SafeWork NSW

Draft - Work near overhead and underground electric lines

Code of practice

Editorial note

When reading this Code of practice (this Code), please be aware that any reference to:

- the '*Work Health and Safety Act*' refers to the *Work Health and Safety Act 2011* (NSW), or any successor legislation,
- the '*Work Health and Safety Regulation'* refers to the Work Health and Safety Regulation 2017 (NSW), or any successor regulation,
- a code of practice refers to the relevant NSW Code of practice, or any successor code of practice.

This Code may contain references to relevant withdrawn or superseded Australian Standards or Australian/New Zealand Standards.

Copyright information

Acknowledgment

Safe Work NSW wishes to acknowledge the contribution and collaboration of industry and social partners through the public comment period and technical development of this code.

Additionally, the cooperation of other WHS regulators and Safe Work Australia is acknowledged for aligning materials where appropriate, particularly from Safe Work Australia's Guidance Material.

Contents

Foreword

This Code of Practice (this Code) on how to manage work health and safety risks of working near overhead and underground electric lines is an approved code of practice under section 274 of the *Work Health and Safety Act 2011* (the WHS Act).

An approved code of practice provides practical guidance on how to achieve the standards of work health and safety required under the WHS Act and the *Work Health and Safety Regulation* (the WHS Regulation) and effective ways to identify and manage risks.

A code of practice can assist anyone who has a duty of care in the circumstances described in the code of practice. Following an approved code of practice will assist the duty holder to achieve compliance with the health and safety duties in the WHS Act and WHS Regulation, in relation to the subject matter of the code of practice. Like regulations, codes of practice deal with particular issues and may not cover all relevant hazards or risks. The health and safety duties require duty holders to consider all risks associated with work, not only those for which regulations and codes of practice exist.

Codes of practice are admissible in court proceedings under the WHS Act and WHS Regulation. Courts may regard a code of practice as evidence of what is known about a hazard, risk, risk assessment or risk control and may rely on the code in determining what is reasonably practicable in the circumstances to which the code of practice relates. For further information see Safe Work Australia's the *Interpretive Guideline: The meaning of 'reasonably practicable'*.

Compliance with the WHS Act and WHS Regulation may be achieved by following another method if it provides an equivalent or higher standard of work health and safety than the code.

An inspector may refer to an approved code of practice when issuing an improvement or prohibition notice.

Scope and application

This Code is intended to be read by a person conducting a business or undertaking (PCBU). It provides practical guidance to PCBUs on how to manage risks to health and safety associated with working near overhead and underground electric lines (commonly referred to as power lines). Other approved codes of practice should be referenced for guidance on managing the risk of specific hazards.

This Code may be a useful reference for other persons interested in the duties under the WHS Act and WHS Regulation.

This Code applies to all types of work and all workplaces covered by the WHS Act where work near overhead and underground electric lines is carried out, excluding:

- work on electricity network assets where the work is carried out in accordance with the requirements of the Electricity Supply (Safety and Network Management) Regulation 2014 and the work is either:
    - by or for an electricity supply authority, or
    - by an accredited service provider, or
    - by a telecommunications network operator.
- mobile plant or vehicles operating on a public road where the design envelope is not greater than the transit envelope and is in any case not greater than 4.6 metres in height (e.g. a side loading waste collection vehicle collecting waste bins from the side of a public road under overhead electric lines)
- when the crane or item of plant is correctly stowed for travelling on a public road
- work on a mine site
- work involving low flying aircraft (e.g. crop dusting, pesticide or herbicide spraying, etc)

- work carried out by emergency services, including state emergency service, fire, police, volunteer rescue association and ambulance during a declared emergency or other local emergency incident. In this situation the agency may only proceed in consultation and/or coordination with the relevant electricity supply authority of the circumstances of the emergency work and ensure a safe system of work is applied by emergency services undertaking the work.

How to use this Code of Practice

This Code includes various references to the legal requirements under the WHS Act and WHS Regulation. These are included for convenience only and should not be relied on in the place of the full text of the WHS Act or WHS Regulation. The words 'must', 'requires' or 'mandatory' indicate a legal requirement exists that must be complied with.

The word 'should' is used in this Code to indicate a recommended course of action, while 'may' is used to indicate an optional course of action.

1 Introduction

1.1 What is work near overhead and underground electric lines?

Work 'near' overhead and underground electric lines (commonly referred to as power lines) refers to situations where there is a chance of a person, directly or through any conducting medium, getting closer than the approach distances outlined in this code. In simpler terms, *'near'* in this context can be swapped with other terms like *'close proximity*,' *'unsafe distance*,' or '*in the vicinity of*.'

Working near live overhead or underground electric lines poses significant risks and is a leading cause of fatalities involving mobile plant and equipment.

Exposure to live electricity can result in serious burns due to the discharge of electrical energy, and additional dangers include potential fires and explosions that may render the equipment inoperative.

Direct contact with live electric lines is dangerous as any voltage causing sufficient current through the heart can lead to severe injuries or even fatalities.

It's important to note that a fatal electric shock doesn't necessarily require direct contact with a high-voltage overhead and underground electric line; **simply being too close can be lethal**.

This Code operates on the premise that individuals without specific training on overhead and underground electric line hazards, termed ‘ordinary persons’, lack the technical knowledge to identify the voltage of live electric lines. This lack of knowledge makes them unable to recognise and avoid electrical hazards when working with cranes or plant near these electric lines.

The approach distances specified in this Code take account of differing levels of technical knowledge and items of plant and are substantially greater for ordinary persons than for persons who are trained.

1.2 Who has health and safety duties?

There are a number of duty holders who have a role in managing the risks of work near overhead and underground electric lines.

A person can have more than one duty and more than one person can have the same duty at the same time.

The main duty holders and key legislative provisions have been referenced in the table below, however the list is not exhaustive.

Duty holder	Application
Person conducting a business or undertaking (PCBU) **WHS Act sections 19, 46 and 47** **WHS Regulation clause 166**	A PCBU must eliminate risks to health and safety arising from work near overhead and underground electric lines, or if that is not reasonably practicable, minimise the risks so far as is reasonably practicable. This includes: • the provision and maintenance of safe plant and structures, and • the safe use, handling, storage and transport of plant, structures and substances, • the provision of information, training, instruction and supervision, • monitoring the health and conditions of the workplace to prevent illness and injury,

