well maintained.

Electrical safety

The most common direct and indirect electrical risks causing injury are:

- Electric shocks. – these happen when a person becomes part of an electrical circuit and the current flows through their body. Electric shocks can be fatal or cause severe injury (electrocution).
- Burns – electricity can arc, flowing through the air between two conductors, and can burn your skin if it contacts your body. People in contact with, or being around, an electrical arc may suffer severe burns, permanent disfigurement or fatal injuries.
- Falls – if you receive an electric shock or arc blast while working at height, such as on a ladder or scaffold, this could result in a fall potentially causing serious injury or death.
- Poisoning – a consequence of burning and arcing electrical equipment is the release of harmful gases and contaminants. Breathing these may cause short-term or chronic illness, or suffocation.
- Fire – faulty or badly maintained electrical equipment and poor work standards can lead to electrical fires that may cause injury or death to people and damage to property.

Isolation and de-energisation of equipment

An electrician was electrocuted while installing a tilt switch on machinery in a laboratory. The machine was not isolated from the power supply and the worker touched the inside of the control box door while repairing the switch.

Electrical apprentices (supervised workers) should not work on or near energised electrical installations.

Electrical apprentices in their final year of their apprenticeship can carrying out fault finding or testing on energised electrical installations, if they are directly supervised by a supervising electrical worker while they are carrying out the task.

Before commencing any electrical work, the equipment to be worked on must be isolated and de-energised. This means the equipment is disconnected from all sources of electricity and isolation points are secured to prevent them being accidently turned on.

All apprentices should observe and take part in the de-energisation procedure and, once adequately trained, perform the procedure under the direct supervision of a qualified electrical worker to gain sound safe working practices.

Steps for effective de-energisation of equipment

1. Isolate

This means the electrical circuits must be shut down. This is done by switching off the isolator/circuit breaker and removing fuses or other components.

2. Secure (lock and tag)

Lock

This is when a lock is put on an ON switch so the machine can't be turned on. A wide range of locks can be used in this process. They can include: switches with a built-in lock, chains and jaws or hasps.

> ***Remember:***
>
> *There should be one key only for each lock (or set of locks), and this should be held by the person who put the lock on.*
>
> *All people involved in carrying out the work must fit their own lock at the same isolation point(s).*
>
> *Locks must be clearly labelled (tag)*
>
> *Locks must be removed upon completion of work or at the end of the shift. If the work will be continued by others, they must fit their own locks.*

Tag

This means to attach an information tag to a power source or piece of equipment warning others not to operate it. A lockout tag:

- includes the name of the person working on the equipment, the time and date of the work and the equipment that's being isolated
- must be attached in a prominent position at each isolation point
- must be fitted and removed by the person who attached it, or by an ‘authorised person’
- must be removed upon completion of the work or at the end of the shift. If the work will be continued by others, they must fit their own tags.

Two types of tags that are commonly used are danger tags and out of service tags.

3. Test

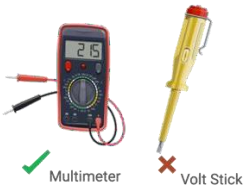
This means to check that equipment has been de-energised using proper test instruments (multimeters) to make sure everything is safe before going ahead with work.

Example of the de-energise procedure

A machine or equipment has to be serviced or repaired	Determine the machine is energised
• The machine is stopped and shut down. • The circuit breaker is switched off. • All energy sources are isolated using an isolation device.	1. Isolate
• All energy sources are locked using a lockout device. • An out of service tag is fixed to the machine. • Danger tags are fixed at the energy sources and the operating controls of the machine. • All other potential hazards are controlled.	2. Secure
• Before any repair or maintenance is carried out, the machine is tested again by trying to restart the machine to ensure it has been completely de-energised, without exposing the tester or others to a risk	3. Test
	Machine is de-energised
• Once the work is completed, the worker who tagged the controls removes the locks and tags before the machine is returned to operational status.	Machine is energised

Remember:

Volt sticks are not a testing instruments. Correct electrical rated testers (multimeters) should be used to determine if equipment is energised



Roof work and electricity

A worker was checking an air conditioning unit for faults. He was working alone in the roof space of a private house. The unit was not isolated before he started work on it. The worker was electrocuted when he touched the live terminals of the motor while in contact with the steel roof frame.

