energysafe VICTORIA

Electricity hazards safety guide

For emergency services workers

Creating a safer state with electricity and gas

Energy Safe Victoria (ESV) has developed the *Electricity hazards safety guide* to provide guidance to Victorian emergency services personnel when dealing with potential electricity hazards and managing safety where the electricity supply system may be involved in fire, rescue and other emergency situations.

It is intended for use by Victoria's emergency services personnel in the course of emergency services duties. It should not be used by other persons for any other purpose.

Acknowledgement

Energy Safe Victoria would like to acknowledge the contribution of Victoria's electricity supply industry and other government agencies' representatives and express our gratitude to those who participated in the development of this document.

The information contained herein is referenced from electricity industry safety practices and regulatory guidelines.

It has been developed with the assistance of:

Disclaimer

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Contents

The energy industry safety regulator

Energy Safe Victoria

ESV is the independent technical regulator responsible for electricity, gas and pipeline safety in Victoria. ESV is established under the *Energy Safe Victoria Act 2005*.

Our principal role is to ensure the safe and efficient supply of energy to all Victorians.

The nature and scope of our activities are defined by the objectives, functions and responsibilities as described in the *Energy Safe Victoria Act 2005*, the Electricity Safety Act 1998, the Gas Safety Act 1997 and the Pipelines Act 2005 (the Acts), and the corresponding regulations.

We achieve our objectives through:

- minimising safety risks arising from exposure to energy supply and use
- ensuring that pipeline safety hazards are mitigated, and
- promoting energy safety and efficiency.

Our mission

ESV aspires to lead the Victorian community and industry in responding to the risks arising from the unprecedented transformation of energy devices, systems, networks and customer market behavior; to ensure compliance with energy and pipeline legislative safety obligations by energy network and system operators, the gas and electrical trades, and the manufacturers and suppliers of energy products, and; to lead the state in demonstrating Victoria's commitment to safe and efficient energy supply and use, and pipeline safety.

Our vision

ESV is recognised as the leading technical and safety regulator, making a real and substantial difference to energy safety in Victoria through continuous improvement, risk-informed safety monitoring, and capability for anticipating and responding to safety issues.

Safety objective

Minimise injury, loss of life and damage to property due to electrical or gas causes or the construction and operation of pipelines.

1. The basics of an electricity system

A path to earth

Electricity is continuously looking for a path to Earth. The flow to earth will always be the path of least resistance.

Generation and distribution

Electricity is generated in power stations. Our largest electricity generators are usually located near the source of fuel (coal), and well away from major cities.

Power stations produce electricity at between 16,000 and 23,000 volts. This is then transformed to between 220,000 and 500,000 volts and taken by the transmission system to our major cities, which are known as load centres. At a load centre, the transmission system feeds into a terminal station where the voltage is stepped down to sub-transmission voltage – 66,000 volts.

The sub-transmission 66,000 volt lines transport electricity through our streets and communities to zone substations, located throughout our cities and towns.

Distribution lines leaving zone substations can run at various voltages, most commonly 11,000 and 22,000 volts. The distribution lines carry electricity throughout our streets to pole, ground and kiosk transformers, where the voltage is once again stepped down to 230/400 volts.

SWER

In rural Victoria, high voltage lines are often a Single Wire Earth Return (SWER), operating at approximately 12,700 volts.

Domestic voltage

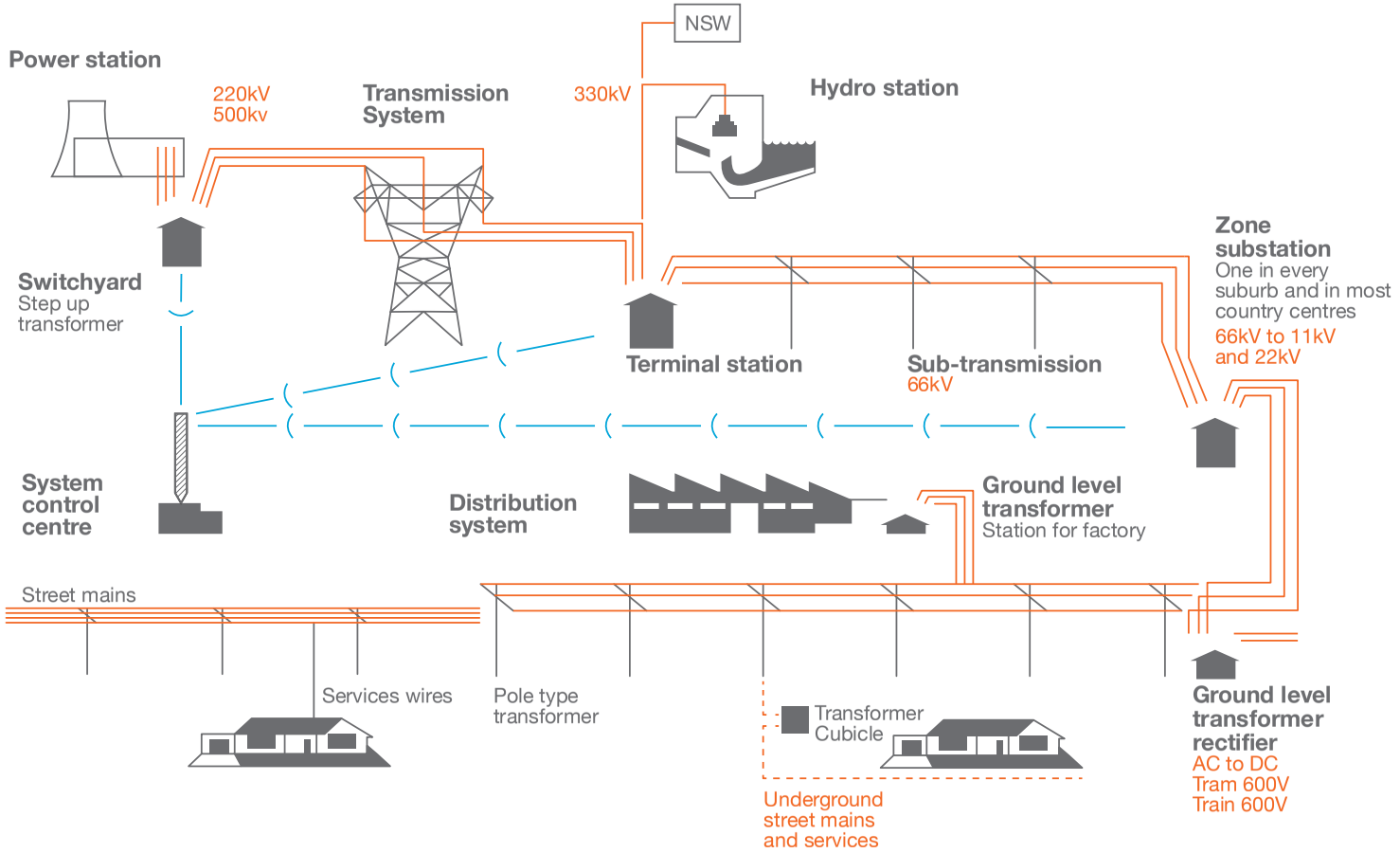
The 230/400 volt system is generally referred to as the low voltage system or LV. The LV system most commonly interfaces with customers as it takes electricity into our homes and businesses.