	• the provision of adequate facilities for the welfare at work of workers, • managing psychosocial hazards. PCBUs also have duties to • consult workers about work health and safety, • consult, cooperate and coordinate with other duty holders. PCBUs must ensure, so far as is reasonably practicable no person, plant or thing at the workplace comes within an unsafe distance of overhead or underground electric lines. If it is not reasonably practicable to ensure the safe distance, a risk assessment must be conducted and control measures implemented. Any requirements of the electricity supply authority must also be met.
Persons with management or control of plant at a workplace **WHS Act section 21** **WHS Regulation Part 3.1, clauses 203 – 215 and 219 - 220**	A PCBU with management or control of plant must: • manage health and safety risks associated with the plant, • ensure that any mobile plant doesn't collide with pedestrians or other powered mobile plant, • so far as reasonably practicable, prevent unauthorised alterations or interference with plant, • take all reasonable steps to ensure that the plant is used only for the purpose it was designed.
Officers **WHS Act section 27**	Officers of the PCBU must exercise due diligence to ensure the PCBU complies with the WHS Act and WHS Regulation. This includes maintaining up to date WHS knowledge and taking reasonable steps to ensure the business or undertaking has and uses appropriate resources and processes to eliminate or minimise risks to health and safety from work near overhead and underground electric lines. Further information on who is an officer and their duties is available in Safe Work Australia's *Interpretive Guideline: The health and safety duty of an officer*.
Workers **WHS Act section 28**	While at work, workers must: • take reasonable care for their own health and safety, • take reasonable care that their actions or omissions do not adversely affect the health and safety of other persons, • comply with any reasonable instructions given by the PCBU, as far as they are reasonably able, • cooperate with any reasonable health and safety policies or procedures of the PCBU. If personal protective equipment (PPE) is provided by the PCBU, the worker must, so far as they are reasonably able, use or wear it in accordance with the information, instruction and training provided.
Other persons at the workplace	A person at a workplace must: • take reasonable care for their own health and safety,

WHS Act section 29	• take reasonable care that their acts or omissions do not adversely affect other people's health and safety, • comply, so far as they are reasonably able, with reasonable instructions given by the PCBU to allow the PCBU to comply with the WHS Act.

1.3 Consultation

Duty/Provisions	Application
Consulting workers **WHS Act sections 47 - 49**	• PCBUs have a duty to consult with workers, so far as reasonably practicable, on WHS matters which affect them. • Consultation is a two-way process with workers to identify WHS issues, share information, give workers a reasonable opportunity to express views and take those views into account before making decisions about health and safety matters. • While consultation may not always result in agreement, agreement should be the objective as it will make it more likely the decisions are effective and actively supported. • Workers should be encouraged to report hazards and health and safety problems immediately so the risks can be managed before an incident occurs. • If workers are represented by a health and safety representative, the consultation must involve that representative. • Workers must be advised of consultation outcomes in a timely manner. • PCBUs must have effective mechanisms to consult with workers, including when: - identifying hazards and assessing risks, - making decisions about ways to eliminate or control risks, - changing or updating workplace facilities, - proposing changes that may affect the health and safety of workers, - making decisions about consultation procedures, resolving safety issues, monitoring workers' health and conditions, and providing information and training, - selecting new equipment, - introducing new tasks, changing existing tasks or carrying out work in new environments.
Consulting, cooperating and coordinating activities with other duty holders **WHS Act section 46**	• PCBU's must as far as reasonably practicable, consult, cooperate and coordinate activities with all other persons who have a WHS duty in relation to the same matter. • Duty holders should exchange information about who is doing what to ensure effective coordination of works and management of risks, this includes: - the PCBU engages workers to carry out work, - the PCBU directs or influences workers in carrying out work, - other persons may be put at risk from work carried out in their business or undertaking, - the PCBU manages or controls a workplace or the fixtures, fittings or plant at a workplace, - the PCBUs business or undertaking involves designing, manufacturing, importing or supplying plant, substances or structures for use at a workplace - the PCBUs business or undertaking involves installing, constructing or commissioning plant or structures at a workplace.

	For example, representatives from a construction company and an electricity supply company must consult about the risks associated with working near overhead and underground electric lines. They should work together in a cooperative and coordinated way to manage the risks, such as ensuring electric lines are de-energised or appropriate exclusion zones are established and maintained during construction activities.

Further guidance on consultation requirements is available in the Code of practice: *Work health and safety consultation, cooperation and coordination.*

1.4 Information, training, instruction, and supervision

Duty / Provisions	Application
Information, training, instruction or supervision **WHS Act section 19** **WHS Regulation clause 39**	• PCBU's must provide any information, training, instruction, or supervision necessary to protect all persons from health and safety risks, including when using plant. • The information, training and instruction: - must be suitable and adequate for the nature of works, risks and control measures implemented, - must be readily understandable to the person it is being provided to, so far as is reasonably practicable, - should be supported by relevant safe work procedures, ie. emergency procedures, traffic rules, PPE. • Workers need to be trained and have the appropriate skills to carry out tasks safely. • Training needs to be provided to workers by a competent person. • Training programs should be practical and 'hands on' and take into account the particular needs of workers. Units of competency/training packages are subject to change and are often updated. Current training information can be found at www.training.gov.au

Please refer to Chapter 5 Training and competence – trained person.

2 Risk management process

WHS Regulation clauses 34 - 38

Risk management is a systematic process to eliminate or minimise the potential for harm to people.