Apprentice electricians often work on roofs and in ceiling spaces. Conductive material, such as guttering, roof sheeting or metal battens, can become live if it comes in contact with overhead electrical wiring, or if there is a fault with the electrical wiring in the area.

In Western Australia, WHS laws prohibit workers entering the roof spaces of residential buildings unless the electrical installation is de-energised. Prior to entering a roof space, a risk assessment must be undertaken by a competent person.

Residential buildings mean:

- a single dwelling (i.e. a detached house, a row house, terrace house, town house, villa unit)

- a boarding house, guest house, hostel or the like with a total area of all floors not exceeding 300 m², and no more than 12 persons would ordinarily be resident
- a non-habitable building or structure including a private garage, carport, shed.

When working in ceiling spaces you must ensure that someone is aware of where you are and that you maintain the contact with them until the work is completed.

> ***Remember:***
>
> *Extreme care must be taken to avoid touching any live overhead electrical lines or supply cables, and that people are not exposed to the risk of contact with energised wiring or equipment, even when the circuit(s) to be worked on have been de-energised. Use battery powered tools on the roofs.*

Personal protective equipment (PPE)

A licensed electrician was electrocuted while carrying out some electrical tests on a compressor. He directly wired the compressor to a low voltage switchboard. At the conclusion of the tests, the electrician attempted to re-attach insulating tape to the terminals he had been using within the switchboard. One of his hands came into contact with the adjacent live terminals, resulting in a fatal electric shock.

The use of PPE is an essential part of working safely. Many electrical workers have avoided serious injury or a fatality because of the clothes and other PPE they were wearing at the time.

PPE should be used together with other risk control measures (see SAMM for hierarchy of controls). PPE cannot be relied on as the sole risk of protection from electrical hazards.

Basic PPE and clothing for electrical workers and apprentices

Type	Requirements	Some level of protection from
 Safety footwear	• be non-conductive • comply with AS/NZS 2210	• electric shock • falling objects
 Safety glasses	• have non-conductive frames • comply with AS/NZS 1337	• flying objects caused by activities such as grinding and cutting • electrical arcs (limited protection only)
 Work gloves	• have no conductive fasteners such as zips or studs • be made of durable material appropriate for the required work • comply with AS/NZS 2161	• mechanical impact in relation to tools, equipment and work materials
 Safety helmets	• be non-conductive • comply with AS/NZS 1801 • Many work sites require safety helmets to be worn at all times.	• overhead wires/structures • falling objects

 Residual current device (RCD) on fixed or portable socket outlets	• should be tested for correct operation before commencing work	• electrocution in the event of electric shock from unintentional energisation of equipment being worked on, or a malfunction of portable electric tools and extension leads
 Protective clothing	• should cover the body completely • be of material with properties equivalent to 185gsm, 100 percent cotton drill or better • have non-conductive and concealed buttons • have sleeves to wrist length and legs reaching to footwear • fit properly and remain fastened to avoid catching or entanglement	• electric arcing/flash burns • flying or falling objects • electric shock

Conductive jewellery such as wristwatches, rings, chains or piercings must **not** be worn while carrying out electrical work. It may increase the risk of:

- electrocution
- burns when exposed to high temperatures
- injuries when dangling, protruding or loose jewellery catch or jam in equipment components or tools or get caught into moving parts.

Remember:

When you are issued with PPE, look for the relevant Australian/New Zealand Standard marking, rating, classification and certification expiry date to comply with the requirements.

How can you keep safe working with electricity?

- Plan and discuss the job with your supervisor, including assessing any safety risks.
- Make sure you are under direct supervision at all times by a qualified electrical worker. Listen to your supervisor's instructions carefully. Confirm that you are understand the instructions.
- Only start working with electricity when authorised to do so. Your electrical supervisor must be confident that you are fit for work.
- Follow the isolation and de-energisation procedures and TEST BEFORE YOU TOUCH.
- Make sure you have received training on rescue and resuscitation techniques*. Before working with electricity, check that your work mates also know rescue and resuscitation techniques.

