Learner Guide

UETDRMP018 Perform rescue from a live low voltage panel (Release 1)

V1.0

Disclaimer

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This guide has been prepared as a resource to assist students to understand the requirements of the learning program.

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Unit Application

This unit involves the skills and knowledge required to perform a rescue from live low voltage (LV) electrical apparatus in an electrical industry environment. This does not include overhead lines and underground cables.

It includes the organisational workplace requirements for the inspection and use of live LV panel rescue equipment, and how it applies to electricity supply industry (ESI) workers and/or electrical industry workers to meet work health and safety (WHS)/occupational health and safety (OHS), mobility and mutual aid requirements.

Licensing/regulatory information

The application of the skills and knowledge described in this unit may require a licence/registration to practice in the workplace.

Other conditions may also apply under state and territory legislative and regulatory licensing requirements which must be confirmed prior to commencing this unit.

Pre-requisite unit

HLTAID009 Provide cardiopulmonary resuscitation.

Elements and Performance Criteria

Element	Performance Criteria
1. Prepare to perform rescue procedures from live LV panel	1.1 Workplace requirements for the rescue are identified and confirmed. 1.2 Electricity isolation point is identified. 1.3 Rescue equipment including personal protective equipment (PPE) is obtained and inspected in accordance with workplace requirements.
2. Carry out rescue from live LV panel	2.1 Situation is assessed, and rescue response is activated in accordance with workplace requirements. 2.2 Casualty is removed from the live LV panel in accordance with workplace requirements.
3. Complete the LV panel rescue procedure	3.1 Casualty is assessed in accordance with workplace requirements. 3.2 Incident site is secured and entry controlled in accordance with workplace requirements. 3.3 Incident is reported in accordance with workplace requirements.

Performance Evidence

Evidence required to demonstrate competence in this unit must be relevant to and satisfy all of the requirements of the elements and performance criteria on one occasion and include:

- identifying organisational rescue requirements
- identifying hazards, assessing risks and applying control measures
- identifying the isolation point
- confirming voltage(s) and related safe approach distance(s)
- obtaining and inspecting rescue equipment
- fitting of rescue personal protective equipment (PPE)
- performing a rescue from a live low voltage (LV) panel in accordance with workplace requirements.

Knowledge Evidence

Evidence required to demonstrate competence in this unit must be relevant to and satisfy all of the requirements of the elements and performance criteria and include knowledge of:

- organisational procedures for the rescue of a casualty from a live LV panel including:
    - inspection and placement of rescue equipment
    - types and application of rescue PPE
    - assessment and control hazards to rescuer, casualty and others
    - isolation identification procedures
    - identify voltages and related safe approach distances.
    - safety observer role and responsibilities
    - assessment of situation
    - activation of emergency response
    - electrical contact release
    - removal of casualty to safe location
    - assessment of casualty
    - incident site security
    - reporting requirements.

Please Note:

This guide will provide you with general information about the electrical supply industry. Some of the content you will review here will include general requirements, as well as specific state-based rules and regulations. Please ensure you reference the information relevant to your State.

Topic 1 – Working with Electricity

1.1 Workplace requirements for the rescue are identified and confirmed.

By the end of this topic, the student should be able to:

- Identify and confirm legislative and workplace requirements that relate to emergencies while working on or near low voltage apparatus.
- Understand the roles and responsibilities of a safety observer and a rescuer when carrying out work on or near live low voltage equipment.

Introduction

In our modern world, electricity stands as a fundamental force that drives our daily lives. Yet, its potential for dangerous outcomes cannot be understated. Proper risks management is imperative to prevent serious injuries and fatalities.

From the Electrical Regulatory Authorities Council (ERAC) recent records:

- Thirteen (13) electrical deaths from 12 incidents were recorded in Australia and New Zealand in 2018-19. Eleven (11) of these thirteen (13) deaths occurred in Australia.
- There were seven (7) distribution network related deaths caused by electrical accidents. These deaths were associated with overhead conductors.
- Six (6) deaths were caused by five (5) incidents involving customers' installations, appliances, or equipment:
    - A damaged extension cord resting on the tray of the truck resulted in the conductive metal parts of the truck and the electric fence type cabling becoming energised and killed two (2) people.
- Of the thirteen (13) people who were electrocuted, 69% (9 of 13) were either non-electrical workers, or the general public.

These figures highlight the urgent necessity for a comprehensive understanding of electrical hazards within Australia's Electrical Supply Industry.

Throughout this training we will look at potential risks in the ESI industry when working with electricity and cover industry best practice strategies to mitigate these risks. A significant focus of this training is on Low Voltage (LV) rescue techniques – a life-saving skill that plays a pivotal role in ensuring the safety of those exposed to electrical hazards.

Empowering ourselves with knowledge of safety protocols and emergency rescue skills not only safeguards those working directly with electricity but also fosters an environment of safety for the wider community, collectively contributing to a safer future for all Australians involved with electrical power.

What is Electrical Work?

According to the Model Code of Practice for Managing Electrical Risks in the Workplace, Electrical work generally refers to connecting or disconnecting electricity supply wiring to and from electrical equipment and installing, removing, adding, testing, replacing, repairing, altering or maintaining electrical equipment or an electrical installation.

Electrical Legislation

Work Health and Safety (WHS) Act

The Work Health and Safety Act 2011 (Cth) requires persons who have a duty to ensure health and safety to **'manage risks'** by eliminating health and safety risks so far as is reasonably practicable, and if it is not reasonably practicable to do so, to minimise those risks so far as is reasonably practicable.

The WHS Act provides a framework to protect the health, safety, and welfare of all workers at work. It also protects the health and safety of all other people who might be affected by the work.

The WHS Act places the primary health and safety duty on a person conducting a business or undertaking (PCBU) who must ensure, so far as is reasonably practicable, the health and safety of workers at the workplace. Duties are also placed on officers of a PCBU, workers and other persons at a workplace.

Electrical Safety (ES) Act

Each state and territory in Australia will also mandate an Electrical Safety Act which generally aims to eliminate the death, injury and destruction that can be caused by electricity - the human cost to individuals, families, and the community.

ES Acts establish a legislative framework for preventing persons from being killed or injured and preventing property from being destroyed or damaged by electricity. ES Acts place the primary electrical safety duty on a PCBU, who must ensure the business or undertaking is conducted in a way that is electrically safe.

Duties are also placed on officers, workers, and other persons at a workplace, as well as electricity entities, designers, manufacturers, importers, suppliers, installers, repairers, and persons in control of electrical equipment.

In terms of electrical safety, where the ES Act and the WHS Act both apply, the ES Act takes precedence.

Workplace Requirements

There are several work requirements that must be adhered to when working on or near live electrical apparatus, however, ensure you clarify the requirements with your employer, the network on which you are working, and the relevant State/Territory requirements for electrical work before you start.

For all intents and purposes, low voltage (LV) typically refers to electrical energy at voltages exceeding 32 Volts AC or 115 Volt DC but not exceeding 1000 Volt AC or 1500 Volt DC. The nominal low-voltage level in Australia is now 230V.

Identifying Voltages in LV Environments

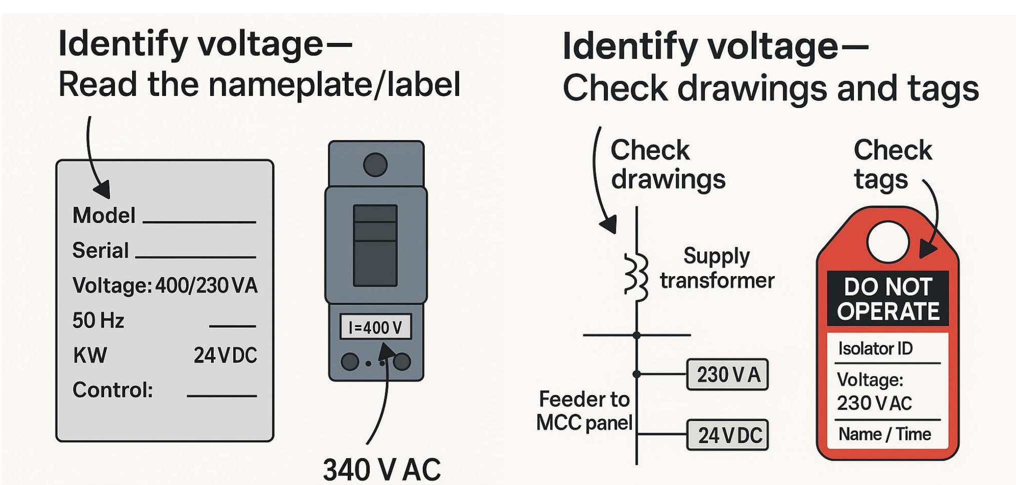
Correctly identifying voltages helps you choose the right safe approach distance (SAD), PPE and rescue equipment, and avoid accidental contact during a rescue.

Voltage categories you'll see:

- **Extra-low voltage (ELV):** typically, ≤ 32 V AC or ≤ 115 V DC in this guide's context. Used for control/communication and battery systems.
- **Low voltage (LV):** > ELV up to and including 1000 V AC or 1500 V DC. Typical for building supply and most panels.

Identify the voltage by first reading the equipment nameplate or label, including control transformer labels, power supply ratings and breaker markings (for example, 230 V AC, 400 V AC or 24 V DC). Check the drawings and tags, such as single-line diagrams, circuit schedules and lock-out/tag-out (LOTO) tags which usually state the supply voltage.

Look for multiple sources because panels often contain mixed supplies (such as 230 V AC and 24 V DC) and possible backfeeds from a UPS, battery or a VSD DC bus. Finally, confirm with an approved test instrument before you act - labels and colours are not proof, so treat the installation as live until it is isolated and proved de-energised.



Who is Involved?

When working with another person on or near live exposed low voltage apparatus you must both work on the same electrical potential.

When working on or near any live low voltage apparatus, you must have a:

- Safety Observer.
- Rescuer.

Safety Observer

If you are required to work on or near live low voltage-exposed conductors, you must be accompanied by a Safety Observer who is authorised in the category of work being observed. The role of the safety observer is to observe the worker performing the live work to ensure the work is being undertaken safely with the appropriate safety controls implemented.

The Safety Observer must:

- Take up an appropriate position to ensure Safe Approach Distances (SADs) will not be breached by any plant, machinery, equipment being used, or any other persons.
- Ensure adequate barriers are installed to cover all conductors and conductive material *__within extended reach__* of the work *(*excluding the conductor/apparatus being immediately worked on.
- Be listed as such on the job safety documentation.