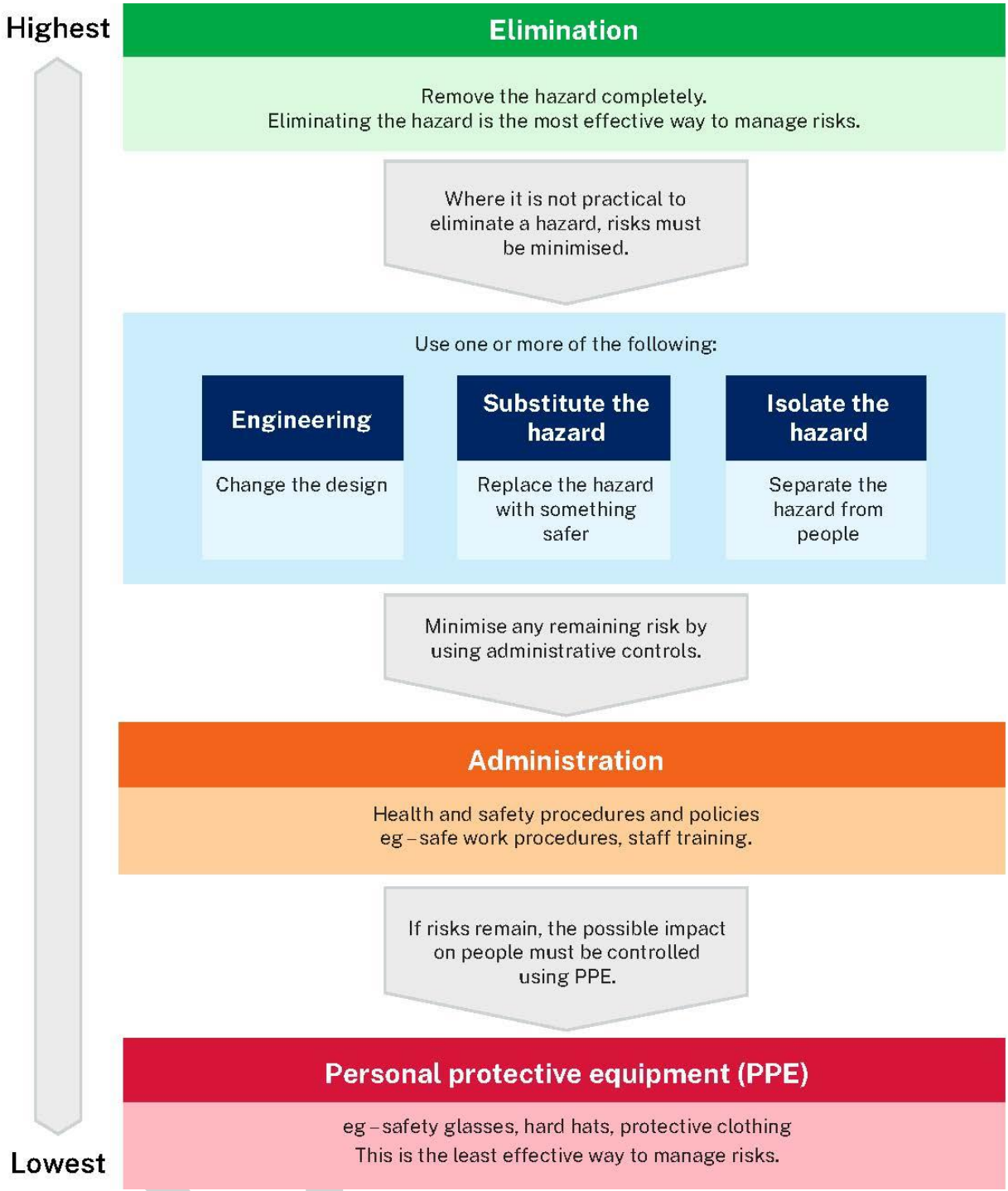

Figure 1: An overview of the hierarchy of control

Further risk management guidance is available in the:

- Code of Practice: *How to manage work health and safety risks*
- Code of Practice: *Managing psychosocial hazards at work*
- Code of Practice: *Sexual and gender-based harassment*

3 Preparations for commencing work

To ensure the safe execution of work, careful planning and preparation is essential. Before commencing any task, all prescribed controls must be identified and established, as indicated by the risk assessment(s) and safe work method statement(s). It is also important to ensure that there is no risk of introduction of new hazards.

The preparatory phase should consider the following:

- clearly define the nature of the planned work and establish adaptable strategies to address changes as the work progresses,
- identify and address potential hazards and risks associated with the intended work,
- use tool such as “Look up and Live” to assist in the identification of potential hazards or risks,
- consult with the electricity supply authority to get the necessary insights and ensure alignment with operational requirements,
- define and implement effective communication and interaction protocols among workers at the work site,
- verify and ensure the training, qualifications, and competency of all workers involved in the task,
- conduct a thorough check of the operation of plant and equipment, including the functionality of limiting devices,
- manage the proximity of persons, plant, materials, and tools to electric lines,
- ensure safe proximity of individuals to cranes and mobile plant(s),
- provide precise, specific and clear instructions to workers regarding their roles and responsibilities,
- plan for safe and efficient workplace access and egress,
- formulate emergency procedures, covering first aid, evacuation, and rescue plans, and more as needed in consultation with workers and other stakeholders,
- ensure policies and procedures are in place that address environmental factors, such as ground conditions, wet and/or unfavourable weather, that may impact work execution.

Figure 2 represents the information above in a flow chart for preparation before commencing work.

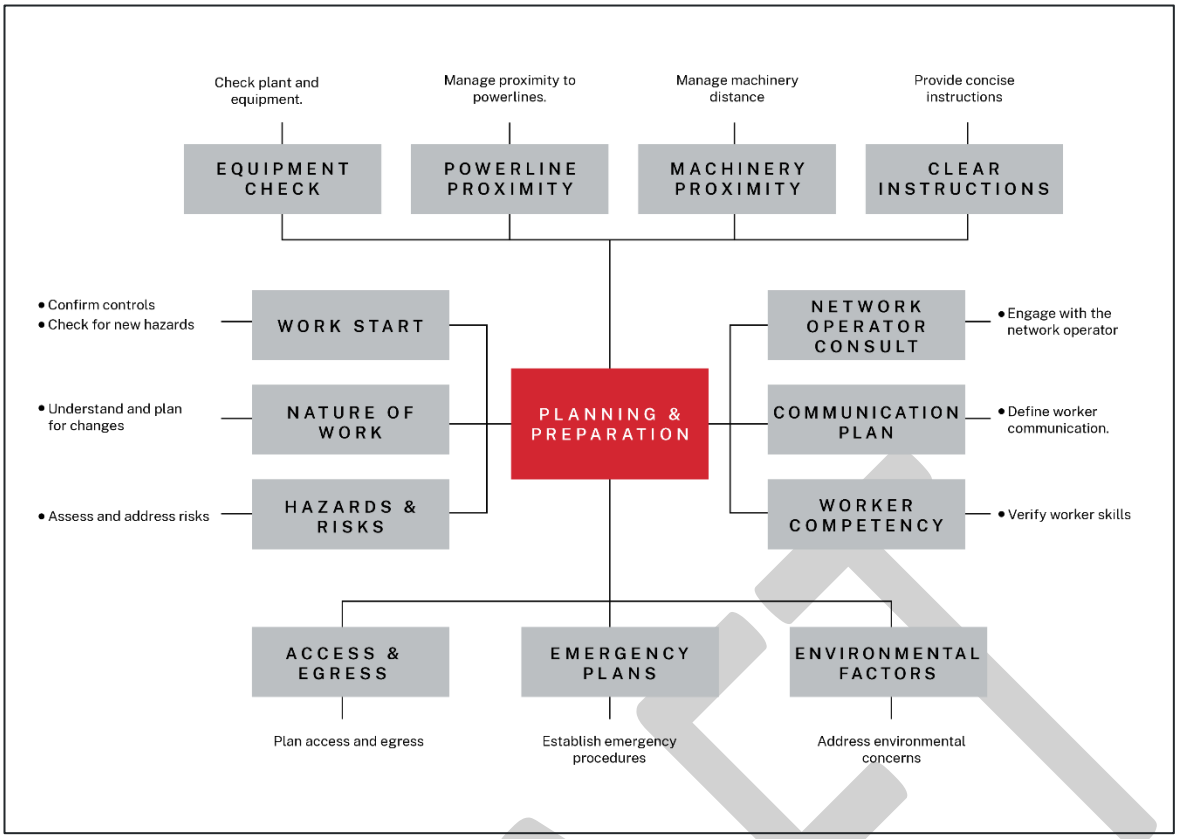

Figure 2: Planning flowchart before commencing work

4 Approach distances when working near overhead electric lines

This chapter outlines the framework for work near overhead electric lines. It covers general risk management principles and approach distances to live electrical conductors. This includes no-go zones for cranes, plant (and their loads), vehicles, individuals, and handheld tools. The guidance is applicable to individuals with varying levels of qualifications, training, or knowledge.

The approach distances set out in this chapter are only part of an overall safe system of work, which must be implemented by PCBUs working near electric lines and associated electrical apparatus. In implementing a safe system of work consideration should be given to the risk assessment process outlined in Chapter 2, planning outlined in Chapter 3 and the control measures throughout the code.

4.1 Basis and assessment of approach distances

Before commencing any work near overhead electric lines, it is crucial to assess the height, voltage, and horizontal safety clearance of these lines at the worksite. Several factors must be considered when determining the appropriate approach distances for the task.

The possibility of errors in estimating distances, especially at higher voltages, where there is a large approach distance, means it may be necessary to allow more clearance or to use methods that provide more accurate estimation of distances. For example, a laser marker, which provides a safe and accurate method of estimating distances near overhead electric lines.