**All electrical workers and apprentices should receive ongoing training in rescue and resuscitation procedures by attending a recognised training course from a reputable training provider annually.*

- Make sure that you have the appropriate PPE, it is in good condition and you understand how to use it correctly.
- Your employer must provide RCDs or safety switches at workplace to reduce the risk of electric shock and electrocution.

Quiz – Electrical safety

1. The first step in effective de-energisation of equipment is to:
   a. test equipment
   b. purchase the key
   c. prepare written procedures
   d. identify and disconnect all sources of electricity

2. Which of the following in **not** a hazards of electricity?
   a. Shock.
   b. Burns.
   c. Explosion and fires.
   d. Sore throat.

3. The protective clothing for an electrical worker should:
   a. cover the body completely, have sleeves to wrist length and have legs reaching to footwear
   b. be of material with properties equivalent to 185gsm, 100 percent cotton drill or better
   c. have non-conductive and concealed buttons
   d. all of the above

4. What of the following risks can be caused by wearing metallic jewellery to perform electrical work?
   a. Electrocution
   b. Burn
   c. Jewellery might catch or jam in moving parts of machine resulting in injuries
   d. All of the above

5. You are about to assist your supervisor who is a qualified electrical worker to install a security alarm on a private house. You are asked to run cables through the celling space of the house.

   What must be done first to prevent electric shock?
   a. Prepare the cables.
   b. Isolate and de-energise all sources of electricity in the roof space.
   c. Test whether the electric source is working.
   d. Put on sun protection to prevent sunburn.

Equipment and tools

Many young electrical workers injure themselves using power tools. Common injuries are cuts, abrasions, lacerations, amputation and eye injuries. The types of tools widely used by electrical workers include powered or battery-operated drills, angle grinders, and chasing machines.

Electrical workers need to show caution when using angle grinders or chasing machines. Large angle grinders, if not operated as per the manufacturer's instructions or the *Concrete and masonry drilling and cutting code of practice*, can cause severe injuries.

Never use a large angle grinder or chasing machine above shoulder height. Cutting above shoulder height is against the manufacturer's instructions for use and kickback could cause serious or fatal injuries.

What can your employer do to keep you safe?

It is your employer's responsibility to:

- ensure and maintain the safe condition of equipment and tools issued to workers (i.e. power tools must be fitted with guards and safety switches)
- check that the power supply for any plug-in tools or equipment is RCD protected
- have safe work procedures in place and provide you with training and supervision in the proper use of handing of equipment and power tools
- provide you with appropriate PPE such as safety goggles and gloves to protect you against hazards from using electrical equipment and power tools.

What can you do to be safe?

- Operate the equipment and power tools correctly and safety. Use tools according to the manufacturer's instructions and follow safe work procedures. Speak to your supervisor if safe work procedures are not available.
- Maintain tools with care. Examine each tool for damage before use and don't use damaged tools. If you find damage, remove the tool from use and tag it 'Do Not Operate or Use'.
- Keep all machinery and tool guards in place. Any guard removed during cleaning must be replaced before the item is used again. Guards are there to protect you from moving parts.
- Disconnect tools from their power source when not in use, before servicing and cleaning, and when changing accessories such as blades, bits and cutters.
- Use RCD protection when operating any plug-in electrical tool or equipment.
- Use non-conductive tape measures when working on or near electrical equipment.
- Wear PPE and appropriate clothing for the task. Loose clothing, untied long hair and dangling jewellery can become caught in moving parts.

Quiz – Equipment and tools

6. Which of the following IS a safe practice when working with power tools?
   a. Never use a large angle grinder or chasing machine above shoulder height.
   b. Use RCD protection when operating any plug-in electrical tool or equipment.
   c. Examine each tool for damage before use. If you find damage, remove the tool from use and tag it "Do Not Operate or Use".
   d. All of the above.

7. Which of the following injuries can be caused when using power tools?
   a. Cuts
   b. Abrasions

c. Lacerations

d. All of the above

8. What should you do before using a power tool?

a. Carefully inspect the tool to make sure that it is not damaged.

b. Carry the tool by the power cord with your finger on the power switch.

c. Remove all guards.

d. Nothing.