Industrial voltage

Some large industrial customers are supplied with electricity directly from the high voltage (HV) distribution system, and operate their own high and low voltage networks.

Traction

Other systems include traction to operate trains and trams, these voltages typically operate at between 600 and 1500 volts DC.


NSW
Power station
220kV
500kv
Transmission System
330kV
Hydro station
Zone substation
One in every suburb and in most country centres
66kV to 11kV and 22kV
Switchyard
Step up transformer
Terminal station
Sub-transmission
66kV
System control centre
Distribution system
Ground level transformer
Station for factory
Street mains
Services wires
Pole type transformer
Transformer Cubicle
Ground level transformer rectifier
AC to DC
Tram 600V
Train 600V
Underground street mains and services

2. Communicating with electricity supply companies

In any situation where electricity is involved, it is extremely important to communicate with the respective supply company (or distribution business) as soon as possible. Much of the electricity system is remotely controllable, therefore providing the supply company with detailed location information of an incident, such as street name, nearest cross street name, pole number (if possible) and house number, improve response times. In rural areas, a meter number or nearest other customer is also helpful.

Emergency service numbers

Electricity supply (poles and powerlines)

CitiPower 131 280

Powercor 132 412

AusNet Services 131 799

Jemena 131 626

United Energy 132 099

Transmission towers and lines

AusNet Services 1800 111 164

Traction system

Public Transport Victoria 1800 800 007

Electricity supply company (distribution business) boundaries

3. Site risk assessments

Hazards risk assessment

Prior to entering any situation where electricity may be an issue, a risk assessment must be undertaken to determine the associated potential hazards.

A range of risks must be considered, including (but not limited to) the following:

- Immediate risk of electric shock to self and others (victims or bystanders).
- Risk of electric shock when moving plant or equipment.
- Risk of fire or explosion from arcs and sparks.
- Risk of release of toxic fumes/ gas from heat or fire.
- Risk of insulating gases (SF_6) or other gases/fumes displacing air in confined spaces.
- Risk of electric shock from stored energy sources e.g. battery banks.
- Risk of wires or other electrical equipment becoming live from unexpected sources by:
  - automatic, inadvertent or remote switching
  - induction from adjacent, energised lines (not necessarily at the immediate location)
  - portable generators
  - solar panels
  - uninterruptible power supply systems (UPS).

Overhead powerlines

In situations where plant and equipment are required, be aware that overhead powerlines are susceptible to movement from the effects of heat and wind. Appropriate clearances must be maintained to ensure that sagging and swaying powerlines do not create additional hazards.

Electricity is not easily detected by our senses.

This is a key consideration when assessing the safety of a site involving electricity, as the lives of rescuers, victims and bystanders are at risk.

Once the hazards have been identified, preventative control measures must be put in place to mitigate the occurrence of potential hazards.

There are various aspects to consider in a risk assessment specific to the situations emergency personnel encounter. These are discussed in more detail in the relevant sections of this safety guide.

Regardless of the situation, required distances must be maintained, between emergency personnel and any electricity conductor, or any conductive object the electricity conductor is in contact with.

Refer: Safe approach distance and Step and touch potential, page 7.

4. Electrical injuries

Path to earth and voltage

Most electricity takes the path of least resistance and will travel the easiest path to earth. Where it passes through a human body electricity will cause injury between where it enters and exits.

The extent of injury depends on the voltage level, amount of current flow and time. As time is the only factor that may be influenced in an emergency situation it is critical to act quickly to minimise exposure.

The path taken by the electricity is also critical. Where electricity passes through major organs including the heart, the risk of serious injury or death is high.

Low voltage causes muscles to contract. This may lead to the person's hands locking onto an electrical conductor, not able to let go and result in their death.

High voltage, however, may blast a person clear and cause severe life threatening internal and external burns.

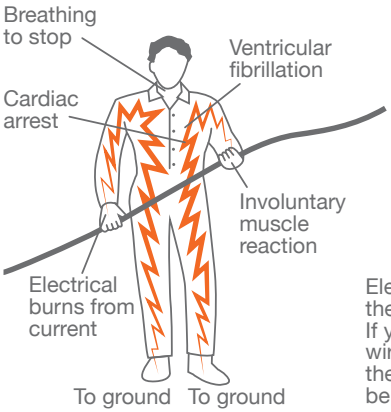
Where no actual contact is made, but exposure to an electrical arc has occurred, severe radiant burns and eye injuries may result.

Electric shock

A person displaying any of the following injuries may be the victim of electric shock:

- breathing stopped
- cardiac arrest
- ventricular fibrillation
- involuntary muscle reaction
- entry and exit burns
- bone fractures caused by muscle spasm.

Electric current passing through the body can cause:



Electricity always seeks the easiest path to ground. If you touch an energised wire and the ground at the same time, you may be killed or severly injured.

5. Step and touch potential/ safe approach distance

Step and touch potential is a hidden and potentially dangerous hazard which can lead to serious and fatal injuries.

This situation can arise in many ways. For example, where a powerline has fallen to the ground or is in contact with a metal or other object and that object is in touch with the ground such as a vehicle, crane, ladder, plant machinery etc.