If the height or voltage of the overhead electric lines cannot be accurately determined consult the electricity supply authority.

Do not attempt to directly measure the height of the overhead electric lines. Do not use conductive metallic objects or measuring devices such as metal tape measures for estimating the height of overhead lines.

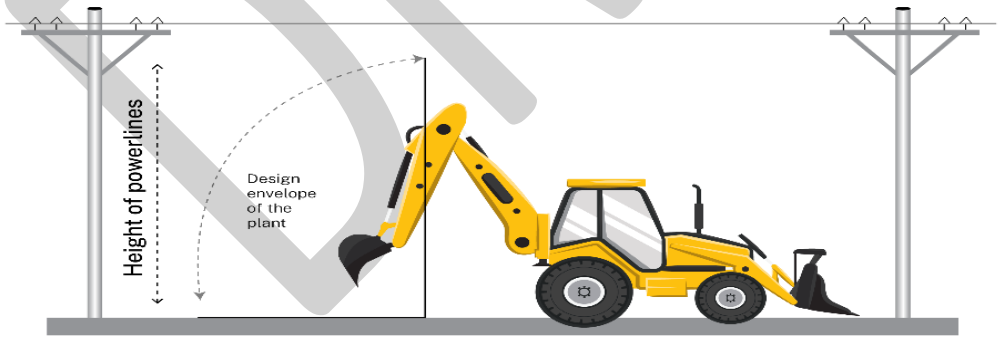

Figure 3: Distance that must be assessed for each worksite

Overhead electric lines are made of conductive material and are therefore subject to expansion and contraction when heated and cooled.

- This can be a direct result of high ambient air temperature and/or excessive electrical load current passing through the conductors.
- Regardless of the cause, any expansion will result in gravity causing the electric lines to sag downwards.

- Wind can also cause the electric lines to swing from side to side. For this reason, the approach distances must be increased either vertically or horizontally by the amount of conductor sag or swing at the point of work. Refer to Figure 4.

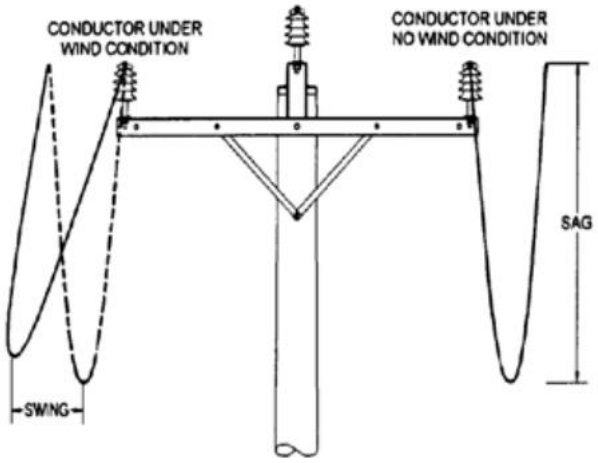

Figure 4: Illustration of overhead electric line 'sag or swing'

- Where more than one voltage is present, for example overhead electric lines with two or more circuits operating at different voltages on the same poles, the approach distance appropriate to each voltage must be maintained independently.
- Increased clearances must be allowed where a risk assessment identifies a reasonable possibility of the load or lifting gear (crane hook, chains, slings, etc) moving or swinging towards the overhead electric lines or associated electrical apparatus when the crane or item of mobile plant is operated.

How close can I go to electric lines?

Once an assessment has been undertaken for the worksite and the electric lines, a decision can be made on the approach distance for the proposed work. The approach distances and work zones described in this chapter and illustrated in Figure 5 vary with the voltage of the electric lines and the level of training of the person/s performing the work.

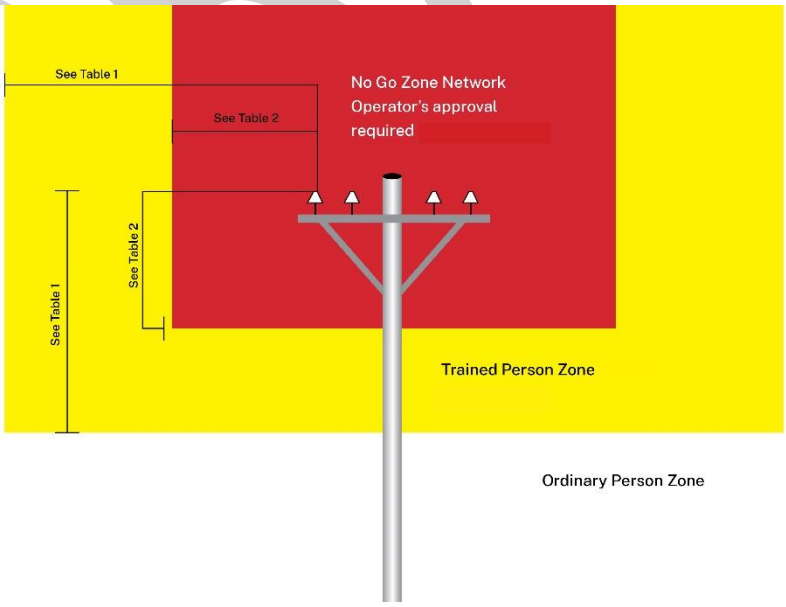

Figure 5: Approach distances and work zones near overhead electric lines

The relevant approach distances are set out in the following tables:

- Table 1 provides the approach distances for ordinary persons. These are workers who have not received training in electric line electrical hazards and are restricted to work in the ordinary person zone. Refer to Chapter 4.2 and Figure 5.

- Table 2 provides reduced approach distances for trained persons. These are workers who have successfully completed a recognised training course in electric line electrical hazards and are therefore permitted to work closer to the electric lines in the trained person zone. Refer to Chapter 4.3 and Figure 5.
- Table 3 provides the approach distances for vehicles that are driven under electric lines. Refer to Chapter 4.5.

The approach distances vary with the voltage and they apply to:

- any part of a crane or item of mobile plant, including vehicles,
- any load being moved, including the slings, chains and other lifting gear,
- any person working at heights, for example, from an elevating work platform, scaffold, or other structure, or
- any hand tools, hand control lines, equipment or other material held by a person.

Note: Special approach distances apply for scaffolding work (Chapter 8) and work near low voltage service lines (Chapter 10).

4.2 Ordinary person zone

Table 1 provides approach distances for:

- ordinary persons performing work near electric lines, (including plant, hand tools, equipment or any other material held by a person), or
- cranes (and their loads) and items of mobile plant operated by an ordinary person near overhead electric lines.

Table 1: Approach distances (in metres) for work performed by ordinary persons

Nominal phase to phase A.C. voltage (volts)	Approach distance (m)
Up to and including 132,000	3.0
Above 132,000 up to and including 330,000	6.0
Above 330,000	8.0
Nominal pole to earth D.C. voltage (volts)	**Approach distance (m)**
Up to and including +/- 1500 Volts	3.0

Note:

- Where a written risk assessment determines it necessary, the use of a safety observer should also be considered for work performed by ordinary persons working outside but up to the approach distances specified in Table 2. The duties of the safety observer are described in Chapter 5.
- Special approach distances apply for scaffolding work (Chapter 8) and work near low voltage overhead and underground service lines (Chapter 10).