Falls from a height

A fall from height can be considered as a fall from one height or level to another. Electrical workers are often required to work at height such as on roofs. They may encounter incidents such as trips and falls on roofs, through roofs and openings or while accessing and exiting roof areas. A fall from height can be fatal.

Some common causes of falls from height include:

- tripping over unprotected edges
- stepping onto fragile roof surfaces such as skylights or vents
- working in bad weather conditions (i.e. strong winds can cause loss of balance, and rain can cause slippery conditions from wet roof surfaces)
- losing balance or grip.

Fragile roofs

A qualified electrician and an apprentice electrician worked at a property to install solar panels. Before starting, the electrician got up onto the roof and had a look around as a part of an informal risk assessment. It appeared that the roof was sheeted entirely with galvanised tin. However, the electrician failed to identify that one part of the roof was made of polycarbonate sheeting (skylights). Different roofing materials are likely to support different weight.

The electrician and the apprentice started working on the roof. Shortly afterwards, the apprentice stepped backwards over the ridge of the roof onto the skylight and fell 3.8 metres to the ground. He was seriously injured and required emergency surgery to treat his injuries. His employer was substantially fined for failing to take the practicable steps to identify the hazard, assess the risks and having control mechanisms to reduce the risks.

All roofs should be treated as fragile until a competent person has confirmed they are not. If practicable, the work should be done from scaffolding or another work platform.

The following roofing materials are likely to be fragile:

- old liner panels on built-up sheeted roofs
- non-reinforced fibre cement sheets
- corroded metal sheets
- glass (including wired glass)
- rotted chipboard
- polycarbonate sheeting (skylights)
- slates and tiles.

If there is a risk of falling through the roof, protection must be provided such as:

- a non-corrosive safety mesh that is capable of preventing a person falling through the roof fixed directly over the top of the fragile areas, or directly underneath the brittle or fragile areas

- securely fixed and adequately maintained barriers around the brittle or fragile areas.

Falls from ladders

An electrical apprentice decided to show some initiative and tidy up some cables they ran the previous day. His tradesman had told him to wait for him before starting any work, but the apprentice grabbed the extension ladder and set it up against the wall of the shed. The base of the ladder was resting on a dusty and slippery concrete floor. As the apprentice climbed the ladder, the ladder slipped on the dusty floor and he rode the ladder all the way to the ground breaking both his arms.

Many falls occur from inappropriate use of ladders. Your employer must provide ladders that are suitable for the task and make sure they are looked after. Ladders are only used for light work or easy to reach places.

You must be supervised when you first use the ladders and until you are competent. Before using a ladder, safety checks should be conducted to check that:

- the ladder is industrial-rated (do not use a domestic ladder)
- the ladders are made from fibreglass not aluminium (fibreglass will not carry an electrical current)
- there is no damage to the ladder, including loose or missing parts
- the ladder is properly put up and secure
- the ladder is located on a firm footing
- the ladder protrudes at least 900 mm beyond the landing for the platform it is being used to access

Make sure that you maintain “three point contact” when going up or down a ladder. This means two hands one foot, or two feet one hand

What can my employer do to keep you safe from falling from a height?

- Your employer must ensure tools and equipment provided are appropriate for the task and in good condition.
-
- Where possible, it is best to avoid or limit the need to work at height. This can include reducing the amount of time spent working on roofs.
- If working at height cannot be avoided, your employer must provide safe systems of work such as:
- fall injury prevention devices – examples include roof safety mesh, safety net, guard railing, scaffolding, fall-arrest systems and elevating work platform
- work positioning systems – for example, travel restraints* which are designed to prevent workers from reaching an edge where they could fall.

** A travel restraint consists of a harness that is connected by a lanyard to a suitable anchorage point. It prevents the user from approaching an unprotected edge on a building construction where a fall may occur.*

What can you do to be safe from falling from a height?

- Use all PPE given to you correctly. Safety belts and harnesses should be checked and inspected each time before use, with particular attention being paid to buckles, rings, hooks, clips and webbing.
- Never stand on or walk across a roof made of fragile material.
- Use ladders properly. Conduct safety checks before using a ladder.