This may also occur where a pole has been impacted by a machine or vehicle, resulting in the powerline remaining on the pole, but dislodged from its insulator position and touching the supporting structure.

Once electricity contacts the ground there is a gradient or rippled effect outwards from the point of contact. This creates two specific electrical hazards – step potential and touch potential.

This gradient can radiate out to varying distances depending on the conditions before dissipating the electrical energy down to a safe level, and as such can make the area unsafe to approach.

People and powerlines

The diagram below shows the voltage dissipation over distance where a powerline is contacting the ground. Standing inside the gradient area with feet apart may cause a person to suffer an electric shock due to the potential voltage difference between the feet.

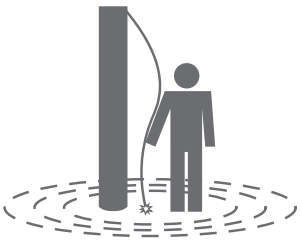
Similarly, the diagram to the right shows the voltage dissipation over distance where a powerline is contacting the ground. Standing inside the gradient area while touching the cable or pole or any other object at a different potential, may cause a person to suffer an electric shock because of the potential voltage difference between the feet and other part of the body.

Voltage dissipation over distance where a powerline is contacting the ground

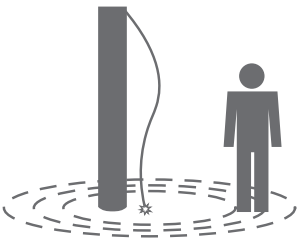
Step and touch potential

Touch potential is the voltage difference between where you are standing and what you touch. When there is a voltage difference and your body becomes part of a circuit, there will be current flow through the body.

Step potential is the voltage difference between the ground at each foot.



Touch potential



Step potential

Plant and powerlines

The diagram below shows a plant item touching a high voltage overhead powerline. This could be any type of plant, vehicle, farm machinery or where a powerline has come down to rest on a vehicle.

Standing inside the gradient area may cause a person to suffer an electric shock due to the step or touch potential difference between the feet, and or feet and hands.

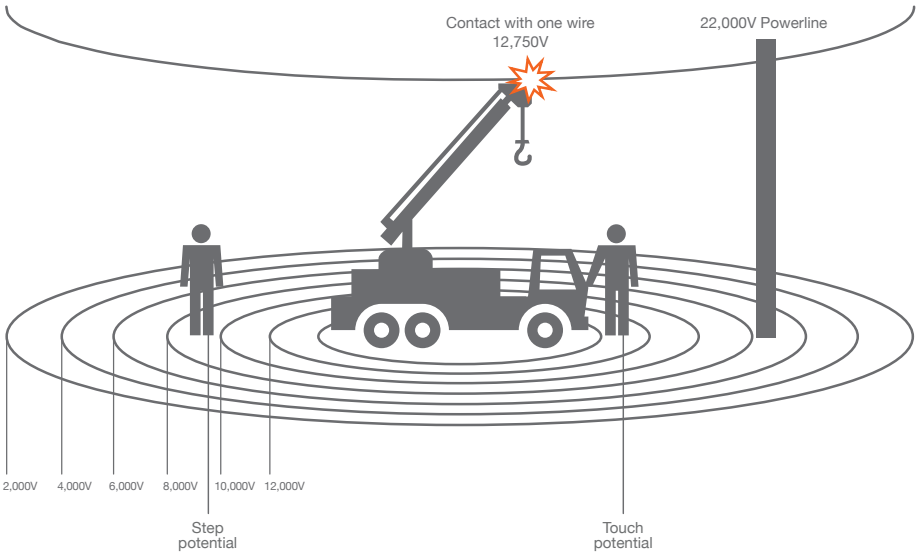
This dangerous situation can be avoided by staying at least 8 to 10 metres away from the point of contact or vehicle concerned.

If called to attend an incident where a plant item such as a crane is in contact with overhead powerlines, do not approach the vehicle closer than 8 metres and encourage the operator to stay in the unit.

If the operator must leave the unit due to another life-threatening situation, such as fire, encourage the operator to jump clear of the unit, not step off, keep both feet together and hop away.

If the operator falls over in the course of moving away, encourage the operator to roll away, and not stand up.

Plant item touching a high voltage overhead powerline



6. Voltage and structure identification

(high voltage and low voltage)

The electrical apparatus images below are provided to assist emergency personnel identify the difference between high and low voltage circuits.

Different insulators relate to different voltages. Emergency services personnel are not required to identify the various voltages, however, it is useful to differentiate between high and low voltage.

High voltage (HV) is generally over 1000 volts.

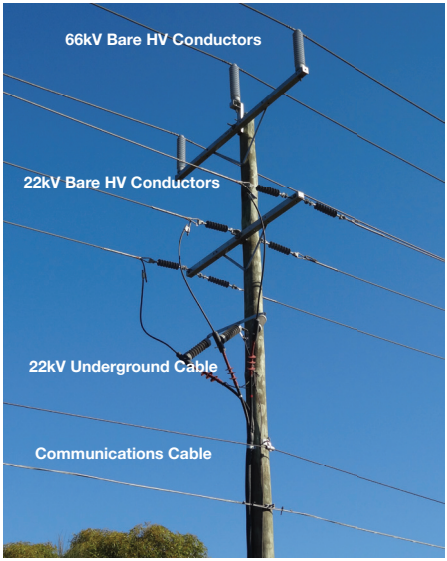
Low voltage (LV) is below 1000 volts.

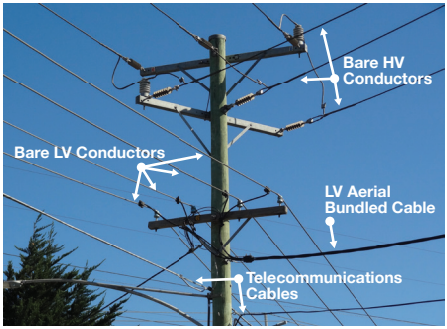
Kilovolt (kV) is 1000 volts

Most domestic and industrial supply is low voltage—230/400 volts.