The Safety Observer MUST be able to immediately stop work with verbal communication.

Rescuer

In addition to a safety observer, a rescuer must be nominated to provide emergency assistance within the Safe Approach Distance (SAD) when working on or near energised electrical equipment in any of the following circumstances:

1. **Phase Interaction:** Where there is a risk of contact between conductors of differing phases and voltages.
2. **Earthing:** Where there is a risk of conductors coming into contact with earth conductor.
3. **Uninsulated Contact Risk (indirect):** Where there is a risk of uninsulated contact with individuals not involved with the task being performed.
4. **Uninsulated Contact Risk (direct):** Where there is a risk of uninsulated contact with exposed bus bars or open conductors.
5. **Working at Heights:** Where electrical work is performed at a fall of more than 2 metres (measured from bottom of the worker's feet to the ground), a fall restraint is required.
6. **Other:** Where regulatory and workplace instructions, codes of practice and/or guidelines require it.

The rescuer must:

- Have an available means of communicating with emergency services and the network controller for the duration of the task.
- Be in proximity to an appropriate rescue kit and be ready to use it if required.
- Hold current competency in rescue procedures relevant to the work being undertaken as well as in Cardiopulmonary Resuscitation (CPR).

The same person can carry the responsibilities of the Safety Observer, and the Rescuer provide they hold the required competencies.

The Low Voltage Rescuer

A low voltage rescuer is a competent first responder in emergency situations involving low voltage electrical incidents. The training you are undertaking today will equip you with the skills and knowledge necessary to assess, manage, and mitigate the risks associated with electrical accidents, while also providing immediate assistance to victims if they come into contact with low voltage electrical sources.

As a low voltage rescuer, your key responsibilities include:

1. **Conducting a Risk Assessment**: You must be able to quickly assess a situation and identify potential hazards. This involves determining whether the electrical source has been properly isolated, evaluating the casualty's condition, and deciding on the appropriate course of action.

2. **Isolation and De-energisation**: If it is possible and safe, you should isolate the power source to prevent further electrical exposure. This might involve turning off circuit breakers, unplugging equipment, or utilising appropriate isolation techniques.

3. **Emergency First Aid**: You must provide immediate first aid and care to the casualty. This might include administering CPR, checking for breathing and circulation, and providing basic medical assistance until emergency services arrive.

4. **Communication**: Depending on the situation, you may be required to communicate with emergency service personnel, co-workers, or other relevant personnel to ensure proper response and assistance is provided to preserve life.
5. **Extraction and Evacuation**: If the casualty is unconscious or unable to move, you must be capable of safely extracting them from the hazardous area and providing appropriate care.
6. **Prepare and Utilise Rescue Equipment**: Being familiar with the necessary personal protective and rescue equipment and how to use it is crucial. You will need to prepare and use insulated gloves, rescue hooks, and other specialised tools designed to minimise the risk of electrical shock.

In addition to these key responsibilities, the rescuer will need to be familiar with the work being carried out and the plant and equipment being used:

- You must be positively identified to each member of the work team and nominated on the safety documentation.
- You must be aware of the work being undertaken and how it will progress and what changes need to be made to a potential rescue scenario. For example, as the work progresses, the rescue kit may need to be moved.
- You must be competent to use the equipment that may be needed to affect a rescue. For example, you must know how to operate Elevating Work Platform (EWP) controls from the base if an EWP is being used for the work task.
- You must know and document the physical location of the job so that it can be communicated to an external party easily with a clear address.
- You must assemble the rescue kits prior to commencing the live LV work so that they can be deployed for immediate use. They must be within reach of the rescuer and not stored in a vehicle, for example.
- As the rescuer, you may perform other tasks during the work, provided that the rescue kits remain in proximity, and you can access the rescue equipment almost instantly.
- Where a pole top rescue may be required, you must don a safety harness prior to the live LV work commencing.

The rescue equipment MUST be inspected prior to job commencement to ensure that all contents are present and in good condition. Damaged or out-of-date equipment MUST be replaced.

Topic 2 - Hazards and Risks in the Incident Environment

By the end of this topic, the student should be able to:

- Understand common electrical hazards and high-risk situations and conduct inspections to identify hazards in the work environment.
- Assess identified risks to determine the likelihood and severity of harm occurring to the worker as well as additional risks to the rescuer, the casualty and to bystanders.
- Determine appropriate control measures to control electrical and other risks to minimise harm.

Introduction

Electrical risks refer to potential dangers and hazards associated with the use, generation, distribution, and maintenance of electrical systems and equipment. These risks arise due to the presence of electric currents, which can lead to various harmful effects, including electric shock, burns, fires, explosions, and even fatalities.

Electrical risks are present in various settings, including homes, workplaces, industries, and public spaces and these risks are generally higher when working:

- Outdoors or in damp surroundings as equipment may become wet and may be at greater risk of becoming damaged.
- In cramped spaces with earthed metalwork. For example, inside a tank or bin it may be difficult to avoid receiving an electrical shock if an electrical fault develops.

Some types and items of equipment can also involve greater risk than others, for example:

- Portable electrical equipment such as plugs and sockets, electrical connections and to the cable itself are especially vulnerable to damage.
- Extension leads, particularly those connected to equipment that is frequently moved, can suffer similar problems.

Higher-risk workplaces are where the environment is likely to damage equipment including:

- Wet or dusty areas.
- Outdoors.
- Workplaces that use corrosive substances.
- Commercial kitchens.
- Manufacturing environments.

In this topic, we look at some common hazards when working on or near live low voltage apparatus, and the risk management process to mitigate these risks.

What is an Electrical Risk?

Electrical risks are risks of death, electric shock or other injury caused directly or indirectly by electricity. Even the briefest contact with electricity at 50 volts (AC) or 120 volts (DC) can have serious consequences to a person's health and safety. It only requires a very small failure of a work practice, such as a slip with a screwdriver or a dropped tool, for such accidents to occur.

Workers using electricity may not be the only ones at risk - faulty electrical equipment and poor electrical installations can lead to fires that may also cause death or injury to others.

Common Electrical Hazards

Electrical hazards come in a variety of forms, but all have the potential to cause serious injury. The most common electrical hazards include:

- Contact with live wires and/or exposed electrical components resulting in electric shock and burns.
- Fires due to faulty or inadequate wiring.
- Ignition of fires or explosions due to electrical contact with potentially flammable or explosive materials.
- Improper grounding sometimes caused by workers deliberately removing the ground pin on an electric plug to fit a two-prong extension cord.
- Interaction with overhead power lines.
- Damaged wire insulation causing electrical conductors to contact each other, tools, or a worker's body.
- Overloaded circuits.
- Wet conditions when working with electrical equipment.

Electrical Risks

Electrical risks and causes of injury are:

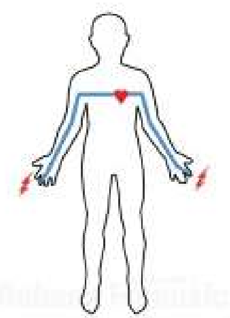
- **Electric shock** causing injury or death because of contact with exposed live parts (for example exposed leads or other electrical equipment coming into contact with metal surfaces such as metal flooring or roofs).
- **Electric shock** from 'step-and-touch' potentials.
- **Burns** from arcing, explosion, or fire. Injuries are often suffered because arcing or explosion or both occur when high fault currents are present.
- **Falls** from ladders, scaffolds, or EWPs as a direct consequence of an electric shock.
- **Fire** resulting from an electrical fault.
- **Poisoning** from toxic gases and contaminants caused by burning and arcing associated with electrical equipment can cause illness or death.

Let's take some time to look at these in more detail.

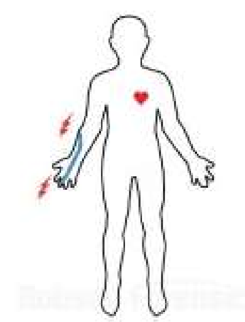
Electric Shock

Electricity can flow through the human body which poses significant risks when contact is established between two objects with differing voltage potentials. For instance, if an individual simultaneously touches two terminals at varying voltage potentials, electric current will pass through their body's tissues.

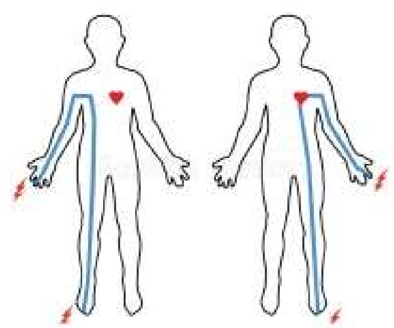
In another scenario, even when only one terminal (the active) is touched, contact with the earth or conductive materials can create a similar effect. These situations can arise through various means, including contact across conducting media, such as wet environments, or due to arcing.



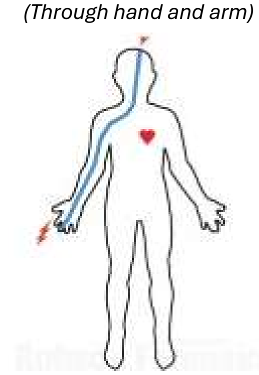
Hand and Hand Contact
(Through hands, arms, and chest)



Hand and Arm Contact
(Through hand and arm)



Hand and Foot Contact
(Through hands, arms, chest, abdomen, leg, and foot)



Hand and Head Contact
(Through hand, arm, neck, and head)

The repercussions of electric current on the body, particularly the nervous system, result in what we commonly refer to as **electric shock**. **Electrocution** means death resulting from an electric shock.

The impact of electric shock varies based on factors like the magnitude of the electric current, the path, frequency, and duration of contact. Even the briefest exposure to electricity can lead to severe consequences.

When the magnitude of the current falls within a specific range and its path intersects the heart region, the normal heart rhythm can be disrupted. This disruption, known as **ventricular fibrillation**, causes the heart to contract irregularly, leading to an inability to circulate blood effectively. Typically, a return to the regular rhythm is unlikely without intervention. If ventricular fibrillation persists for more than a few minutes, the outcome is tragically almost always fatal.

Furthermore, electric shock can halt the heart's functioning altogether and even disrupt the victim's breathing.

Burns

Electrical **flashovers** and **arcs** introduce a host of risks, emphasized by the generation of exceedingly high-temperature gases. These intense heat levels can result in severe burns, leaving victims with enduring disfigurement and lifelong scars. The danger extends further as inhalation of these gases can inflict profound internal burns upon the victim's airways, worsening the trauma.