4.3 Trained person zone

Table 2 provides approach distances for:

- trained persons (refer to Chapter 5), with a safety observer who are performing work near overhead electric lines (including plant, hand tools, equipment or any other material held by a person), or
- cranes (and their loads) and items of mobile plant operated by a trained person with a safety observer near overhead electric lines.

The approach distances in Table 2 are based on:

- completion of a written risk assessment prior to the commencement of work,
- application of a safe system of work, which includes the use of a safety observer,
- if determined by the written risk assessment, consultation with the electricity supply authority regarding the proposed work and compliance with any conditions imposed by the electricity supply authority for the work.

Table 2: Approach distances (in metres) for work performed by Trained Persons, with a Safety Observer

Nominal phase to phase A.C. voltage (volts)	Approach distance (m)
Insulated low voltage cables up to 1000, including LV ABC	0.5
Un-insulated low voltage conductors up to 1000	1.0
Above 1000 up to and including 33,000	1.2
Above 33,000 up to and including 66,000	1.4
Above 66,000 up to and including 132,000	1.8
Above 132,000 up to and including 220,000	2.4
330,000	3.7
500,000	4.6
Nominal pole to earth D.C. voltage (volts)	**Approach distance (m)**
Up to+/- 1,500	1.0

Note: Special approach distances apply for scaffolding work (Chapter 8) and work near low voltage overhead and underground service lines (Chapter 10).

4.4 Working inside the no-go zone – approval of the electricity supply authority

The no-go zone is the area around overhead electric lines into which no part of a person, material, cranes, vehicles or items of mobile plant may encroach without the written approval of the electricity supply authority.

Note:

- Person - includes hand tools, equipment or any other material held by a person.
- Plant - includes the load, controlling ropes and any other accessories associated with the plant.

If there is a risk that the work could cause any person, plant, or thing to be inside the no-go zone (closer than the approach distances listed in Table 2 or above the electric lines); prior to commencing work the PCBU must consult with and comply with the directions of the electricity supply authority.

The written advice should be available at the worksite and able to be produced when and if requested.

4.5 Approach distances for vehicles or plant in transit

Table 3 provides approach distances for vehicles, mobile plant stowed for transit or with a design envelope up to and including 4.6 metres in height, which are driven by or operated by persons under overhead electric lines.

When assessing the approach distance for a vehicle driven under overhead electric lines a number of factors should be taken into account including:

- the approach distances specified in Table 3 are based on the fact that the design or transit envelope of the vehicle does not allow any part of the vehicle to come closer than the approach distances specified. This includes the load, exhaust pipe and attachments such as rotating/flashing lights or aerials. Refer to Figure 6 below.

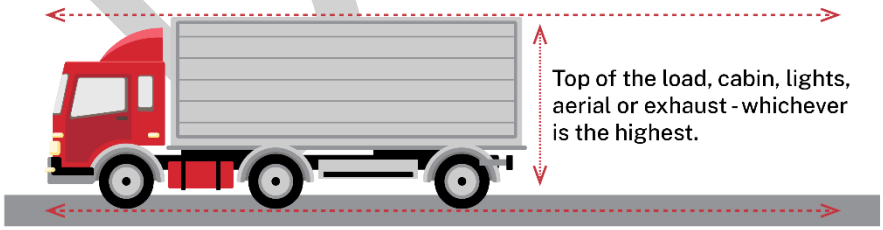

Figure 6: Transit envelope – the maximum overall height of the vehicle

- where a work activity involves a person working safely from, standing on or walking across the top of a vehicle the relevant approach distance specified in either Table 1 or Table 2 must be maintained. This may include for example the driver of a livestock transporter who may need to access the top of the vehicle to check livestock.

- when work involves the construction of a road or a levee bank where an incline is being formed beneath electric lines, ongoing assessment of the approach distances must occur and the risk assessment reevaluated as needed.
- any additional assessment and consultation with electricity supply authority for factors that may be relevant for the operation of the vehicle as described in Chapter 4.1.

Table 3: Approach distances (in metres) for vehicles

Nominal phase to phase A.C. voltage (volts)	Approach distance(m)
Low voltage conductors up to 1000	0.6
Above LV (1000), up to and including 33,000	0.9
Above 33,000 up to and including 132,000	2.1
Above 132,000 up to and including 220,000	2.9
330,000	3.4
500,000	4.4

5 Training, competence and knowledge

To carry out work at distances less than the approach distances specified in Table 1, the following workers must be trained:

- the operator of a crane,
- the operator of mobile plant (including an elevating work platform),
- the safety observer.

PCBU must ensure that the workers are trained, competent and the competency is maintained.

The following provides guidance on training, competence and knowledge.

5.1 Training and competence – trained person

Trained person, include crane and plant operators, mobile plant operators, elevating work platform operators, and safety observers involved in work within close proximity to overhead and underground electric lines.

A trained person is a person who has successfully completed and been deemed competent in the national unit of competency (or equivalent): UETDREL006 *Work safely in the vicinity of live electrical apparatus as a non-electrical worker.* This course is conducted by a registered training organisation and recognised by both SafeWork NSW and electricity supply authorities.

For successful completion, individuals must pass a skills and knowledge assessment to be deemed competent. The registered training organisation will provide a statement of attainment or written certification with a unique identifying number.

To ensure compliance, PCBU should maintain thorough records of training and assessment for trained persons and other workers engaged in work near overhead and underground electric lines.

5.2 Safety observer – general requirements

The safety observer is a worker allocated the responsibility to oversee work near live overhead and underground electric lines and associated electrical apparatus to:

- advise workers or the crane or plant operator to maintain the approach distances, and
- advise workers of any other unsafe conditions during the activity.

The safety observer must:

- be used whenever the work activity is to be performed in the Trained Person Zone,
- be positioned at a suitable location to effectively observe both the overhead and underground electric lines and plant,
- be able to immediately and effectively communicate with the operator of the crane or mobile plant, or other workers if required,
- ensure that all persons stay outside the specified approach distance (unless performing a rescue in accordance with approved procedures or carrying out a specific task that is described in the safe work method statement, for example, a crane dogman holding a non-conductive tag line attached to a load suspended from a mobile crane),
- not carry out any other work while performing the role of a safety observer, which includes the passing of tools, equipment or materials directly to the workers performing the work,
- not observe more than one work activity at a time,
- continue to monitor the work activity being carried out and have the authority to suspend the work at any time.

Note: Where a written risk assessment determines it necessary, the use of a safety observer should also be considered for work outside but up to the Trained Person Zone.

For overhead electric lines, a safety observer must complete the national units of competency (or equivalent):

- HLTAID009 - Provide cardiopulmonary resuscitation, and
- UETDREL006 - Work safely in the vicinity of live electrical apparatus as a non-electrical worker, and
- UETDRMP007 - Perform rescue from a live low voltage panel.
- For maintenance of competency, refer to section 5.3.

These courses are conducted by a registered training organisation and recognised by both SafeWork NSW and electricity supply authorities.

5.3 Maintenance of competency

PCBUs are responsible for ensuring the ongoing competence of workers engaged in activities related to work near overhead and underground electric lines.