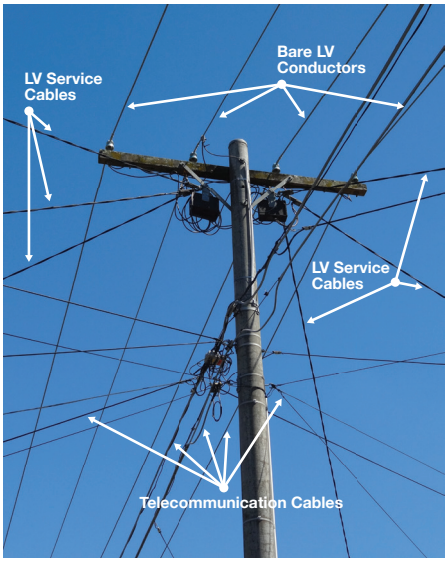
Low voltage pillar

Poles and towers

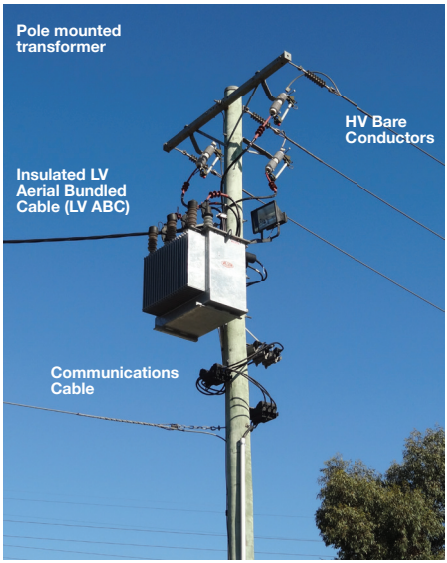




Poles and towers



Transformers

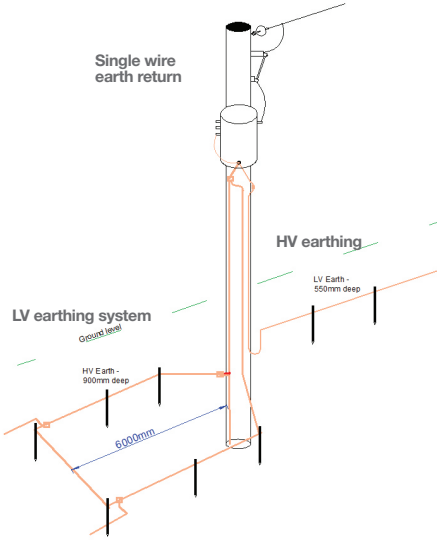


SWER systems

Hazards associated with Single Wire Earth Return (SWER) systems

SWER systems can be identified by a single high voltage wire energised at 12,700V. They can be difficult to see in different lighting conditions.

These lines are common in rural areas of Victoria.



A SWER system, as the name suggests, uses the earth as the return path for the electric current. Transformers are connected between the energised line and the earth.

The earth leads that run down poles to connect transformers to ground carry an electric current. These leads are extremely hazardous if damaged or cut.

The ends of any damaged leads may be live at high voltage – up to 12,700V.

Never touch or approach a SWER transformer pole if there are any signs of damage to the leads running down the pole, or to underground cables within a 10 metre radius of the pole.

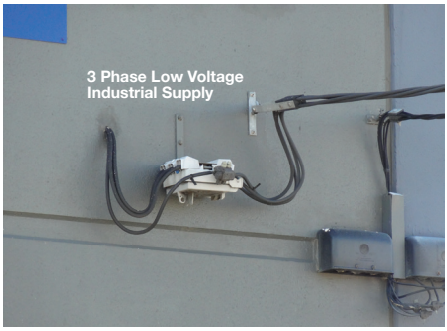
Wait until the relevant power supply company advise it is safe to enter/approach the area.

Signs of a hazardous situation due to a damaged earthing system may be:

- smoke or steam originating from the ground
- dead livestock close to the pole
- dried out ground or vegetation near the pole.

Points of supply

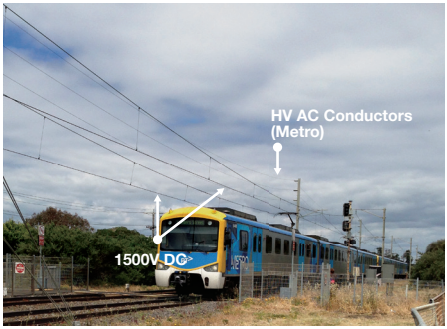

Single Phase
Residential
Service Line


3 Phase Low Voltage
Industrial Supply

Low Voltage Underground Pit

Underground Pillar

Trams and trains (traction)



7. Safe approach distance to electricity supply aparatus

Victoria has a number of Regulations, a Code of Practice and electrical safety rules relating to approach distance to electricity supply apparatus, including DC traction systems for trams and trains. These include the Blue Book and the Orange Book.

These documents are managed by ESV. They prescribe the regulatory safe approach distances to electrical apparatus for both persons and/or plant.

Where powerlines are not directly involved in an emergency situation, i.e. the powerlines are in their normal state, rescue work may necessitate approach to powerlines and safe approach distances apply.

The regulatory safe approach distances are as follows.

Persons

The safe approach distance is the clearance distance beyond the reach of any part of a person's body or anything conductive a person is holding or touching.

Mobile plant

Under normal conditions, No Go Zone rules operate in Victoria. They require a spotter/safety observer to observe the movement of mobile plant equipment being used within 6.4 metres of a powerline, or 10 metres of a towerline.

However, while fighting fires or attending an emergency, trained persons working under the Victoria State Emergency Services Act are exempt from the provisions of the No Go Zone rules, as they have powers granted to them under the Victorian State Emergency Services Act.

During skills acquisition and maintenance training processes, including performing certification testing of personnel, all persons must comply fully with the No Go Zone rules.

For more information about No Go Zones, visit our website www.esv.vic.gov.au and search for No Go Zones. Worksafe also provide various resources about No Go Zones and safe work practices around powerlines on its website www.worksafe.vic.gov.au.

Safe approach distance for persons

	Low voltage (up to 1000V AC) (and 1500V DC)	High voltage (up to 66,000V)	High voltage (over 66,000V)
Insulated	100 mm		
Bare	1500 mm	2000 mm	4000 mm

8. Conductive and insulating materials

Electricity is conducted by all types of materials to varying degrees. Some materials conduct electricity very well and are known as conductors, while other materials that do not readily conduct electricity are known as insulators.