Entry and Exit Wounds

Notably, the hazard of injury escalates dramatically when dealing with high fault currents. This situation is especially relevant in the case of low voltage circuits positioned near transformers or switchboards. In such instances, the installed electrical protection mechanisms might detect and interrupt an arcing fault sluggishly or not at all, heightening the potential for catastrophic consequences.

Additionally, it's essential to highlight the explosive nature of high-energy electrical arcs. These arcs have the tendency to not only cause injury through the intense heat they produce, but also through the force of the explosion itself. The resulting impact can propel debris at high velocities, endangering anyone within proximity.

Falls

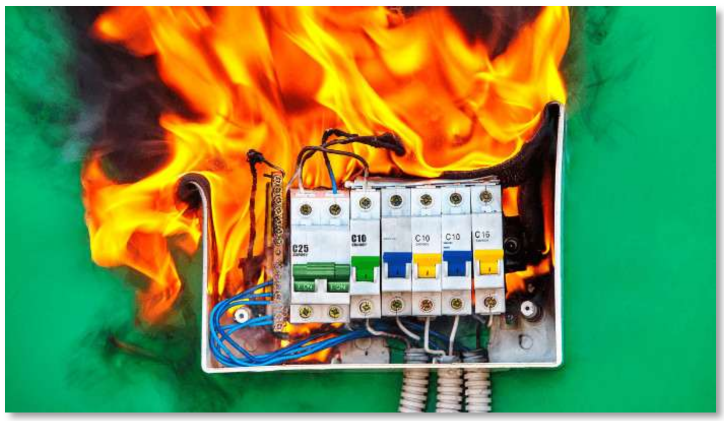
The dangers associated with electrical incidents extend beyond the immediate shock or blast effects. Falls from elevated positions, such as ladders, scaffolds, or work platforms, can directly result from these incidents, potentially leading to grave consequences ranging from serious injuries to fatalities.

The chain of events is clear: an electric shock or arc blast can cause a sudden reaction or involuntary movement, leading to a loss of balance for the individual involved. This momentary loss of stability can lead to dangerous falls from elevated surfaces, thereby compounding the risks associated with electrical accidents.

Fire

While the immediate focus is often on the safety of workers handling electricity, the ramifications of faulty electrical equipment and inadequate installations extend beyond this. These issues can result in fires, which in turn pose threats to individuals, property, and overall community well-being.

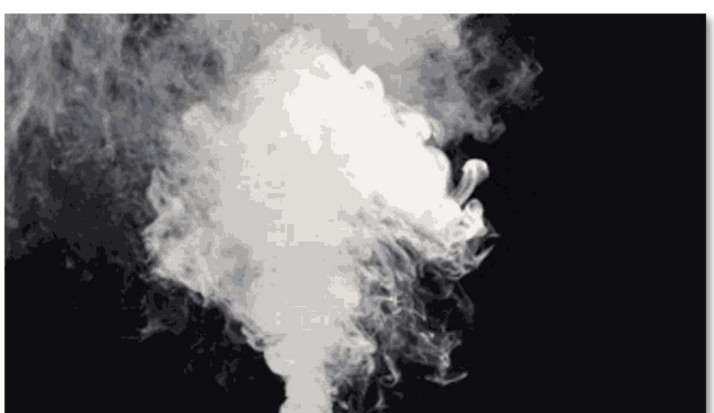
When electrical equipment malfunctions or installations are inadequate, the potential for fires increases significantly. These fires can swiftly engulf surroundings, putting not only workers but also bystanders and the broader community in harm's way. The consequences can range from injuries and fatalities to significant property losses.



Poisoning

Electrical equipment malfunctions, characterised by burning and arcing, can have repercussions that extend beyond the visible damage. These events often lead to the release of harmful gases and contaminants into the surrounding environment. The inhalation of these byproducts poses a substantial risk, potentially triggering short-term or chronic illnesses, and in extreme cases, culminating in death due to suffocation.

As electrical components degrade or fail, the heat generated can cause materials to combust or break down, releasing noxious gases. These gases could contain toxic compounds that are hazardous to human health. Inhaling these substances can lead to immediate symptoms or contribute to longer-term health issues, impacting individuals' well-being in ways that extend far beyond the initial incident.



The Risk Management Process

In terms of electrical safety, a systematic approach to risk management is key. This process requires individuals and organisations to identify, assess, and mitigate potential hazards, ensuring the well-being of all stakeholders.

In the context of electrical safety, the risk management process is as follows:

1. **Identification of Hazards:** Evaluate the work environment to recognise potential risks.
2. **Risk Assessment:** Evaluate the hazards in terms of the likelihood of them occurring, and the severity of the consequences if they did.
3. **Control the Risk:** Strategies to mitigate or eliminate the risks must then be implement in reference to the hierarchy of controls.
4. **Monitoring and Review:** Monitoring the risk management process and the effectiveness of controls ensuring ongoing effectiveness.

Let's look at each of the steps in the process.

1. Identifying Hazards

The first step in the risk management process is to identify all hazards involved with electrical work. This involves finding things and situations that could potentially cause harm to people. Hazards generally arise from the following aspects of work and their interaction:

- Physical work environment.
- Equipment, materials, and substances used.
- Work tasks and how they are performed.
- Work design and management.

Potential electrical hazards may be identified in different ways including:

- Talking to workers and observing where and how electrical equipment is used.
- Regularly inspecting and testing electrical equipment and electrical installations as appropriate.
- Reading product labels and manufacturers' instruction manuals.
- Talking to manufacturers, suppliers, industry associations, and health and safety specialists.
- Reviewing incident reports.

Electrical hazards stem from a multitude of factors, including the design, use, and context of electrical equipment and installations. The scope of potential hazards include:

- **Design, Construction, Installation, Maintenance, and Testing**: From inception to regular maintenance, each phase of an electrical system's lifecycle carries inherent risks. Flaws in design, construction, installation, maintenance, or testing can contribute to hazards that jeopardise safety.
- **Design Changes or Modifications**: Modifications to the original design can inadvertently introduce new risks if not performed with precision and consideration of safety implications.
- **Inadequate or Inactive Electrical Protection**: Safety mechanisms are integral to electrical systems. The absence of appropriate protection or its inactivity can lead to accidents and hazardous situations.
- **Operating Conditions and Environment**: The environment in which electrical equipment operates significantly impacts its performance and longevity. Exposure to adverse conditions, such as outdoor settings or factory environments, can lead to damage or reduced efficiency.
- **Atmosphere and Context**: Electrical equipment used in areas with potential fire or explosion risks, like confined spaces, demands heightened caution due to the volatile nature of the surroundings.
- **Type of Electrical Equipment**: Certain types of equipment, particularly portable or frequently moved items like extension leads, are prone to damage due to their mobility.
- **Age of Equipment and Installations**: As equipment ages, wear and tear can compromise its integrity, potentially leading to hazardous situations.
- **Work Proximity to Electrical Elements**: Tasks carried out near electrical equipment, overhead lines, or underground services introduce a layer of risk, particularly when performed in confined spaces or areas connected to plant or services.

2. Risk Assessment

The next step is to assess the risks which involves considering what could happen if someone is exposed to a hazard and the likelihood of it happening.

A risk assessment can help to determine:

- The severity of an electrical risk.
- Whether existing control measures are effective.
- What action you should take to control an electrical risk.
- How urgently the action needs to be taken.

In some circumstances, a risk assessment will assist to:

- Identify which workers are at risk of exposure.
- Determine what sources and processes are causing the risk.
- Identify if and what kind of control measures should be implemented.
- Check the effectiveness of existing control measures.

A risk assessment should be done when:

- There is uncertainty about how a hazard may result in injury or illness.
- The work activity involves a number of different hazards and there is a lack of understanding about how the hazards may interact with each other to produce new or greater risks, or
- Changes at the workplace occur that may impact on the effectiveness of control measures.

Step 1

To complete a risk assessment, first we need to work out **how hazards may cause harm**.

In most cases, incidents occur because of a chain of events and a failure of one or more links in that chain. If one or more of the events can be stopped or changed, the risk may be eliminated or reduced.

Factors to consider when assessing the risks associated with electrical work are:

- The sources of electrical risks, including energy levels at the workplace.
- The properties of electricity; *electricity is particularly hazardous because electrical currents are not visible and do not have any smell or sound*.
- Work practices and procedures and the nature of the electrical work to be carried out. For example, isolation to carry out maintenance.
- The competence, skill and experience of the workers carrying out the electrical work.
- Potential or actual high fault current levels (i.e., Risks associated with arc flash).
- Availability of isolation points.
- The type of plant, machinery, and equipment to be used.
- Availability of suitable test instruments.
- Availability of properly rated personal protective equipment (PPE).

- The workplace and working environment, for example:
  - In and around trenches, pits, and underground ducts.
  - Ladders, scaffolds, portable pole platforms, elevating work platforms, poles, and towers.
  - Confined spaces or atmospheres that present a risk to health and safety from fire or explosion.
  - The conditions, for example wet weather.
  - Ability to safely rescue people.

Also consider individual workers' needs, for example:

- Is the worker experienced, and have they been properly trained for the working conditions?
- Is the worker physically fit for the proposed work, for example are they able to climb to heights to work on an overhead conductor; are they mentally alert and not fatigued?
- Does the worker have a visual or hearing impairment, for example do they have a visual colour deficiency or hearing loss?
- Does the worker take medication that may increase their vulnerability when working in electrical environments?
- Is the worker working excessively long hours?
- Does the worker suffer from claustrophobia?

Step 2

Secondly, we must work out **how severe the consequences could be**. To estimate the severity of harm that could result from each hazard you should consider the following questions:

- What is the potential impact of the hazard?
  - How severe could the electrical hazard be? For example, direct contact causing electrocution, fire or explosion causing serious burns or death.
  - How many people are exposed to the hazard?
- How likely is the hazard to cause harm?
  - Could it happen at any time, or would it be a rare event?
  - How frequently are workers exposed to the hazard?

You can rate the severity as one of the following:

1. **Minor** – Insignificant.
2. **Moderate** – First aid may be required.
3. **Serious** – Medical attention and time off work may be required.
4. **Major** – Long term illness or serious injury may result.
5. **Catastrophic** – Kill or cause permanent disability or illness.

Severity Rating	Description of consequence
1. Minor	No treatment required.
2. Moderate	Minor injury requiring first aid treatment (e.g., minor cuts, bruises, bumps).
3. Serious	Injury requiring medical treatment or lost time.
4. Major	Serious injury (injuries) requiring specialist medical treatment or hospitalisation.
5. Catastrophic	Loss of life, permanent disability, or multiple serious injuries.