This regular evaluation ensures that trained persons and/or safety observers possess the essential knowledge and skills required for safe practices in proximity to overhead and underground electric lines. It also includes approved resuscitation procedures and emergency protocols to be followed in case of an accident.

In instances where individuals do not maintain competency due to insufficient on-the-job application of acquired skills and knowledge, refresher training and competency re-assessment become necessary to maintain competency.

6 Operating cranes and mobile plant near electric lines

This chapter outlines specific requirements for workers operating cranes or mobile plant near overhead electric lines, including various mobile plant types. These include:

- cranes (including mobile and vehicle loading cranes),
- concrete placing booms,
- elevating work platforms (EWPs),
- mobile plant (e.g., truck operators involved in load-related tasks),
- load shifting equipment (e.g., forklifts),
- excavation and earthmoving equipment around electrical assets,
- high load transportation vehicles.

However, the application of this chapter is not limited to any particular type or class of mobile plant or equipment.

Note: This chapter is not intended to cover cranes and mobile plant when they are retracted and correctly stowed when travelling on a public road or where the design envelope of the crane or item of mobile plant is less than 4.6 metres in height.

For requirements regarding underground assets, refer to Chapter 11 of this Code.

6.1 Hazard identification

Prior to operating a crane or mobile plant, the operator or PCBU must inspect the workspace to uncover potential hazards. This includes identifying live overhead electric lines or other electrical apparatus in the vicinity.

Operators should assume all overhead electric lines are live unless an access authority/permit or written documentation from the electricity supply authority is received.

Figure 7: Cranes and mobile plant working near overhead electric lines

Mobile plants, such as cranes, excavators, graders, EWPs, earthmoving machinery, tipper trucks, and concrete placing booms within the specified approach distances in Table 1, must adhere to the safe work systems outlined in this chapter.

6.2 Risk assessment

When facing a hazard near electric lines, especially if there's a chance of work, cranes, or mobile plants getting close to the specified distances in Table 1 for ordinary persons, a written risk assessment must be conducted. The following factors should be considered:

- consultation with the electricity supply authority regarding the proposed work,
- whether the electricity supply will be de-energised or isolated,
- the location and voltage of the electric lines,
- the number of people involved and their individual needs,
- the nature of work undertaken,
- the nature, size and shape of the load to be moved, e.g., dimensions, surface area and whether the load is conductive,
- the setting up and packing up processes,
- the location of underground services and ground conditions when setting up a mobile crane,
- the safe work practices and procedures in place,
- the type of crane, mobile plant, machinery and equipment to be used and its design envelope,
- site conditions, including the stability of crane or mobile plant and suspended loads,
- the potential for inadvertent movement of the crane or mobile plant, the load, persons and electrical equipment in the area,
- the qualifications, competency, skill and experience of people doing the work,
- any vehicular traffic, pedestrians, or livestock that could interfere with the work,
- prevailing and unexpected weather conditions, such as wind strength and direction, that may impact the work,
- any foreseeable abnormal conditions that may exist at the worksite.

After assessing the risks, it is crucial to take action to eliminate or control the risks. Adequate supervision is key to ensuring that control measures are effectively applied by workers. The PCBU must ensure that all necessary steps are taken to maintain a safe work environment. This includes ongoing monitoring, review, and adaptation of safety measures to address changing circumstances and emerging risks. Every workplace is different, so select the controls that are fit for purpose.

6.3 Control measures for cranes and mobile plant operating near overhead and underground electric lines

When deciding on control measures for a specific task, factors that should be taken into account include terrain, ground conditions, weather, lighting, nearby work, and the nature of the task itself. Opt for the highest level of control to ensure safety, so far as reasonably practicable. Once the most effective control measures have been chosen, you can also use additional lower-level controls in accordance with the hierarchy of controls.

Elimination

To remove the danger of harm from electricity, electric shock, or burns, PCBUs should work with the electricity supply authority to de-energise the electricity supply during the task. After consulting

with the electricity supply authority, consider exploring options like redirecting or relocating overhead electric lines or replacing them with underground cables.

The PCBU or crane/mobile plant operator should:

- Discuss de-energising or rerouting the electricity supply with the electricity supply authority or for private overhead electric lines, the person in control of the premises.
- Consider working at a time when the electricity supply can be turned off.
- Check if the section of overhead electric lines near the work can be de-energised while leaving the rest connected.

Minimise risks

If the risk cannot be eliminated, PCBUs must take steps to select appropriate controls to minimise the risks, such as:

- opting for an alternative crane or mobile plant that cannot encroach on the specified approach distances,
- restricting hoisting, slewing, or other movements of the crane or mobile plant through:
    - implementing mechanical stops or interlocking systems to prevent powered movements within the approach distance,
    - applying mechanical constraints on the crane or mobile plant components that may contact live overhead electric lines,
    - utilising cranes or mobile plant equipped with programmable zone limiting devices.
- positioning the crane or mobile plant to ensure the design envelope stays outside the approach distance, giving consideration to any movement of the load.
- minimise unexpected movement of the crane, mobile plant and or load:
    - adding outriggers, supports, or packing to enhance stability,
    - preparing the ground or surface, or adjusting the crane or mobile plant, to reduce surge or backlash,
    - tag lines must be polypropylene rope, clean of defect or contaminate,
    - PCBUS must ensure increased clearances if there's a possibility of the load or lifting gear moving, such as wind, towards overhead electric lines during crane or mobile plant operation.
- establish marked barriers to designate restricted zones for the crane or mobile plant:
    - use rigid or tape barriers, or other electric line markers to cordon off areas beneath overhead electric lines,
    - consult with the electricity supply authority to mark the limits of appropriate distance, such as high-visibility 'bunting' or similar (Refer to Figure 8.), noting bunting must be performed in a way that doesn’t encroach the trained person zone.

- providing electrical separation between the people and hazard in accordance with the guidance outlined in Chapter 6.4 Workers in contact with the crane, load or mobile plant.

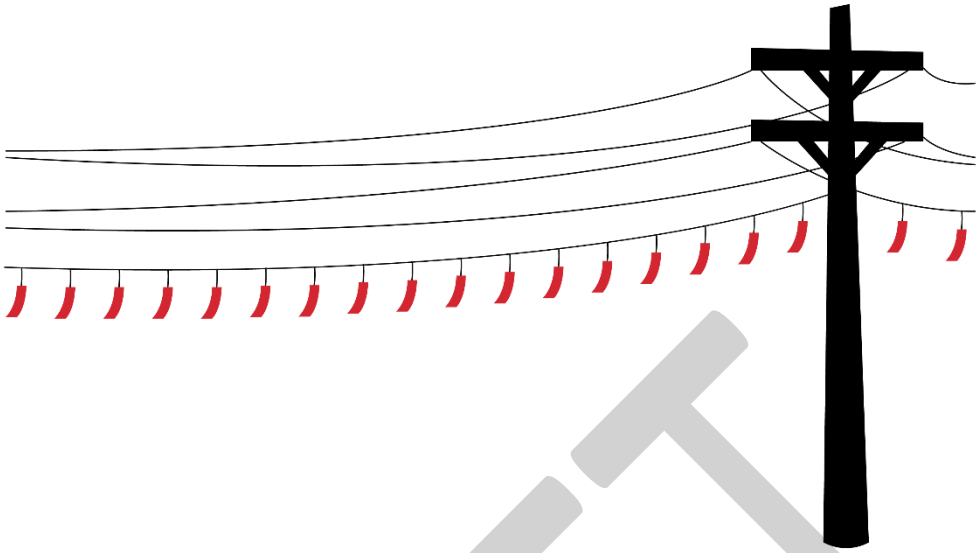

Figure 8: Illustration of a visual tape bunting fitted by the electricity supply authority under overhead electric lines