Conductive materials

- All metals such as:
  - copper
  - aluminium
  - steel
- Water
- Green timber
- Concrete reinforced poles
- Steel poles
- Fire/smoke and flame
- Polluted air
- People

Insulating materials

- Glass
- Porcelain
- Very dry timber
- Plastic
- Rubber
- Clean and dry air

Some materials can act as insulators as well as readily conduct electricity depending on a range of factors, such as moisture content, surface condition and contamination. Examples of these materials:

- Wood
- Paper
- Earth
- Rubber tyres
- Air

9. Conductive poles and structures

A conductive pole or structure is any pole or structure that can conduct electricity. These include concrete poles, steel poles, public lighting poles and wooden poles with an earth cable to ground.

Dry wooden poles with no earth cable to ground are generally considered non-conductive.

Powerlines are supported by insulators appropriate to their operating voltage. However, their supporting poles or structure can become live in specific situations, including:

- insulator breakdown
- powerlines resting on the structure due to vehicle impact or other damage
- apparatus internal breakdown (pole mounted transformers etc.)
- arcing between powerlines and the supporting structure
- flashover

Properly installed conductive poles are safe, however, contact with conductive poles subject to any of the above conditions should be avoided.


High Voltage Conductive Concrete Pole


Metal Street Light Column

10. Underground cables and vandalised equipment

Underground cables

Poles with underground cables attached may cause a hazard if the cable and surrounding cable guards are damaged by a vehicle collision.

Signs may include smoke or arcing noises coming from the area of the cable guard.

These cables can either be low voltage or high voltage.

Vandalised assets

Vandalism of network assets has been increasing over the past few years. Vandals seek to steal the copper cables and switchboard bars.

In some circumstances the equipment may still be live and could present a hazard to anyone who approaches it.

Wait until the relevant electrical supply company advise it is safe to enter/approach the area.

11. Releasing a person from electrical contact

Where a person is in contact with high voltage electricity, or the voltage level is not known, no attempt should be made to perform a rescue until an authorised electricity supply company representative confirms the power is off, and the situation is safe to approach. People are conductive and while a person is in contact with high voltage, the rescuer is at risk of being electrocuted and step and touch potential hazards may be present.

Household voltages—230/400 Volts AC

Where the voltage is known to be low voltage, as in a domestic home, a rescue may be carried out if the rescuer is trained in managing the risks posed by low voltage electricity. The rescue should be attempted as quickly as possible, as every second is vital to ensure survival.

Where possible, the circuit should be switched off or in the case of an appliance, the appliance plug removed from the power point before a rescue attempt is made.

If the circuit cannot be switched off, or switched off in a timely manner, the victim's contact with the electricity must be broken quickly. This can be achieved by pushing or pulling the victim away from the contact using an item of sufficient insulating quality appropriate for the voltage level.

What to do

Great care must be taken to ensure that contact is not made with the victim's skin.

Items providing sufficient low voltage insulating quality for this situation include:

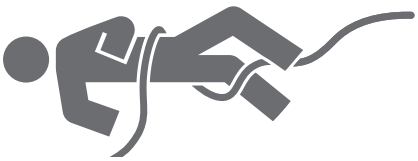
- dry clothing
- dry material e.g. curtains, towels, sheets, blankets
- dry wood
- dry rope
- PVC or other types of plastic pipe
- rubber.

Do not use anything metallic or anything damp or moist.

If other people are available, have them locate the switchboard and turn off the main switch while the rescue is being performed.

Call an ambulance and notify the electricity supply company.

Once contact has been broken, ensure any by-standers remain clear of the electrical hazard and render first aid/CPR immediately.



12. Damaged poles and powerlines

Where a pole has suffered any type of impact, extreme care must be taken.

Poles may be unstable or fractured, and contact with the pole or fallen powerline must be avoided at all times due to the risk of physical injury resulting from an electric shock through step and touch potential.

This situation presents various hazards to emergency services personnel. It is particularly electrically hazardous as powerlines may have been dislodged,
or may become dislodged if moved, from their normal insulator position and may
be resting on or against the structure.

It is also possible for powerlines on adjacent poles to be dislodged, causing high voltage powerlines to fall from their normal position and make contact with low voltage powerlines. This may lead to low voltage powerlines being energised at high voltage.

Broken poles and powerlines

If a pole has sustained severe impact damage or has broken as a result of the impact, the situation is far more hazardous. In addition to the electrical hazards, there are a number of mechanical hazards to consider.

If a pole is broken, but still standing, it may be supported by the powerlines. As powerline wires are not designed to support a pole, and the broken pole will be causing additional tension on the powerlines, the powerlines may give way at any time allowing the pole and powerlines to fall
to the ground.

If the powerlines break and the pole falls, powerline wire recoil can occur and may cause injury to rescuers and by-standers. The situation may become more hazardous if the powerlines, broken or otherwise, are still live.

Powerlines may be energised from both directions and if a powerline is broken, both ends may still be live.

Stay well clear of fallen powerlines. Just standing near them can be fatal. Always assume powerlines are live, even when broken.

What to do

If a site assessment indicates the pole is not structurally damaged and the powerlines have not been dislodged, it may be safe to carry out a rescue if required.

Take extreme care as impacted poles can appear sound but may fall later without notice. Powerline hardware components
may also fall at any time without notice.

If an assessment indicates the pole is damaged and/or powerlines have been dislodged from their normal position, the area must be kept clear until the pole and surrounding site is made safe by the electricity supply company.

Where a rescue is necessary, ensure only the minimum number of people required enter the site. Keep all other people, vehicles and by-standers away.

13. Fallen powerlines

Broken or dislodged powerlines

Powerlines may be dislodged or broken by various factors, such as vehicle impact with the supporting structure, over-height vehicle loads, farm machinery or other plant contacting powerlines, high current fault conditions, high wind velocity, falling trees, storm damage from flying debris, fire damage and in some locations, powerlines may be brought down by snow and ice build up.

Emergency services personnel must conduct a site risk assessment, including the risk of step and touch potential, if powerlines have fallen to the ground, are sagging close to the ground, fallen onto an object on the ground or are broken.