Step 3

Determining **the likelihood that someone will be harmed** is the next step, and can be estimated by considering the following:

- How often is the task done? Does this make the harm more or less likely?
- How often are people near the hazard? How close do people get to it?
- Has it ever happened before, either in your workplace or somewhere else?

You can rate the likelihood as one of the following:

1. **Almost certain** - Expected to occur in most circumstances.
2. **Very likely** - Will probably occur in most circumstances.
3. **Possible** - Might occur occasionally.
4. **Unlikely** - Could happen at some time.
5. **Rare** - May happen only in exceptional circumstances.

Likelihood	Description of likelihood
1. Rare	Will only occur in exceptional circumstances.
2. Unlikely	Not likely to occur within the foreseeable future, or within the project lifecycle.
3. Possible	May occur within the foreseeable future, or within the project lifecycle.
4. Likely	Likely to occur within the foreseeable future, or within the project lifecycle.
5. Almost certain	Almost certain to occur within the foreseeable future or within the project lifecycle.

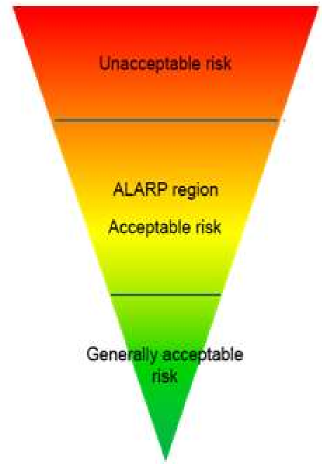
Step 4

Finally, a risk evaluation uses the result of your risk analysis to work out which hazards need to be addressed based on their **'risk level'**. Risk must be managed to a level that is as low as reasonably practicable (ALARP).

Deciding whether a risk is acceptable or unacceptable may be different for each organisation and will depend on the internal policy, goals and objectives of the business and relevant legislation.

The ALARP principle recognises that there are three broad categories of risks:

1. **Acceptable risk:** Broadly accepted by most people as they go about their everyday lives.
2. **Tolerable risk:** We would rather not have the risk, but it is tolerable in view of the benefits obtained by accepting it.
3. **Unacceptable risk:** The risk level is so high that we are not prepared to tolerate it.



Risk Level	Evaluation Action
Extreme	**This is an unacceptable risk level.** The task, process or activity **must not proceed**.
High	**This is an unacceptable risk level.** The proposed activity can only proceed, provided that: **1.** The risk level has been reduced to as low as reasonably practicable using the hierarchy of risk controls. **2.** The risk controls must include those identified in legislation, Australian Standards, Codes of Practice etc. **3.** The risk assessment has been reviewed and approved by the Supervisor. **4. A Safe Working Procedure or Work Method Statement has been prepared.** The supervisor must review and document the effectiveness of the implemented risk controls.
Medium	**This is an unacceptable risk level.** The proposed activity can only proceed, provided that: **1.** The risk level has been reduced to as low as reasonably practicable using the hierarchy of risk controls. **2. The risk assessment has been reviewed and approved by the Supervisor.** **3.** A Safe Working Procedure or Work Method Statement has been prepared.
Low	Review work methods to ensure tasks are completed as safely as is practicable. Highlight risks and any control measures at toolbox to ensure team members understand the risk and their role in managing it. Consider using a SOP.

A Risk Assessment Matrix

When you combine the consequence of the harm, the likelihood of the risk occurring and the acceptable / unacceptable risk levels in a matrix like that below, you can then identify the **level of risk**. Now you can report the hazards and associated risk levels to your supervisor.

Likelihood	Consequence				
	Minor	Moderate	Significant	Major	Severe
Almost Certain Is expected to occur	Low	Medium	High	Very High	Very High
Likely Will probably occur in most circumstances	Low	Medium	High	Very High	Very High
Possible Could occur at sometime	Low	Medium	Medium	High	Very High
Unlikely Event hasn't occurred but it could in some circumstances	Low	Low	Medium	Medium	High
Rare Exceptional circumstances only	Low	Low	Low	Medium	Medium

3. Risks Control Methods

Once hazards have been identified and the risks assessed, appropriate control measures must be put in place.

The ways of controlling risks are ranked from the highest level of protection and reliability to the lowest. This ranking is known as the **hierarchy of risk control.**

You must work through this hierarchy to choose the control that most effectively eliminates or minimises the risk in the circumstances, so far as is reasonably practicable. This may involve a single control measure or a combination of two or more different controls.

Let's look at each level in the hierarchy.

Elimination

You must always aim to eliminate the risk. The most effective control measure is to remove the hazard or hazardous work practice altogether. By designing-in or designing-out certain features, hazards may be eliminated. For example, working on de-energised equipment rather than live equipment will eliminate the hazard of electrocution.

If eliminating the hazards and associated risks is not reasonably practicable, you must minimise the risk by one or more of the following:

Substitution

Replacing a hazardous process or material with one that is less hazardous will reduce the hazard, and hence the risk. For example, it may be reasonably practicable to use extra low voltage electrical equipment such as a battery-operated tool rather than a tool that is plugged into mains electricity.

Isolation

Isolating a hazard can prevent workers being exposed to the risk. Preventing workers from coming into contact with the source of an electrical hazard through barriers and protection will reduce the associated risks.

Engineering Controls

Use engineering control measures to minimise the risk, for example installing residual current devices, will reduce the risk of receiving a fatal electric shock.

Administrative Controls

If risk remains, it must be minimised by implementing administrative controls, so far as is reasonably practicable. Administrative controls involve the use of safe work practices to control the risk, for example establishing exclusion zones, use of permits and warning signs.

Personal Protective Equipment (PPE)

Any remaining risk must be minimised with suitable PPE. PPE includes protective eyewear, insulated gloves, hard hats, aprons and breathing protection. Most forms of PPE are not relevant to minimising electrical risks in workplaces, except in relation to energised electrical work.

NOTE: Administrative controls and PPE do nothing to change the hazard itself. They rely on people behaving as expected and require a high level of supervision. Exclusive reliance on administrative controls and PPE must only occur where other measures are not reasonably practicable or as an interim control while the preferred control measure is being implemented.

Ensure the chosen control measure does not introduce new hazards.

Common measures to control electrical risks at a workplace include:

- Ensuring only appropriately licensed or registered electricians carry out electrical work.
- Standing on insulated mats when carrying out work.
- Providing safe and suitable electrical equipment, for example not using leads and tools in damp or wet conditions unless they are specially designed for those conditions.
- Inspecting leads for damage before use and removing any that are damaged to prevent future use.
- Providing enough socket outlets to avoid overloading.
- Ensuring power circuits are protected by the appropriate rated fuse or circuit breaker.
    - If a circuit keeps overloading, don't increasing the fuse rating as this creates a fire risk due to overheating.
- Using battery powered tools instead of mains operated where possible.
- So far as is reasonably practicable arranging electrical leads so they will not be damaged:
    - Not running leads across the floor or ground, through doorways and over sharp edges.
    - Using lead stands or insulated cable hangers to keep leads off the ground.
    - Using cable protection ramps or covers to protect cables and cords, where applicable.
- Using Residual Current Devices (RCDs) (also known as 'safety switches') to protect workers using portable equipment as required by the WHS Regulations.
    - Determining the reason why an RCD, circuit breaker or other over current protective device disconnected the electricity before it is switched back on.
    - Ensuring RCDs are effective by regular testing.
- Carrying out preventative maintenance on electrical equipment as appropriate for example an appropriate system of visual inspection and where necessary, testing.

4. Monitoring and Reviewing Safety

Finally, control measures must be maintained so they remain fit for purpose, suitable for the nature and duration of work, and installed, set up and used correctly.

The control measures should be regularly reviewed to make sure they are effective and revised when necessary to ensure it remains effective in controlling the risk.

You must review and revise a control measure:

- When the control measure does not control the risk so far as is reasonably practicable.
- Before a change at the workplace that is likely to give rise to a new or different risk to health or safety that the measure may not effectively control.
- When a new relevant hazard or risk is identified.
- When the results of consultation indicate that a review is necessary, or
- When a health and safety representative requests a review if that person reasonably believes it to be necessary.

Common review methods include workplace inspection, consultation, testing and analysing records and data. You can use the same methods as in the initial hazard identification step to check control measures.

The following questions will help you evaluate how well you are currently managing electrical risks in your workplace:

- Do you talk to your workers about electrical safety?
- Do any relevant new work methods or equipment have the potential to make work safer in your workplace?
- Are procedures for identifying electrical hazards in the workplace effective?
- Are electrical safety procedures followed?
- Do you encourage your workers to report electrical hazards?
- Do you regularly inspect and maintain your electrical equipment to identify safety problems?
- Do you fix or rectify identified electrical hazards in a timely manner?

If problems are found, go back through the risk management steps, review your information, and make further decisions about risk control.

Topic 3 – PPE and Rescue Equipment

1.3 Rescue equipment including personal protective equipment (PPE) is obtained and inspected in accordance with workplace requirements.

By the end of this topic, the student should be able to:

- Identify and fit various types of personal protective equipment (PPE) required to protect self when working on or near live electrical apparatus.
- Identify and source the necessary rescue equipment required and ensure it is fit for purpose and safe to use.
- Determine the appropriate locations to place rescue equipment to optimise effective emergency response.

Introduction

The tools, instruments and equipment used by electrical workers often have special design characteristics (e.g., many are insulated). All insulated tools and equipment should be suitable for the work and be maintained in good working order, including regular maintenance, inspection and testing.

Tools, instruments, and equipment that are poorly maintained, inappropriately used or not fit for purpose can cause shock injuries and increase the risk of electrical risks. Incorrectly rated instruments or inadequately insulated or maintained tools and test instruments might conceal a mechanical defect that could cause an open circuit in a testing device.

Where any doubt exists about the adequacy of the insulation of tools and equipment they should not be used.

Personal Protective Equipment (PPE)

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

Clothing of 100% cotton or clothing with flame retardant properties will give maximum protection, provided all surfaces are adequately covered (that is, sleeves rolled down and buttoned at the wrist and legs totally covered). Rings, metal neck chains and other conductive materials should be removed before commencement of work.

Appropriate PPE provides a limited level of protection from:

- Electric shock.
- Flash burns resulting from an arcing fault.
- Mechanical impacts.