Quiz – Falls from a height

9. Which of the following statements is **not** correct?
   a. All roofs should be treated as fragile until a competent person has confirmed they are not.
   b. Never stand on or walk across a roof made of fragile materials.
   c. Roofs made of corroded metal sheets are fragile roofs.
   d. All roofs are considered stable.

10. Before using a ladder, safety checks include checking that the ladder:
   a. has no damage including loose or missing parts
   b. is properly put up and secured
   c. is industrial rated
   d. all of the above.

11. 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 (such as a safety harness).
   c. Reducing the amount of time spent working on roofs.
   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, which affect the muscles, bones and/or joints.

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. vibration-induced white finger from hand-arm vibration)
- soft tissue injuries.

How does performing a manual task may 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:

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

What can your employer do to keep you safe?

Your employer has a responsibility to provide and maintain a safe workplace. If you are about to perform tasks that may become hazardous, ask your employer or supervisor for assistance.

Your employer should provide you with **risk management* and ***task specific training* for performing hazardous manual tasks at your workplace.

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

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 new ones 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 their sources 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 the load, where applicable
- organise the task 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.

> ***Remember:***
>
> *Speak up if you think the task is too much for you. The effects of injuries from manual tasks can last a lifetime.*

Quiz – Manual tasks

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

13. What injuries can be a consequence of performing hazardous manual tasks?
    a. Sprains and strains of muscles, ligaments and tendons
    b. Nerve injury or compression
    c. Muscular and vascular disorders
    d. All of the above

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

d. All of the above

Hazardous Substances

A hazardous substance can be any substance, liquid, solid, dust or gas that may cause you harm. Electrical workers may encounter or work with hazardous substances such as asbestos, silica dust, rosin flux, synthetic mineral fibres, glue, paint or solvents.

These substances shouldn't be a problem most of the time, but things can go horribly wrong 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.

Example of hazardous substances

Asbestos

Electrical workers may work with switchboard panels or encounter asbestos in building materials. Asbestos become a health risk when its fibres are released into air and breathed in. Asbestos dust is very dangerous to inhale and may cause cancer.

In Australia, asbestos was once used in more than 3,000 different products including fibro, flue pipes, drains, roofs, gutters, brakes, clutches and gaskets. Asbestos is now banned for use in new materials, but it is still commonly found in older properties.

When asbestos is bound in asbestos cement sheeting and in good condition, it is not a problem. However, if asbestos cement sheeting is cut with power tools or broken up, asbestos dust is produced.

What can you do to be safe from asbestos?

- Make sure you follow safe work procedures.
- Know what to do and where to go if you are affected by asbestos. Check with your employer if you are unsure.
- If you are not sure whether something is asbestos, ask your supervisor. If you are still not sure, treat it as if it is, just in case.
- Ask to be trained in the procedure to handle asbestos panels without making dust. Never use power tools to cut or drill asbestos material.
- Wear PPE provided.

Silica Dust

Electrical workers may be required to perform tasks such as chasing gutters or grooves in concrete, brickwork or other masonry surfaces to allow for the inclusion of wires, cables, pipes or flashing. Silica (or silicon dioxide – SiO_2) is a very common mineral used in the construction industry. Sand, concrete, bricks, tiles, mortar and engineered stone all contain silica. Silica is most dangerous to health when dust is generated, becomes airborne and is inhaled by a worker. Concrete dust may carry high levels of silica dust and repeated exposure can cause silicosis, which causes scarring and stiffening of the lungs. The effects are irreversible, resulting in death.

What I can you do to be safe from silica dust?

- If you are working with material that may contain silica, your employer must provide you with information, training and instruction about:
    - the risks associated with the work and exposure to silica dust

- the control measures at the workplace
- the correct use and maintenance of RPE (respiratory protective equipment)
- health monitoring of workers

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

> ***Remember:***
>
> *Silica dust is harmful. If you are required to work with silica and be exposed to silica dust, talk to your employer about the control measures and how to work safely. You must be given RPE and PPE.*

Rosin flux

Flux is a sticky liquid or paste used for metal soldering. Hand soldering is used by workers repairing electrical circuit boards and electronic equipment. When heated during soldering, rosin flux gives off fumes containing many chemical compounds. These can cause irritation and health problems if inhaled. Skin contact usually happens when people get flux on their hands while it is being applied to metal surfaces before soldering.