These situations are extremely dangerous.

Stay at least 8-10m away from fallen powelines.

Always assume powerlines are live and capable of killing anyone who comes near or into contact with the powerline, or other object/s in contact with the powerline.

Emergency services personnel and the general public must keep clear of the site until the electricity supply company has confirmed the supply is off, and the area is safe to approach.

Carefully examine the surroundings and ensure any vehicles are parked well clear of, and to the side of, any fallen powerlines.

Broken powerlines

If powerlines are broken, both ends may remain energised. Never assume only one end is live.

There will be multiple wire ends that may be on the ground, hanging in the air, or a combination of both. Identify the location of all broken wire ends and keep people clear of these.

People must also be kept clear of powerlines that have fallen into, or across water.

Unbroken powerlines

Unbroken powerlines in contact with the ground, or in contact with another object that is in contact with the ground, may burn through as a result of fault current. This may present a mechanical hazard as powerlines may recoil and cause both mechanical and electrical injury to persons standing too close.

Powerlines contacting the ground, or in contact with another object that is in contact with the ground, may cause a fire and must be monitored until the supply company representatives arrive.

Note: Electricity supply is often managed through automatic protection systems where zone substation circuit breakers may open and re-close automatically. Following a fault, a powerline may be de-energised for a short period and then re-energised without warning as system protection equipment operates. **Always assume powerlines are live.**

14. Helping people trapped in vehicles by fallen powerlines

Carry out a site risk assessment and call the electricity supply company immediately. Their representatives will handle the situation. Follow the guidelines below until supply company representatives arrive.

Where a powerline has fallen to the ground and is under a vehicle containing people, or a person has unknowlingly parked over or under a fallen powerline.

Do not touch the vehicle as it may be electrified.

If the driver is uninjured and the vehicle can be driven, direct all occupants to remain in the vehicle and the driver to carefully move the vehicle away.

While the vehicle is moving, all other persons must keep well clear of the area to minimise the risk of mechanical and/or electrical hazards resulting from possible powerline recoil, once the vehicle has moved.

If the driver is injured, and/or the vehicle can not be driven, direct the occupants to remain in the vehicle until electricity supply company representatives arrive.

In each of theses situations ensure all persons at the site remain at least 8 to 10 metres from the vehicle and powerline, consistent with step and touch potential guidelines.

Where a powerline is resting on a vehicle, the occupants are not badly injured but the vehicle is on fire and cannot be driven.

This situation is potentially extremely dangerous. Exiting the vehicle should only be attempted as a last resort.

If the occupants are in immediate danger from fire they must get out of the vehicle.

As step and touch potential may be present, direct the occupants to jump clear of the vehicle. They must not step out.

This can be performed by opening the door and standing on the door sill with both feet prior to jumping.

Simultaneous contact with the vehicle and the ground must be avoided.

Once out of the vehicle, occupants must shuffle or jump away with feet together. They must not walk away. If a person falls over while jumping, direct them to roll away, not stand up.

Where an occupant is badly injured/ unconscious and cannot get out, and the vehicle is on fire and cannot be moved.

Any attempt to rescue the injured person may put the rescuer's life in danger. As such, no action should be taken until electricity supply representatives have confirmed the electricity is off, and the situation is electrically safe.

15. Vehicle collisions with kiosk substations

In many locations, particularly new housing estates, transformers and high voltage switching equipment is housed in large boxes made from either fibreglass or metal that sit directly on the ground. These are called kiosk substations. These installations have both high and low voltage underground cables that feed in and out of the installation.

Other equipment may include ground type substations, where the high voltage transformer sits on the ground enclosed in a wire cage, or low voltage pillars where live low voltage cables are enclosed in an above ground box sitting directly on the ground.

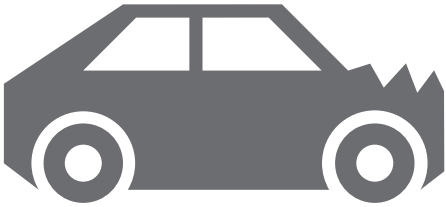
If damage to these installations is identified, the electricity supply company should be notified to undertake a safety assessment of the installation.

What to do

If a kiosk substation has been struck by a vehicle and the vehicle has come to rest against the installation and it is not drivable, the occupants should be directed to remain in the vehicle until the electricity supply company has made the installation safe.

This situation should be handled in the same way as advised in Section 13, where a vehicle has been energised by fallen powerlines.

No contact should be made with the vehicle, and all other persons at the site should remain 8 to 10 metres from the vehicle, consistent with step and touch potential guidelines.



16. Pole fires

Electricity leakage

Pole fires, like most other fires, ignite as a result of heat. The heat source on a powerline pole is generally from electricity leakage from the powerline to the structure.

Under normal conditions, minimal leakage occurs. Under abnormal conditions significant leakage may occur.

Leakage of electricity is generally attributed to conductive deposits (dust, salt, cement, etc.) polluting insulators, combined with moisture.

Using water

Apart from the electrical hazards associated with directing water onto powerlines, directing water onto a pole fire can create additional hazards. Electricity supply personnel who perform this work have generally undertaken specific training.

Directing water to the pole fire area will create heavy air moisture content around the insulators supporting the powerline, which can dissolve pollution deposits and form a conductive solution. This solution over the surface of the insulator to the structure can cause electrical flashover.

Maintaining structure strength and insulation integrity is vital. Electricity supply companies use specially insulated equipment, specific water pressure settings and techniques to test the conductivity of water to be used for tasks such as insulator washing and fighting pole and structure fires.

The magnitude of current through a water stream is a primary electrical hazard. The degree of the hazard depends on various factors including:

- cross section of the water stream
- quality of the water
- water temperature
- water stream length
- operating voltage
- continuity of water stream (aeration).

What to do if you are first on site

Pole fires on powerline structures should be managed by electricity supply company staff and equipment.

If emergency services personnel (such as a fire authority) are first to arrive at the scene of a pole fire and a risk assessment indicates that action must be taken immediately and it has been assessed as safe to do so, the points below provide some guidance.