PPE cannot be relied on as the sole risk control measure to provide full protection from electrical hazards. PPE should be used in conjunction with other risk control measures and be considered as the final safety measure.

PPE must comply with the relevant legislation and Australian or International technical standards. In particular:

- *Work Health and Safety Regulations* which provide general requirements and technical standards for PPE used.
- *AS/NZS 4836:2023 Safe working on or near low-voltage and extra-low voltage electrical installations and equipment (Section 9)* provides a selection guide for PPE for various types of electrical work.
- *ENA NENS 09-2014 National Guideline for the Selection, Use and Maintenance of Personal Protection Equipment for Electrical Arc Hazards*.

Every electrical worker must ensure that:

- They always use PPE appropriate for the work undertaken.
- Their co-workers also use the appropriate PPE.
- They maintain their PPE in good condition and/or replace any defective items.

Types of PPE

In addition to wearing low voltage insulating gloves, you MUST wear the following PPE when carrying out work on or near live exposed low voltage apparatus:

Eye Protection

Safety glasses provide protection from:

- Flying objects caused by activities such as grinding and cutting.
- Electrical arcing.

Safety glasses must have non-conductive frames. Metal spectacle frames should <u>not</u> be worn.

Footwear

Safety footwear provides protection from:

- Electric shock.
- Falling objects.

Wear non-conductive footwear with a covered steel toe cap.

Gloves

Work gloves provide protection from mechanical impact in relation to tools, equipment, and work materials.

Gloves must have no conductive fasteners such as zips or studs, be made of durable material appropriate for the required work.

Use gloves insulated to the highest potential voltage expected for the work being undertaken. Leather work gloves may be considered for de-energised electrical work.

Arc Rated Clothing

Many work sites require full body cover protective clothing to be worn at all times. This is also required for certain types of electrical work, such as testing and fault-finding.

Clothing provides a limited level of protection from:

- Electric arcing/flash burns.
- Flying or falling objects.
- Electric shock.

Protective clothing for electrical work must cover the body completely and be of cotton material, have non-conductive and concealed buttons, and have sleeves to wrist length and legs reaching to footwear.

Additional care must be taken to ensure clothing is reasonably close fitting and remains fastened to avoid catching or entanglement. This is particularly important when working in the vicinity of any moving machinery or rotating equipment.

Use non-synthetic, flame-resistant clothing of non-fusible material. Clothing made from conductive material or containing metal threads should not be worn.

Safety helmets

Many work sites require safety helmets to be worn at all times. They provide protection from contact with:

- Overhead wires/structures.
- Falling objects.

All helmets must be non-conductive.

RCDs

Fixed or Portable RCDs provide protection from electric shock in the event of:

- Inadvertent energisation of equipment being worked on.
- A malfunction of portable electric tools and extension leads.

RCDs should be tested for correct operation before commencing work.

Safety Belt/Harness

Safety belts and harnesses are required for when working at heights and should be checked and inspected each time before use with particular attention being paid to buckles, rings, hooks, clips and webbing.

Additional PPE

Other types of PPE commonly required for general work include:

- Hearing protection (earplugs or earmuffs).
- Respiratory protection (breathing masks).
- Arc rated full-face shield may be appropriate when working where there is potential for high current and arcing.

Inspecting and Fitting PPE

PPE, including arc-rated safety uniform, MUST be inspected prior to use to ensure that it is in a condition fit to provide adequate protection during the work being performed. It must fit well and be fastened properly before work can commence. Ensure:

- That there are no holes, tears, or frays.
- Equipment is insulated and the insulation is intact.
- There are not conductive materials present.
- That it fits and is fastened correctly.
- That you know how to use it properly.

Rescue Equipment

A rescue kit appropriate for the type of work being undertaken MUST be readily available on the ground, accessible for immediate use to the Nominated Rescuer at each location where live work is being carried out.

Some networks and/or employers require a defibrillation unit to be present and accessible whenever live low voltage work is being undertaken where two or more workers are present.

The **Low Voltage Rescue Kit** is designed to be used by the rescuer for the safe rescue of victims of electrical shock and other electrical injuries when working on low voltage apparatus. The kit is designed to comply with *AS/NZS 4836:2023 Safe working on or near low-voltage and extra-low voltage electrical installations and equipment*.

Kits generally consists of:

- A weatherproof orange high visibility bag made from synthetic non tear material with a reflective strip.
- Insulated 1000V gloves.
- Insulated LV Rescue crook made from fiberglass.
- An “Isolate Here in Emergency” sign.
- A fire blanket.
- Thermal shock blanket.
- Burns treatment items.
- CPR face mask.
- LED torch with batteries.
- List of contents and conformity card.

Equipment Inspections

Rescue kits must be checked prior to commencement of work, to ensure the contents are in good condition and applicable to the work situation. Your inspection must include a check to ensure:

- The torch is functioning properly, and the batteries aren’t flat. If required, replace the batteries and test.
- Trauma dressings are sealed and within the use by date.
- The insulated crook and bag are free from signs of damage or deterioration.
- The structural integrity of the insulated crook by using your hands located at each end and applying an “opposing twist”. This creates torsional tension through the length of the insulated crook to verify its integrity.
- Insulating gloves are free from cuts, tears, perishing and distortion, pinholes, punctures, cracks, chemical bloom, embedded foreign matter and hard spots. If either glove is thought to be unsafe, the pair should not be used and returned for testing and replaced.
- No air leakage occurs in insulating gloves. You can test this by:
    i. Holding the glove downward and grasping the cuff.
    ii. Twirl the glove towards your body to trap the air inside. Squeeze the glove to look for damage.
    iii. Hold the glove to your face and feel and listen for escaping air. Alternatively, immense in water and watch for bubbles (be sure to dry gloves before storing back in the kit).

Placement of Rescue Equipment

The rescue kit is to be readily available prior to work being performed on or near live low voltage equipment. It must be placed and arranged so that items, particularly the insulated gloves and crook, are readily available to the rescuer.

You must install the **"Isolate Here in Emergency"** sign at the isolation switch before starting the work.

Let's now look at how to identify the electrical isolation point.

Topic 4 - Electrical Isolation

1.2 Electricity isolation point is identified.

By the end of this topic, the student should be able to:

- Identify electrical isolation point and take action to isolate the energy source in an emergency.

Introduction

Remember, rescuers are to fully assess the situation they are facing and not jeopardise their own safety by any action they may take, despite the consequences this might have for any victim. As such, it is important to determine the electrical source in an emergency and isolate it if possible.

The point of isolation must be identified before the commencement of work and the method required to isolate the electrical source must be understood. Isolation points must be:

- Clearly marked or labelled.
- Clear of obstructions to allow for easy access and exit by the worker who is to carry out the electrical work or any other competent person.
- Capable of being operated quickly.

Electrical Isolation Points

During electrical emergencies, swift and accurate isolation procedures are critical to prevent further incidents and to ensure the well-being of individuals working with electrical systems. Different types of isolations serve distinct purposes and should be utilised according to the situation and the work environment.

Let's now look at common isolation methods, how to identify them and how to use them effectively.

Lockout/Tagout Devices:

Purpose: Lockout/tagout devices are essential for preventing accidental re-energisation of isolated equipment. They visually indicate that maintenance work is in progress and that the equipment should not be operated.

What to Look For: Use standardised lockout/tagout devices that are compatible with your equipment. Attach them to isolation points to provide a clear visual indication of isolation.

How to Use: Attach the lockout device to the isolation point, and if applicable, secure it with a padlock. Use a tag to indicate who is performing the isolation and why.

Circuit Breakers:

Purpose: Circuit breakers are designed to interrupt electrical currents in the event of a fault or emergency. They serve as automatic switches to isolate faulty parts of a circuit.

What to Look For: Locate circuit breaker panels and identify the specific breaker corresponding to the equipment or area that needs to be isolated.

How to Use: Open the circuit breaker by switching it from the "ON" to the "OFF" position. Use lockout/tagout devices to secure the breaker in the "OFF" position, preventing accidental re-energisation.

Isolators or Disconnect Switches:

Purpose: Isolators physically disconnect equipment or sections of a circuit from the power supply. They provide a visible break in the circuit for maintenance or emergency isolation.

What to Look For: Locate isolators or disconnect switches near the equipment. They often have handles or levers that can be moved to open or close the circuit.

How to Use: Turn the isolator or switch to the "OFF" position to disconnect the power supply. Use lockout/tagout devices to secure it in the "OFF" position.

Emergency Stop Buttons:

Purpose: Emergency stop buttons provide an immediate means to halt equipment operation in emergencies.

What to Look For: Locate emergency stop buttons near equipment or work areas.

How to Use: Press the emergency stop button to deactivate the equipment. Use lockout/tagout devices to secure it in the deactivated state.

Electrical Panels and Cabinets:

Purpose: In some cases, isolating electrical equipment involves securing access to the equipment within electrical panels or cabinets.

What to Look For: Identify the appropriate panel or cabinet that houses the relevant equipment.

How to Use: Open the panel or cabinet using proper tools and procedures. Follow isolation steps specific to the equipment inside, which might involve switching off breakers, disconnecting wires, or removing fuses.

Confirming Voltage Absence

Effective isolation requires familiarity with equipment layout, proper labelling, and adherence to lockout/tagout protocols. Always verify that isolation is successful using appropriate testing tools before performing any work or approaching a casualty on or near the isolated equipment.

1. Evaluate likely sources of voltage.
   - Primary supply: incoming mains, feeders and busbars listed in the panel schedule.
   - Secondary/backfeed: control transformers, UPS/battery, generator changeover, solar PV, VSD DC bus, interlocks from adjacent panels.
   - Stored energy: capacitors in power supplies/VSDs may remain energised after isolation.
   - Parallel sources: multiple isolators or remote supplies into the same enclosure.
2. Select suitable test instruments.
   - Use an approved, in-calibration tester appropriate to the task (e.g. two-pole tester or meter with the correct CAT rating).
   - Non-contact "volt sticks" are not sufficient as the only test.
   - Inspect leads/probes for damage before use. If in doubt about insulation, do not use the tool.
3. Prove de-energised using the three-point method.
   i. Prove: Test your instrument on a known live source to verify it reads voltage.
   ii. Test: Check the isolated conductors in all combinations (phase-to-phase, phase-to-neutral, phase-to-earth).
   iii. Prove again: Re-test on the known live source to confirm your instrument still reads correctly.

Keep treating equipment as live until isolation is proved dead.