Exposure to rosin flux can cause eye, throat and lung irritation, nosebleeds and headaches. Repeated exposure can cause respiratory and skin sensitisation, causing and aggravating asthma.

What can your employer keep you safe from flux?

- If possible, eliminate soldering completely
- Replace rosin flux by using fluxes that do not contain rosin or use rosin core solder which doesn't spill onto hands.
- Separate the worker from the flux fumes by physical barriers as in most automated soldering processes.
- Where soldering work is done frequently, use local exhaust ventilation to capture fumes.
- Provide PPE (safety gear) like gloves, glasses and masks that should be worn while soldering.

What can you do to be safe when soldering?

- Never touch the element or tip of the soldering iron. These are very hot (about 400°C) and can cause burns. Be aware that the element and tip will stay hot for a few minutes after the iron is unplugged.
- If you are burnt, cool the affected area immediately by running the burn under cold water for a minimum of 20 minutes. In the absence of water, use any cool clean fluid such as beer or soft drink.
- Seek medical attention if the burn covers an area larger than a 20 cent piece, or is deep.
- Hold any wires that need heating with tweezers or clamps.
- Always return the soldering iron to its stand when not in use. Never put it down on your workbench. Turn the unit off or unplug it when not in use.
- Soldering should be performed in a well-ventilated area. Avoid breathing in the smoke by keeping your head to the side of, not above, your work.
- Wear appropriate PPE such as gloves and safety glasses when soldering.

Quiz – Hazardous substances

15. Which statement is correct?
    a. Inhaling asbestos fibres is the major health hazard associated with asbestos.
    b. Asbestos dust is very dangerous to inhale and may cause cancer.
    c. Asbestos is banned for new buildings, but can still be found in older buildings.
    d. All of the above.

16. When chasing concrete walls, workers may be exposed to _____.
    a. wood dust
    b. silica dust
    c. dust mites
    d. rosin flux

17. Breathing solder fumes is unsafe. Soldering should be performed in a well-ventilated area:
    a. True
    b. False

18. You do not need to wear safety glasses when soldering:
    a. True
    b. False

Working safely in hot conditions

Having to work outdoors, on roofs and in ceiling spaces is common for electrical workers. Heat stress and solar ultraviolet (UV) radiation exposure are well-recognised work health and safety hazards. The effects of heat stress range from discomfort to life threatening illnesses such as heat stroke. Sunburn can cause permanent skin damage and is a major risk factor for developing melanoma.

Heat may come from:

- hot climate conditions
- radiant heat from the surroundings such as heat trapped in celling space
- 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 to maintain a healthy temperature. Symptoms of heat stress include:

- cool, moist skin with goose bumps when in the heat
- 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 40C
- hot dry skin
- irritability
- speech problems
- confusion
- convulsions
- unconsciousness

- cardiac arrest*.

**Cardiac arrest is potentially fatal; however, it is reversible in most victims if treated within a few minutes. Cardiac arrest is a life threatening condition that requires immediate first aid (cardio pulmonary resuscitation – CPR) and medical treatment.*

What can your employer do to keep me safe?

- 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 their skin is not exposed to the sun.

What can you do to be safe?

- 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 that may increase your risk of heat illness.
- Maintain a healthy lifestyle, including a healthy diet and regular exercise.
- Apply sunscreen (SPF30+) 20 minutes before sun exposure. Make sure the back of your neck and arms are covered. Re-apply as necessary.
- 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 clothing, drink plenty of water and fluids, and apply a wet cloth, cold water or ice packs to the skin (particularly the neck, armpits and groin).
- Although water is generally adequate for fluid replacement, low joule cordials and electrolyte replacement solutions may be provided to encourage fluid intake. High sugar cordials and sports drinks are not recommended.