- Never stand below the fire position or under the powerline.
- Never stand on the inside angle of a powerline as structure failure will cause lines to fall in your direction.
- Determine a safe position from where to contain the fire.
- Never direct water at or near powerline wires or insulators.
- Never direct the water stream across powerlines.
- Water stream should be fogged to break up water particles, not a solid stream, as a solid stream is more conductive and the force of the water could cause structural damage or dislodge a conductor.
- The water must be very clean, not mineralised or salty.
- The water container must be clean and free from contaminants; no rust.

Water temperature and directing the stream

Warm water has a higher current leakage than cool water and as such, pipes and hoses should be flushed before being used.

If a fire is very close to a powerline wire, do not direct a stream of water on the wire. Rather, direct the stream above the fire area to allow water to fall onto the fire position. Do not attempt this by directing the water stream into the wind.

17. Turning off supply during premises fires

The 230/400 volt system is the most common voltage entering homes and buildings, with the exception of some large customers that are supplied with electricity directly from the high voltage distribution system.

When emergency services personnel are called to a house or building fire, it may be beneficial for the electricity to be left on, to provide light in which to work.

However, if a risk assessment indicates that the presence of electricity may exacerbate the hazardous nature of situation, the electricity must be turned off.

Meter board/ switch board position

If electricity is to be turned off from the normal meter box/switch board position, great care must be taken when opening the meter box door.

If the meter box is metal, insulated gloves must be worn as the box may be live as a result of damaged wiring from the fire.

Opening the main switch or switches will isolate the supply from that point, however, the wiring between the supply pole or pit will usually remain live. These switches may be of a metal construction and insulated gloves must be worn.

In these emergency situations, fault conditions may overload circuits and operating a main switch may be more hazardous than usual.

To reduce the risk of injury during the switch opening operation, wear eye protection, turn eyes away from the switch at the moment of operation and stand to one side of the switch. Even after the main switches are turned off, wiring should be treated as live until it is confirmed safe by an authorised person.

Electricity supply point of entry

Some situations require the electricity to be isolated from the supply point of entry to the premises. In normal situations only electricity supply company representatives are allowed to isolate supply.

Removing low voltage fuses

If supply company representatives have not yet arrived and an assessment of the situation indicates that supply must be isolated immediately, the low voltage fuse or fuses at the point of entry can be removed by fire authority personnel who have received specific training in this task and have the appropriate safety equipment.

Note: The electricity supply company should be notified of any fire damage to a building so that an installation safety inspection can be carried out. The incident must also be reported to ESV if the origin of the fire is alleged or suspected to be electrical in nature.

18. Enclosures with electrical apparatus

Throughout Victoria there are many purpose-built enclosures used to house electricity distribution assets. These enclosures are often located at large customer sites; in shopping centres, industrial complexes, hospitals etc.

Within the densely populated areas of our major cities, these enclosures are often located along the side or back wall of major buildings and in underground rooms.

Such enclosures contain a variety of electricity equipment energised at various voltages, most commonly high voltage.
They are potentially very dangerous as energised equipment sits very close together and within reach.

Code of Practice

Work on, in, or near any electricity assets, including these enclosures, is regulated and governed by a Code of Practice.
The purpose of the Code is to provide practical safety guidance in relation to the control of risks associated with being in the vicinity of electrical apparatus. The Principles contained in the Code of Practice apply to all persons.

Do not enter an enclosure or substation

Emergency services personnel should not enter electricity enclosures unless accompanied by an electricity supply company representative, or other trained and authorised person.

Underground substation rooms can present further dangers with respect to toxic atmosphere, and only persons trained in confined spaces should enter these enclosures as the use of breathing equipment may be required.

19. Substation fires and unauthorised persons in substation yards

Fenced substations known as terminal stations, zone substations and distribution substations contain high and very high voltages that are located close to ground level, as shown in the images below.

Substations may contain cylinders of compressed gas, rooms of battery banks and large quantities of transformer oil.


Terminal station

Substations are often remotely and automatically operated and as such are often not normally attended by personnel. Emergency services personnel must not enter these stations unless accompanied by an electricity company representative.

Substation fires

If fire authorities are called to a fire at a substation, no fire-fighting should be undertaken until an electricity company representative has confirmed it is safe to do so and what action is safe to take.

Unauthorised persons in substation yards

If person/s are found climbing into or already inside a substation yard, emergency services personnel must not attempt to enter the yard. The electricity company must be called immediately and requested to attend.

Call the person or persons in the yard to the fence and warn them of the extreme dangers of moving around the station.
They must be encouraged to remain at the fence line.

If a person is located on a piece of apparatus, advise them not to move until an electricity company representative arrives and can lead them safely out.

20. Unauthorised persons climbing electricity structures

Electricity industry structures are manufactured from various materials, predominantly wood, concrete or steel.
These structures should be presumed to be conductive and potentially hazardous.

If emergency services personnel are called to attend a situation where an unauthorised person has climbed, or is in the process of climbing an electricity supply structure, no attempt should be made to climb, rescue or apprehend the person.

The electricity supply company must be contacted immediately, requested to turn off the power and attend the site.

The person on the structure must be encouraged to remain where they are.

All persons at the site must stay well clear of the structure, and no persons or vehicles should be located under the powerline.

If the person is unconscious and the power has been confirmed as off, only appropriately trained and authorised personnel can affect a rescue from a
pole or structure top.

21. Water contact, flooding and burst mains

In an electrically hazardous situation water increases the risk of electrocution.

Powerlines and water

If powerlines are sagging, have fallen or are broken and in contact with wet ground or floors in buildings, contact must not be made with the wet area until the power is off and the area has been confirmed as electrically safe by authorities.

Flooding

In flood conditions where large bodies of water have flooded houses and whole residential areas, many electrical power points may be under water.

In these conditions, as the large body of water is also in contact with the general mass of earth over a wide area, emergency services personnel can safely enter homes to perform rescue operations.

In situations of extreme flooding, emergency services personnel use boat transportation to affect rescues. Powerlines may be operating normally above the flooded area and will be live. Extreme caution is required in the vicinity of powerlines, as the height of the water will reduce required clearances.

Burst mains

Emergency services personnel attending a burst water main or damaged fire hydrant, where the escaping water is at a pressure allowing it to contact overhead powerlines, must assume the water stream contacting the powerlines and the surrounding water is energised.