Isolating Energy in an Emergency

In the event of an emergency, and only if practicable, isolate the electricity to prevent further electric shock(s). If the electrical equipment contacted by the victim is controlled by a switch, which is readily accessible, the switch should be immediately opened to facilitate the rescue. **LOOK** for the “emergency isolation sign”.

This is subject to the rescuer being competent to do so. The equipment involved shall still be treated as alive unless isolated and proved dead.

Topic 5 - Assessing and Responding to an Incident

2.1 Situation is assessed, and rescue response is activated in accordance with workplace requirements.

2.2 Casualty is removed from the live LV panel in accordance with workplace requirements.

By the end of this topic, the student should be able to:

- Assess a rescue situation and activate an emergency rescue response.
- Apply Safe Approach Distances (SAD) to rescue a casualty from a live low voltage panel.
- Apply electrical contact release techniques to detach a casualty from a live LV panel and remove them to a safe location.

Introduction

Conducting a successful low voltage (LV) rescue requires a thorough understanding of the situation and potential risks. At all times rescuers are to fully assess the situation they are facing and not jeopardise their own safety by any action they may take, despite the consequences this might have for any victim.

Take care that as the rescuer, you do not become a casualty!

In the event of an emergency, you must contact emergency services, or have another worker or bystander make the emergency call.

(Or 106 112 from a mobile phone)

Rescue Procedures

Rescue procedures cannot be defined in detail for all cases. However, everyone who works on or near low voltage electrical equipment, and those assisting in such work, are to be familiar with the basic principles outlined below. An easy reference chart has been provided to you which summarises this process. You can find this at Appendix A.

Assessing an Incident Situation

Remember, every situation is unique, and safety is the top priority. If there is any doubt about your ability to safely perform a rescue from live low voltage equipment, it's important to wait for professional assistance from emergency services.

Effective assessment sets the foundation for a well-executed rescue, ensuring the safety of both the rescuer and the victim. Follow these steps to assess the situation before initiating a rescue:

Safety First: Ensure your own safety by wearing appropriate personal protective equipment (PPE) such as insulated gloves, safety goggles, and flame-resistant clothing.

Size Up the Scene: Observe the scene for any visible hazards such as live wires, sparking, or smoke. Assess the environment for factors like confined spaces, water, or other potential dangers.

Identify the Victim: Determine the victim's condition – conscious, unconscious, injured – and whether they are in direct contact with the electrical source.

Evaluate Electrical Sources: Identify the source of electricity involved in the incident. Assess whether it's still active or if power has been isolated.

Where possible, isolate the power if it is safe to do so. However, in some circumstances, it may be more expedient to free the casualty without first isolating the supply, provided safety precautions are taken and there is a low risk to the rescuer of receiving an electric shock.

Call for Help: If available, **call 000** for emergency medical assistance or relevant personnel to ensure professional help is on its way.

Request Assistance: If possible, request backup or assistance from coworkers to aid in the rescue process.

Assess Potential Dangers: Evaluate potential dangers such as the presence of flammable materials, chemicals, or other elements that could complicate the rescue.

Plan Your Approach: Plan your route to the victim, ensuring you avoid contact with live electrical sources. Determine the safest path to reach and assist the victim.

Check for Equipment: Locate and access the rescue equipment including rescue hooks, insulating blankets, or rubber mats. Ensure they are within reach and ready to use.

Communicate with the Victim: If the victim is conscious, communicate with them to determine their condition and whether they are aware of any injuries or pain.

Continuous Monitoring: While assessing, continue to monitor the victim's condition and the environment for any changes that might affect the rescue approach.

Safe Approach Distances (SAD)

When conducting a rescue in low voltage situations, maintaining safe approach distances is crucial to prevent you from being exposed and becoming a casualty yourself. These distances ensure that there's no risk of electric shock during the rescue.

The Safe Approach Distance (SAD) principle delineates an area around an insulated, covered, or exposed energised conductor or electrical source within which no individual, mobile equipment, or object (except approved insulated tools) is permitted to enter. This principle ensures the prevention of potential electrical hazards.

The minimum safe approach distance for live LV conductors or equipment is 500mm *(50cm or half a metre)* **for authorised electrical persons.**

• Qualified Person	• Unqualified person	• General Public
500mm	1,000mm	3,000mm

In emergency situations, adhering to safe approach distances is paramount to safeguarding rescuers and victims from potential electrical hazards. To uphold safe approach distances during emergency, consider the following:

Non-Energised Equipment or Isolated Circuits: If the equipment is confirmed to be non-energised or circuits have been isolated, rescuers can approach as closely as required to perform the necessary actions safely.

Energised Equipment or Circuits: When dealing with energised equipment or circuits, maintain safe approach distances to mitigate the risk of electric shock. The specific distance depends on the voltage level and conditions.

Insulating Tools and Equipment: When approaching energised equipment, you must use insulating tools and equipment to extend your reach while maintaining safe distances. Insulating gloves provides electric shock protection to the hand of the rescuer and the insulated crook provides additional insulation and allows extra clearances to be maintained.

Immediate Action for Victim Safety: While safe approach distances are crucial, the safety and well-being of the victim take precedence. In life-threatening situations, rescuers may need to intervene immediately while taking necessary precautions to minimise risks.

Professional Rescuers and Equipment: For situations involving high voltages or complex hazards, it's advisable to wait for professional emergency responders with specialised equipment to ensure a safe and effective rescue. In the meantime, isolate the energy source if possible.

Constant Vigilance: Throughout the emergency response, you must remain vigilant about maintaining safe approach distances and avoiding accidental contact with live sources.

Rescuing the Victim

In situations involving electric shock, give priority to the prompt release and rescue of a victim as time is essential for the victim's survival. Remember that until the victim is released, or the electricity has been isolated, the victim is electrified at the voltage of the live electrical equipment.

WARNING: Casualty may be LIVE!

Be careful not to touch the casualty's skin before the electrical source is disconnected. Be alert for the presence of water or conducting materials that may be in contact with the casualty.

To remove the victim from the equipment, first access the rescue kit and put on the insulating gloves, taking the insulated crook. Check for danger such as live parts, live cables, water and the potential to cause a short circuit. Then:

- Approaching from behind the victim, place the insulated crook under the victim's shoulder. Turn the insulated crook into the victim's body. If the crook is not turned, it may slide off the victim when pulling the victim clear.
- Pull the victim clear of the live exposed electrical equipment. As the victim falls, stand clear as they may push you towards the equipment. If possible, support the victim's head as they are lowered to a safe position.

- When the victim is free from electrical current use the "one man drag" technique to move them to a safe area away from the live electrical equipment:
    - Crouch behind the victim.
    - Position your arms around the victim's chest.
    - Securely grip both hands over the opposite wrists on the victim.
    - Ensure you adopt a correct lifting procedure with a straight back and bent knees.
    - Drag the victim to a clear safe area.

- If required, apply the fire blanket to the victim if they are on fire:
    - Hold tabs with hands behind blanket.
    - Hold blanket between yourself and the casualty.
    - Place over the casualty covering from them from their head downwards.
    - Pat them down to ensure the fire is extinguished.

If you haven't already done so, contact emergency services to seek immediate medical attention. Once the victim has been safely removed from the power source, you need to provide emergency care.

Now let's look at assessing the casualty and administering first aid until emergency services arrive.

Topic 6 - Assessing a Casualty

3.1 Casualty is assessed in accordance with workplace requirements.

By the end of this topic, the student should be able to:

- Assess the electric shock casualty to determine and administer appropriate first aid response.

Introduction

Electric shock can have a range of effects on the human body, varying based on factors such as the magnitude and duration of the current, the pathway it takes through the body, and the overall health of the individual. The effects can range from mild discomfort to severe injury or even death.

Some of the potential effects of electric shock include:

- **Muscle Contractions**: Electric shock can cause involuntary muscle contractions, making it difficult or impossible for the person to let go of the source of the shock. This effect is known as "freezing" on the electrical source.
- **Pain and Burns**: Electric shock can cause pain at the point of contact with the electrical source. Burns may occur at the entry and exit points of the current on the skin, sometimes with visible charring or blistering.
- **Cardiac Effects**: High-voltage electric shocks, especially those passing through the chest area, can disrupt the normal rhythm of the heart. This can lead to cardiac arrhythmias, including ventricular fibrillation, which can be fatal if not treated promptly.
- **Respiratory Effects**: Electric shock can cause breathing difficulties, including muscle spasms that affect the ability to breathe. In severe cases, the shock may lead to respiratory arrest.
- **Neurological Effects**: Electric shock can affect the nervous system, leading to symptoms such as confusion, disorientation, and loss of consciousness.
- **Internal Injuries**: Electric shock can also cause internal injuries, including damage to organs and tissues. The electrical current can heat tissues and cause internal burns.
- **Secondary Injuries**: In some cases, electric shock can cause secondary injuries, such as falls from ladders or other elevated surfaces due to sudden muscle contractions.
- **Long-Term Effects**: Severe electric shocks can result in long-term complications, including neurological damage, chronic pain, and psychological effects such as post-traumatic stress disorder (PTSD).
- **Fatalities**: In the worst cases, electric shocks with high voltages or current levels can be fatal. The effects on the heart, respiratory system, and vital organs can lead to death if immediate medical intervention is not provided.

It's important to note that the effects of electric shock can vary widely and may not be immediately apparent. Even seemingly mild shocks can have serious internal consequences. Any individual who has experienced an electric shock, regardless of its perceived severity, should be assessed and medical care given. Ensure the casualty receives medical attention to assess potential injuries and receive appropriate treatment.