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

- First, call 000 for an ambulance.
- 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 safety in hot conditions

19. If you suspect a person has heat stress, encourage them to:
    a. rest in a cool, well ventilated area
    b. remove excess clothing and drink plenty of water and fluids
    c. apply a wet coth, cold water or ice packs to the skin (neck, armpits and groin)
    d. all of the above

20. Heat _____is the most serious form of heat stress.
    a. Rash
    b. Exhaustion
    c. Stroke
    d. Waves

21. To avoid heat stress during hot work conditions, it is recommended that you drink at least 250ml of water _____to replace lost fluids.
    a. Every 15 to 20 minutes
    b. During lunch break
    c. Every 2 to 3 hours
    d. If needed

22. What should you do in the first instance when you suspect that your workmate is experiencing heat stroke?
    a. First 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.

Spot the hazards

Western Energy

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

Hazard notebook

Fill in the hazard notebook

#	Spot the hazard	Assess the risk	Make the change	Monitor and follow-up
1	PPE and RPE for silica dust	High	Ask the person to wear RPE and PPE to protect themselves from hazardous dust.	Check in later to confirm that they are wearing the correct RPE and PPE.
2				
3				
4				
5				
6				

Electrical industry – Knowledge quiz

1. The first step in effective de-energisation of equipment is to:
   a. test equipment
   b. purchase the key
   c. prepare written procedures
   d. identify and disconnect all sources of electricity

2. Which of the following in **not** a hazards of electricity?
   a. Shock.
   b. Burns.
   c. Explosion and fires.
   d. Sore throat

3. The protective clothing for an electrical worker should:
   a. cover the body completely, have sleeves to wrist length and have legs reaching to footwear
   b. be of material with properties equivalent to 185gsm, 100 percent cotton drill or better
   c. have non-conductive and concealed buttons
   d. all of the above

4. What of the following risks can be caused by wearing metallic jewellery to perform electrical work?
   a. Electrocution
   b. Burn
   c. Jewellery might catch or jam in moving parts of machine resulting in injuries
   d. All of the above

5. You are about to assist your supervisor who is a qualified electrical worker to install a security alarm on a private house. You are asked to run cables through the celling space of the house. What must be done first to prevent electric shock?
   a. Prepare the cables.
   b. Isolate and de-energise all sources of electricity in the roof space.
   c. Test whether the electric source is working.
   d. Put on sun protection to prevent sunburn.

6. Which of the following IS a safe practice when working with power tools?
   a. Never use a large angle grinder or chasing machine above shoulder height.
   b. Use RCD protection when operating any plug-in electrical tool or equipment.
   c. Examine each tool for damage before use. If you find damage, remove the tool from use and tag it "Do Not Operate or Use”.
   d. All of the above.

7. Which of the following injuries can be caused when using power tools?
   a. Cuts
   b. Abrasions
   c. Lacerations
   d. All of the above

8. What should you do before using a power tool?
   a. Carefully inspect the tool to make sure that it is not damaged.
   b. Carry the tool by the power cord with your finger on the power switch.
   c. Remove all guards.
   d. Nothing.

9. Which of the following statements is **not** correct?
   a. All roofs should be treated as fragile until a competent person has confirmed they are not.
   b. Never stand on or walk across a roof made of fragile materials.
   c. Roofs made of corroded metal sheets are fragile roofs.
   d. All roofs are considered stable.

10. Before using a ladder, safety checks include checking that the ladder:
    a. has no damage including loose or missing parts
    b. is properly put up and secured
    c. is industrial rated
    d. all of the above.

11. 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 (such as a safety harness).
    c. Reducing the amount of time spent working on roofs.
    d. All of the above.

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

13. What injuries can be a consequence of performing hazardous manual tasks?
    a. Sprains and strains of muscles, ligaments and tendons.
    b. Nerve injury or compression.
    c. Muscular and vascular disorders.
    d. All of the above.

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

15. Which statement is correct?
    a. Inhaling asbestos fibres is the major health hazard associated with asbestos.
    b. Asbestos dust is very dangerous to inhale and may cause cancer.
    c. Asbestos is banned for new buildings, but can still be found in older buildings.
    d. All of the above.

16. When chasing concrete walls, workers may be exposed to _____.
    a. wood dust
    b. silica dust
    c. dust mites
    d. rosin flux

17. Breathing solder fumes is unsafe. Soldering should be performed in a well-ventilated area:
    a. True
    b. False

18. You do not need to wear safety glasses when soldering:
    a. True
    b. False

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    a. rest in a cool, well ventilated area
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