No attempt should be made to enter the area until an electricity supply company representative confirms the electricity supply is off, due to the risk of step and touch potential hazards.

22. Alternative power sources

This section provides emergency service personnel with information on how to safely work around micro distributed generation, including solar photovoltaic (PV), uninterruptable power sources (UPS), generators and battery banks.

Safety is the first priority

If there is any risk of electric shock, do not touch any electrical equipment and/or electrical wires or cables, and seek expert advice from a licensed electrician or registered electrical contractor (REC) before proceeding.

If any person receives an electric shock or suspects they have received one, the Incident Controller must be informed. The affected person must be transported to a medical facility for assessment and treatment if required.

If there has been a serious incident, contact WorkSafe immediately on 13 23 60 or ESV on 1800 000 922.

Hazards and risks

Contact with, or work in proximity to live wires, electrical equipment or alternative power sources can pose a risk of injury or death to emergency service workers when attending an incident.

Always assume all power sources are live.

Never touch or attempt to move electricity cables or electrical equipment until their status has been determined by a licensed electrician or registered electrical contractor.

Electricity supply companies

Electricity supply companies are not responsible for the disconnection of alternative power sources.

Electricity supply companies are not permitted to undertake work within the electrical installation.

They are responsible for the service wire in overhead installations, but not the cable from pit to service fuse/switchboard in underground installations. Their authorisation includes electrical work up to the point of supply and the metering equipment at the customer's switchboard.

Works beyond this point require the attendance of a registered electrical contractor/licensed electrician.

In some areas the electricity supply company may be able to remotely turn off the power supply at a property's smart meter. Do not assume this renders the site safe.

Emergency services personnel should follow agency procedures in contacting the electricity supply company.

The Emergency Services Telecommunications Authority (ESTA) has a direct number into each of the five electricity supply company network control rooms. This number is for ESTA to request priority attendance/response for actions such as isolation of electricity supply to the property.

Call 000 if priority attendance or response is required.

Alternative power sources

Alternative electricity power sources include the following:

- diesel or petrol generator
- grid connect solar PV systems
- wind generator
- water generator
- UPR or battery storage systems.

These generation systems pose a risk of electric shock as one or more of these installed generation systems may still be live when normal supply has been disconnected, or the system may start unexpectedly.

Diesel or petrol generators

- Can be manually or automatically switched on/off.
- May be permanently connected or plugged in.
- May still supply electricity in the event of normal supply isolation.
- There is a risk of electric shock from the generator, cable connections and the installation the generator is connected to.

Note: Continuous power systems such as diesel generators may be installed for critical processes, such as life-sustaining equipment at a health facility.

Grid connected solar PV systems

- Electricity is generated during daylight hours.
- May still have live cables between solar panels, inverter and switchboard during night hours.
- There is a risk of electric shock from the PV array, cable connections and the installation the PV system is connected to.

Wind and water generators

- Electricity is generated by wind or water flow.
- Cables are live between the generator, inverter and switchboard at all times.
- There is a risk of electric shock from the wind or water generator, cable connections, inverter and the installation the generator is connected to.

UPS or battery storage systems

- May be permanently connected or plugged in.
- System still supplies electricity in the event of normal supply isolation.
- There is a risk of electric shock from the battery system, cable connection and the installation the UPS or battery storage system is connected to.

Note: Continuous power systems such as a UPS may be installed for critical processes, such as life-sustaining equipment at a health care facility.

Properties with battery storage pose additional safety risks.

- Batteries may explode or catch fire, and present hazards similar to bottled gas or a natural gas service.
- Noxious gases may escape when charging or discharging lithium ion batteries. While these are nonflammable, they should be managed in the same way as a natural gas leak if there is poor ventilation.
- Batteries may leak corrosive chemicals similar to a car battery or household cleaning products.

Note: If a property is off-grid (and therefore never connected to the electricity network), an electricity generation system and its components can still be live until properly isolated by a licensed electrician.

Further risks

Storm damage

Damage to the solar panels, or the structure they are on, may expose wires or the panel's internal structure. These parts will be live, and if any conductive material contacts them such as gutters, downpipes, metal roof sheeting or cladding, they will also become live.

Follow the isolation procedure that should be located at the main switchboard. If this cannot be found, a licensed electrical worker must attend to isolate the system.

This will isolate the generation system from the installation, but may not stop the solar panel from generating. The only way to prevent the panels from generating electricity is to cover them with a 100% opaque cover.

Storms can damage solar panels, and there may be broken glass or other broken components.

Flood damage

Floodwater can become live if it contacts:

- solar panels or exposed grid connect system components
- wind or water generators, or their system components
- UPS or battery storage systems or components

Prior to flood waters inundating the structure, all generation systems should be isolated.

After a flood, storm or fire

- If a solar power system is affected by floodwater, always assume the solar panels, inverter, associated wiring and surrounding area are live.
- Assume the floodwater and any conductive material in contact with the solar power system is live.
- Establish an exclusion zone of at least three metres around any damaged solar panel components.
- Increase the exclusion zone to eight metres if the components are in contact with conductive materials.
- Notify the local Incident Controller.

NEVER attempt to turn the system back on or operate any of the switches. This may result in electrocution. Prior to re-energising, the installation should be tested by a licensed electrical worker.

Emergency service numbers

Call 000 if you are involved in, or witness a serious emergency, and there is an immediate threat to life.

Electricity supply (poles and powerlines)

Refer to distribution map on Page 5

CitiPower 131 280

City and inner suburbs

Powercor 132 412

Western suburbs and western Victoria

AusNet Services 131 799

Outer nothern and eastern suburbs and eastern Victoria

Jemena 131 626

Northern and north-western suburbs

United Energy 132 099

Southern suburbs and Mornington Peninsula

The electricity supply companies also provide the Police, Fire and Ambulance services with a direct un-advertised contact number.

Transmission towers and lines

SP AusNet 1800 111 164

Traction system

Public Transport Victoria 1800 800 007

Energy Safe Victoria

Call 1800 000 922 to report any serious electrical incident

General enquiries 03 9203 9700
or 1800 800 158

Email info@energysafe.vic.gov.au

Website www.esv.vic.gov.au

www.facebook.com/EnergySafeVictoria

https://twitter.com/energysafevic

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Version 13/2018