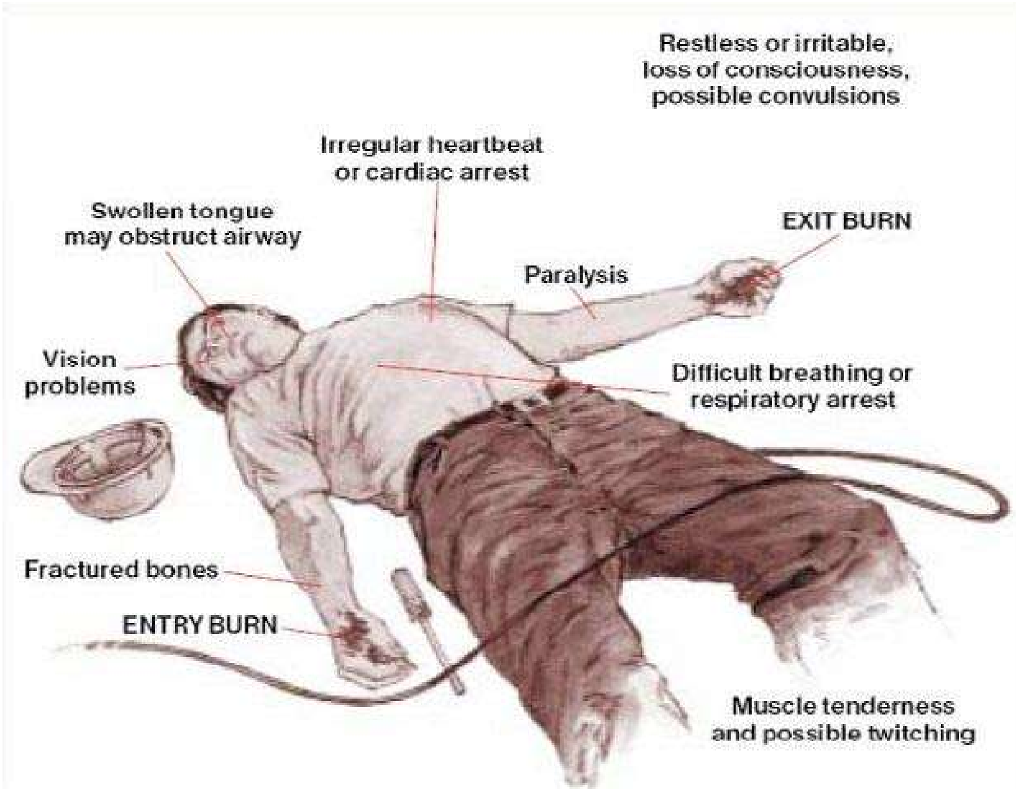
Let's explore the first aid assessment process to a shock victim.

Assessing the Casualty

After successfully performing a low voltage rescue, and when the casualty is clear from electrical hazards, you must conduct a thorough assessment of the casualty's condition to ensure their well-being and address any potential medical needs.

To assess the casualty and determine the medical care required, carefully position the casualty in a comfortable and stable position. If there's any suspicion of spinal injury, take precautions to immobilise the neck and back while moving the casualty. Then conduct your assessment:

1. Check if the casualty is conscious by observing their breathing for regularity, depth, and any signs of distress. Check for a pulse and observe their skin colour. Look for signs of circulation issues, such as pale or bluish skin.
2. Ensure that the casualty's airway is clear and unobstructed. If they are unconscious, gently tilt their head back and lift the chin to open the airway. Observe the casualty's breathing for any signs of difficulty. Listen and feel for breath sounds and assess the depth and regularity of breathing.
3. If the casualty is conscious, ask simple questions to assess their mental alertness and coherence. Communicate with them to provide reassurance and inform them about the situation. Explain that medical assistance is on the way if needed. Offer comfort and support to the casualty, ensuring they feel safe and attended to during the post-rescue assessment.
4. Check for any visible injuries, burns, or wounds on the casualty's body. Be cautious while assessing, especially if there are clothing or gear that might hide injuries. Also observe for signs of shock, including cold and clammy skin, rapid pulse, rapid breathing, and altered mental state. If necessary, cover the casualty with a shock blanket or clothing to maintain body temperature and prevent hypothermia.
5. Based on your assessment, determine whether the casualty requires immediate medical attention. If in doubt, it's best to seek professional medical help. Record all observations and actions taken during the post-rescue assessment. This documentation is valuable for medical professionals and future reviews.



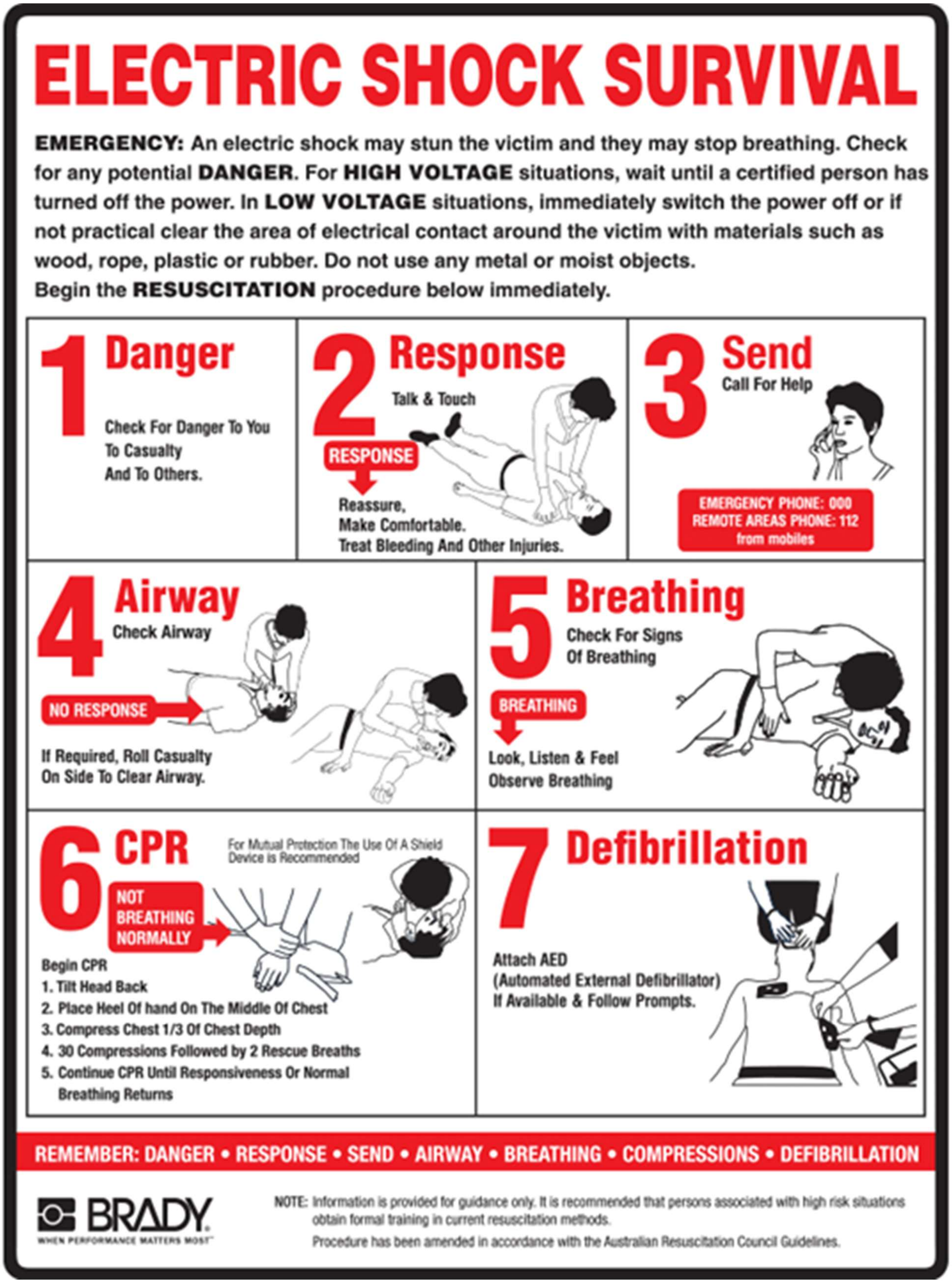
First Aid Response

First aid is the immediate care of an injured or suddenly sick person. It is the care a person applies as soon as possible after an accident or sudden illness. This prompt care and attention prior to the arrival of emergency services can sometimes mean the difference between life and death or between a full or partial recovery.

It is important to understand that first aid has its limitations and does not take the place of professional medical treatment.

DRSABCD

DRSABCD is an acronym that provides a quick and organised way to remember the essential steps to follow when providing first aid in emergency situations, especially in cases of cardiac arrest or life-threatening incidents. Each letter represents a specific action to take:


ELECTRIC SHOCK SURVIVAL
EMERGENCY: An electric shock may stun the victim and they may stop breathing. Check for any potential DANGER. For HIGH VOLTAGE situations, wait until a certified person has turned off the power. In LOW VOLTAGE situations, immediately switch the power off or if not practical clear the area of electrical contact around the victim with materials such as wood, rope, plastic or rubber. Do not use any metal or moist objects.
Begin the RESUSCITATION procedure below immediately.
1 Danger
Check For Danger To You To Casualty And To Others.
2 Response
Talk & Touch
RESPONSE
Reassure, Make Comfortable. Treat Bleeding And Other Injuries.
3 Send
Call For Help
EMERGENCY PHONE: 000
REMOTE AREAS PHONE: 112 from mobiles
4 Airway
Check Airway
NO RESPONSE
If Required, Roll Casualty On Side To Clear Airway.
5 Breathing
Check For Signs Of Breathing
BREATHING
Look, Listen & Feel
Observe Breathing
6 CPR
For Mutual Protection The Use Of A Shield Device is Recommended
NOT BREATHING NORMALLY
Begin CPR
1. Tilt Head Back
2. Place Heel Of hand On The Middle Of Chest
3. Compress Chest 1/3 Of Chest Depth
4. 30 Compressions Followed by 2 Rescue Breaths
5. Continue CPR Until Responsiveness Or Normal Breathing Returns
7 Defibrillation
Attach AED (Automated External Defibrillator) If Available & Follow Prompts.
REMEMBER: DANGER • RESPONSE • SEND • AIRWAY • BREATHING • COMPRESSIONS • DEFIBRILLATION
BRADY
WHEN PERFORMANCE MATTERS MOST
NOTE: Information is provided for guidance only. It is recommended that persons associated with high risk situations obtain formal training in current resuscitation methods.
Procedure has been amended in accordance with the Australian Resuscitation Council Guidelines.

Burns Management

Burn severity is rated on how deep into the skin/muscle/body the burn penetrates. Trained medical professionals, including paramedics, will be able to determine the severity and treat the burns accordingly.

Electrical burns can be more serious than they appear on the surface due to potential internal damage. Seeking medical attention is crucial to ensure the casualty receives appropriate care and to prevent further complications.

To provide basic burns care while you wait for emergency services to arrive, follow these steps:

- Assess the Burn - Evaluate the extent and severity of the burns. Electrical burns might appear minor on the surface but could be more severe internally.
- Cool the Burn - For minor burns, gently cool the affected area with cool (not cold) running water for about 10-20 minutes. This helps reduce pain and prevents the burn from worsening.
    - If you don't have access to running water, you can use clean bottled water or sterile saline solution from a first aid kit or a cool damp (not wet) cloth – **DO NOT USE ICE.**
- Protect the Burn - Cover the burn with a clean, non-stick dressing to prevent infection. Avoid using adhesive bandages directly on the burn.
- Monitor for Shock - Keep an eye on the casualty's condition as electrical shocks can affect the heart's rhythm. Watch for signs of shock such as fainting, shortness of breath, or irregular heartbeat.
- Do Not Pop Blisters - If blisters form, do not pop them as it increases the risk of infection. Instead, let them heal naturally.




Topic 7 - Securing the Incident Site

3.2 Incident site is secured and entry controlled in accordance with workplace requirements.

By the end of this topic, the student should be able to:

- Secure the incident site and control entry of personnel to preserve the site and ensure the safety of others.

Introduction

Securing the site after an incident, especially in the context of electrical hazards, is crucial to ensure the safety of everyone involved and prevent any additional harm. By following security procedures and focusing on the safety measures, you contribute to a safer work environment and reduce the risk of future accidents.

Incident Security

To effectively secure the site after an incident, you must:

1. **Assess the Scene**: Evaluate the area to identify any remaining hazards, potential dangers, or equipment that might still pose a risk.
2. **Isolate and Lock Out**: If not already done during the incident response, ensure that the source of the electrical hazard is isolated and locked out. This prevents any accidental re-energisation.
3. **Restore Order**: Organise the site by removing any equipment or objects that were used during the rescue or response. This helps prevent tripping hazards and confusion.
4. **Secure Equipment**: Secure and properly store any equipment that was used during the incident response. This includes insulating tools, first aid supplies, and rescue aids.
5. **Clean Up Spills**: If any fluids were spilled during the incident, clean them up promptly to prevent slips or contamination.
6. **Warn Others**: Use appropriate signage or barriers to indicate that the area is off-limits or potentially hazardous. This prevents others from unknowingly entering a dangerous zone.
7. **Restore Power Safely**: If power was disconnected, make sure to follow proper procedures for restoring power once the site is safe. This might involve checks and inspections before re-energisation.

Preserving the Incident Site

Preserving the incident site is crucial as it enables thorough investigation, evidence collection, and analysis of the causes behind accidents or incidents, particularly in the context of electrical hazards.

The incident site must not be disturbed until an inspector arrives at the site or directs otherwise. The person with management or control of the workplace is responsible for preserving the incident site as best they can, given the circumstances.

This process not only supports regulatory compliance, insurance claims, and potential legal actions, but also serves as a foundation for learning, improvement, and prevention. By maintaining the integrity of the site, the PCBU can uncover valuable insights, enhance safety protocols, and ensure the well-being of their personnel while preventing similar incidents from occurring in the future.

Any evidence that may assist an inspector to determine the cause of the incident must be preserved—including any plant, substance, structure, or thing associated with the incident. However, preserving an incident site does not prevent any action needed:

- To assist other injured people.
- To remove a deceased person.
- To make the site safe or to minimise the risk of further incidents.
- To facilitate a police investigation.

In all instances, you must report details of electric shock incident. Let's look at reporting requirements now.

Topic 8 – Reporting LV Rescue

3.3 Incident is reported in accordance with workplace requirements.

By the end of this topic, the student should be able to:

- Document and report the incident and the rescue outcomes in accordance with workplace requirements.

Introduction

As a rescuer, part of your responsibilities will be to record the details of any incident or rescue event. You must ensure that the regulator is notified immediately after you become aware of any incident that has exposed a worker or any other person to a serious risk from an immediate or imminent exposure to electric shock.

This is known as a notifiable incident.

Notifiable Incidents

A 'notifiable incident' is:

- The death of a person,
- A serious injury or illness, or
- A dangerous incident that exposes someone to a serious risk, even if no one is injured.

'Notifiable incidents' may relate to any person—whether an employee, contractor or member of the public.

Mandatory Reporting

The WHS law requires that a notifiable incident be reported to the WHS regulator immediately after becoming aware it has happened. This will generally be in the form of a verbal report and possibly a written notification within 48 hours if it's requested. As we discussed earlier, it is advisable that the incident site be preserved until an inspector arrives or provides instructions.

Failing to report a 'notifiable incident' is an offence.

See the contact details below of the regulators for each State/Territory in Australia.

Jurisdiction	Regulator	Telephone	Website
New South Wales	NSW Government SafeWork NSW	13 10 50	www.safework.nsw.gov.au
Victoria	WorkSafe Victoria	1800 136 089	www.worksafe.vic.gov.au
Queensland	Queensland Government WorkSafe.qld.gov.au	1300 369 915	www.worksafe.qld.gov.au
South Australia	SafeWork SA	1800 777 209	www.safework.sa.gov.au
Western Australia	Government of Western Australia Department of Mines, Industry Regulation and Safety	1300 307 877	www.commerce.wa.gov.au/worksafe
Australian Capital Territory	WORKSAFE ACT	02 6207 3000	www.worksafe.act.gov.au
Tasmania	WorkCover Tasmania	1300 366 322 03 6233 7657	www.worksafe.tas.gov.au
Northern Territory	NT WorkSafe	1800 019 115	www.worksafe.nt.gov.au
Commonwealth	Australian Government Comcare	1300 366 979	www.comcare.gov.au

Details to Report

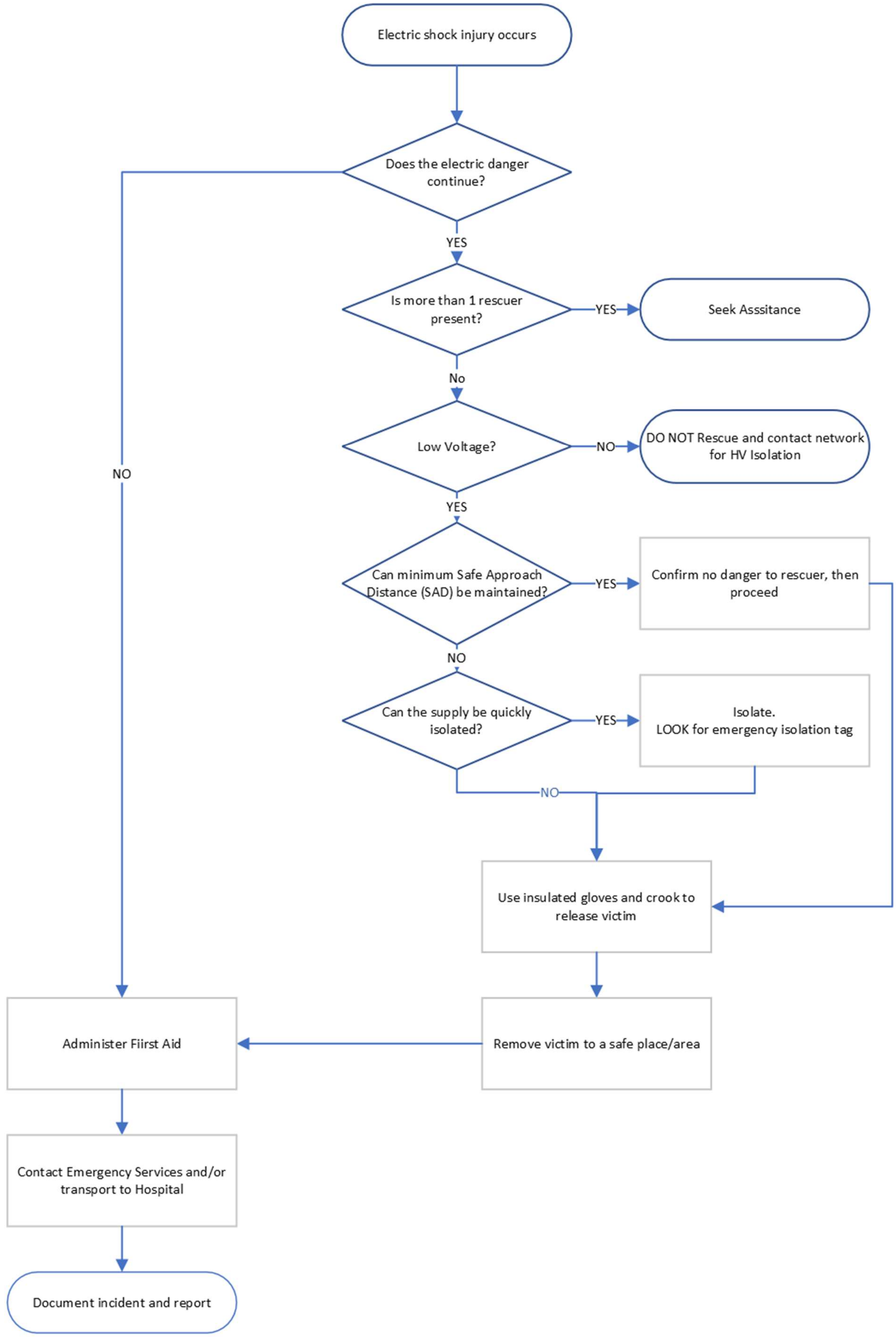
When first reporting a notifiable incident as soon as the circumstances permit, the regulator will ask for a clear description of the incident with as much detail as possible. This will help the regulator determine the need for a follow-up investigation. The following information is usually requested:

What happened: an overview	○ Provide an overview of what happened. ○ Nominate the type of notifiable incident—was it death, serious injury or illness, or 'dangerous incident'?
When did it happen	Date and time
Where did it happen	Incident address. Details that describe the specific location of the notifiable incident—for example section of the warehouse or the particular piece of equipment that the incident involved—to assist instructions about site disturbance.
What happened	Detailed description of the notifiable incident.
Who did it happen to	○ Injured person's name, date of birth, address and contact number. ○ Injured person's occupation. ○ Relationship of the injured person to the entity notifying.
How and where are they being treated (if applicable)	○ Description of serious injury or illness—i.e., nature of injury. ○ Initial treatment of serious injury or illness. ○ Where the patient has been taken for treatment.
Who is the person conducting the business or undertaking (there may be more than one)	○ Legal and trading name. ○ Business address (if different from incident address), ABN/ACN and contact details including phone number and email.
What has/is being done	Action taken or intended to be taken to prevent recurrence (if any).
Who is notifying	○ Notifier's name, contact phone number and position at workplace. ○ Name, phone number and position of person to contact for further information (if different from above).

Record Keeping Requirements

Records of notifiable incidents must be kept for at least five (5) years from the date of notification. It is useful to keep a record of having made the notification and any directions or authorisations given by an inspector at the time of the notification.

Appendix A – Rescue Procedure



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End of Learner Guide