Administrative controls

Consider the following administrative controls to support the other controls:

- Manage and supervise work by ensuring:
  - deliberate and careful work practices are followed,
  - adherence to the employer's safe work method statements,
  - workers are trained and deemed competent.
- Enhance hazard visibility by:
  - arranging for the electricity supply authority to use approved visual indicators like sheeting or sleeves (e.g., 'tiger tails', also known as tarapoli pipes, or aeriel markers or other markers approved by the electricity supply authority) to identify exposed live low voltage conductors (up to and including 1000 volts),
  - ensuring 'tiger tails' extend at least 5 metres beyond the operating zone of the crane or mobile plant,
  - conducting daily visual inspections by a competent person before starting crane or mobile plant operations,
  - contacting the electricity supply authority if 'tiger tails' have moved or been damaged, ensuring replacement or correct repositioning (refer to Chapter 12.1 of this code),
- Plan for emergencies by:
  - providing suitable fire-fighting equipment for electrical fires at the site that is easily accessible,
  - having appropriate first aid equipment available and emergency response/rescue plan.
- Ensure a safety observer is present when a crane, mobile plant, or load is in motion and may approach closer than the distances listed in Table 1 (see Figure 5). Safety observer duties for cranes and mobile plant work are detailed in Chapter 5 of this code.

- Consider fitting a warning device to the crane or mobile plant to alert the operator when entering energised high voltage overhead electric line zones, specifically when the crane or mobile plant has entered the specific distance outlined in the code. Note: These devices do not replace appropriate management of safe work practices.
- Consider using warning signs to indicate the location of overhead electric lines and/or defined work areas, ensuring that the 3 metres distance should not be encroached. Consider additional signage options such as "Look Up and Live", "Danger", "Keep Clear", "Risk of Shock", and more. (Refer to Figure 9 below).

Figure 9: Overhead electric lines warning sign

6.4 Workers in contact with the crane, load or mobile plant

It is prohibited for anyone to maintain contact with any part of a crane, load, or mobile plant and the ground or any other grounded surface while the crane or mobile plant is operating within the approach distances specified for ordinary persons in Table 1 of this code. Additional precautions must be implemented to mitigate the risk of electric shock, as outlined below.

Operators

The operator may handle the controls of a crane or item of mobile plant while standing on the ground or while in an earthed situation only if:

- using a wireless remote control, or
- the operator stands on a rubber insulating mat thick that is clean and dry (applicable for low voltage only), or
- the operator stands on an '*equipotential conductive mat*' which is electrically connected to all metalwork associated with the controls.

6.5 Competency requirements

To perform crane and mobile plant operations within the approach distances outlined in Table 1, the following individuals must be trained and deemed competent, as detailed in Chapter 5 of this code:

- crane operator,

- mobile plant operator (including elevating work platform),
- safety observer,
- any person that will be required to work within the trained person zone.

6.6 Safety observer for crane and mobile plant operations

A safety observer, as explained in Chapter 5, is responsible for monitoring the approach of a crane or mobile plant (along with its load) to live electric lines and associated electrical apparatus.

The safety observer must:

- be present whenever the crane, load, mobile plant, or persons working from the plant are in motion and might come closer than the distances specified in Table 1.
- be positioned to effectively observe both the electric lines and the plant,
- have immediate and effective communication with the crane or mobile plant operator or other workers if needed,
- ensure all persons remain outside the specified approach distance (unless performing a rescue or carrying out a specific task as described in the safe work method statement),
- avoid engaging in other tasks while acting as a safety observer, including passing tools or materials directly to workers performing the work,
- focus on observing one crane or item of mobile plant at a time,
- continuously monitor the work and have the authority to suspend it at any time.

Note: Where a written risk assessment determines it necessary, the use of a safety observer should also be considered for work performed by ordinary persons working outside the approach distances specified in Table 1.

Additionally, the safety observer should not be positioned on the workbasket of an elevating work platform while monitoring work conducted from that workbasket.

A safety observer **is not** required in the following situations:

- for stationary plant, once fully erected, if it is not positioned below the electric lines or electrical apparatus and is horizontally outside the distances specified in Table 2.
- if an effective limiting device is in place to prevent any part of a crane, mobile plant, or load from approaching closer than the distances in Table 2, provided the device is stress-resistant and regularly inspected and tested by a competent person.
- when the crane or mobile plant design restricts movement, ensuring no part of the crane, mobile plant, or load can approach closer than the distances specified in Table 2.

6.7 Earthing systems for cranes and mobile plant

The chassis of a crane or item of mobile plant may, where practical, be earthed and bonded. A system of work must be adopted that ensures workers are kept clear of cranes and mobile plant when work is carried out near live overhead electric lines and workers should be advised of the effectiveness of the earthing system.

For specific advice and guidance about the earthing of a crane or item of mobile plant consult with the electricity supply authority.

6.8 Notices to be fixed to cranes and mobile plant

Cranes or mobile plant used near live overhead electric lines must have a warning notice or label. This label should display the approach distances for ordinary persons, as specified in Table 1.

The notice or label must be well-maintained, legible, and placed at each control set, ensuring visibility to the operator.

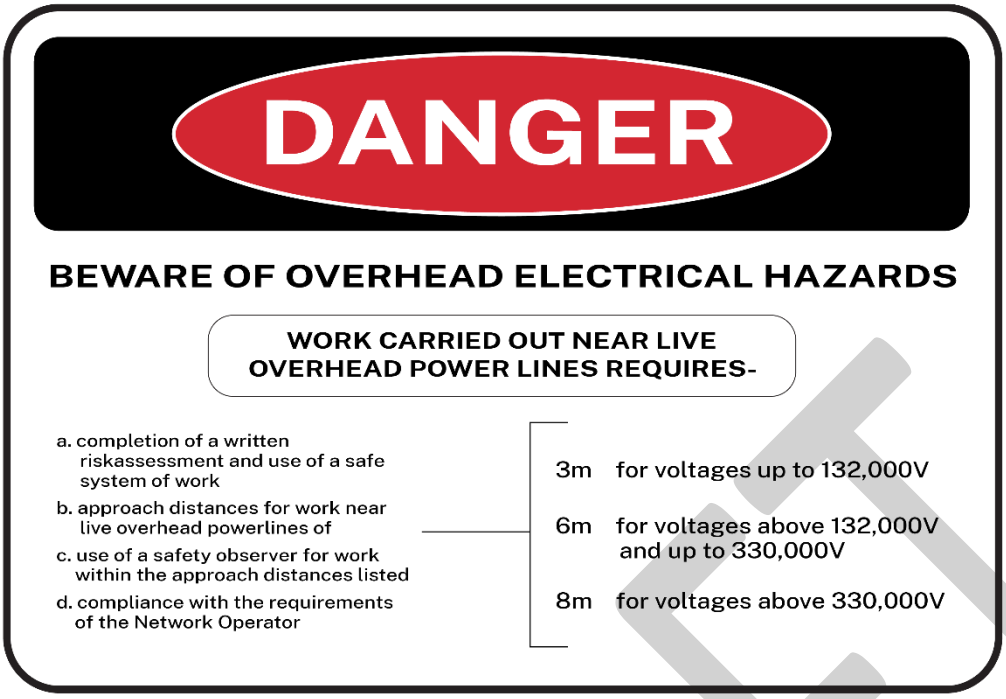

Figure 10: Beware of overhead electric lines warning sign

7 Tree and vegetation management near electric lines

This chapter, in addition to the general requirements in Chapter 4, provides specific guidelines for working on trees, including cutting, trimming, chemical treatment, and other processes near live electric lines. This applies when:

- a person, or something they are holding or in contact with, could come closer than the specified approach distance in Table 1 or Table 2, and/or
- the work poses a risk of damaging electric lines or electrical apparatus.

7.1 Hazard identification and risk assessment

Tree and vegetation management activities involve electrical hazards, which may arise in various circumstances, such as:

- Branches or other vegetation falling onto electric lines during trimming operations.
- Tools like electric saws or trimmers coming into direct contact with electric lines or other associated electrical apparatus.
- Mobile plant, such as an elevating work platform (EWP), coming into contact with overhead electric lines or other associated electrical apparatus.
- Electric lines breaking and falling on the ground, footpath, or road.
- Wind blowing branches or limbs against overhead electric lines.
- High winds causing a loss of control while lowering materials.
- Unexpected movement of the worker, mobile plant, or vegetation relative to the worker.

If a hazard related to tree management work near overhead electric lines is identified, the employer must conduct a written risk assessment. This assessment helps determine the risk to individuals getting too close to the relevant approach distances. This step allows the employer to evaluate the level of risk associated with identified hazards and establish a priority list based on the level of risk.

7.2 Eliminating or controlling risks – general risk factors

The risks linked to electrical hazards stem from proximity to live conductors. The most effective way to eliminate these risks is to prevent people, their equipment, and materials from getting close enough to live conductors, avoiding direct contact or flashovers.

When planning the work, it is crucial to identify potential exposure to electrical hazards and determine the most effective methods to ensure that people and equipment maintain safe distances from live overhead electric lines.

In addition to ensuring that the work near overhead and underground electric lines is avoided, other factors should be considered:

- Always assume that overhead electric lines are live unless you have received an access authority or written documentation from the electricity supply authority.
- Do not assume that a telecommunication cable is harmless; treat it with caution.
- Trees and tree branches can conduct electricity, even in dry conditions. Never assume it's safe for them to touch or rest on overhead electric lines. If there's a risk during felling or cutting that they might come closer than the approach distances in Table 1, the electric lines should be de-energised.
- Do not cut trees in contact with live overhead electric lines unless using a safe system of work approved (in writing) by the electricity supply authority.

- Plant near overhead electric lines can become energised, posing a serious danger. Maintain the relevant approach distances when operating any machinery, tools, or equipment near live overhead electric lines, and cease operations if safety distances are compromised.
- Manage traffic and pedestrians to ensure safe distances from electric lines. If the work requires changes in traffic or speed limits, follow full traffic control measures as per Transport for NSW traffic control at work sites technical manual and/or local council requirements.
- Plan ahead and consider potential sudden weather changes including but not limited to electrical storms, heavy rain, or strong winds that could impact the proposed work.

7.3 Requirements for ordinary persons carrying out tree and vegetation management

An ordinary person should not:

- Climb a tree within 3 metres of live electric lines or cut branches that might come within 3 metres of these electric lines during the work.
- Allow any part of their body, anything they are holding, or anything attached to their body to approach closer than the distances specified in Table 1 of this Code when working near live electric lines.
- Ensure work is not performed above electric lines or where any part of the tree or vegetation might fall within the specified approach distances in Table 1.
- If there's a reasonable possibility of work being done above electric lines or closer than the approach distances in Table 1, trained persons with proper training and current competency in 'tree and vegetation management' near live electric lines should conduct the work.

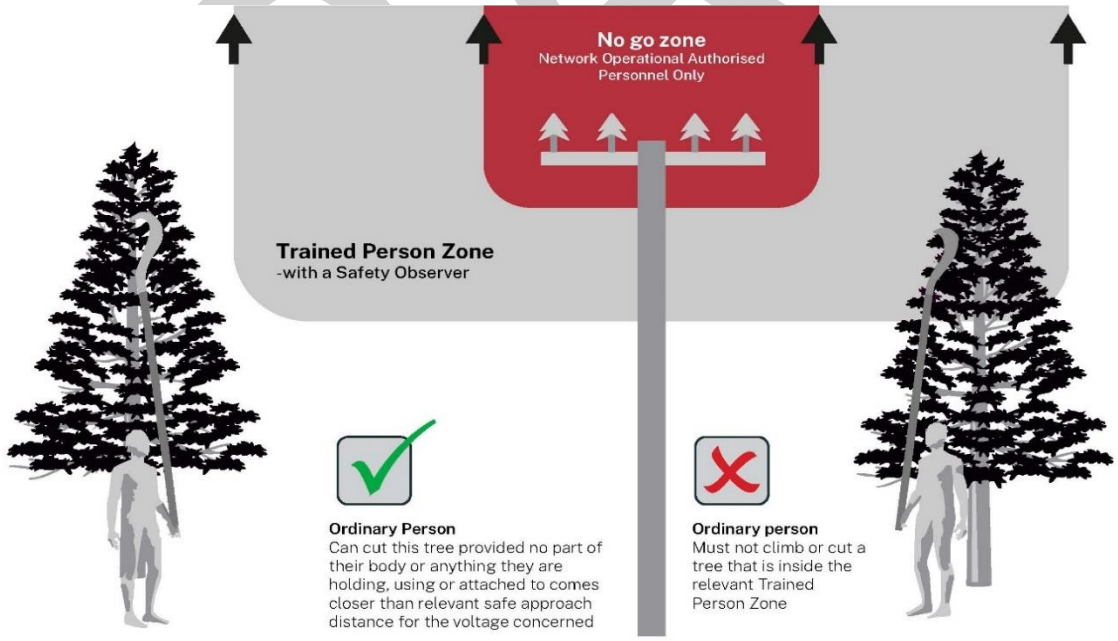

Figure 11: Ordinary person vegetation management guide

7.4 Requirements for trained persons carrying out tree and vegetation management

Trained persons, including a person holding *UET20321 Certificate II ESI – Powerlines Vegetation Control* or an equivalent qualification, with current competency in 'tree and vegetation management' near live electric lines may conduct the work following the approach distances specified in Table 2 of this code, provided the following requirements are met:

- Complete a written risk assessment for the work and implement a safe system of work, including the presence of a safety observer.
- If determined by the risk assessment, consult with the electricity supply authority about the proposed work and adhere to any conditions set by the electricity supply authority for the work.

Note: Training and assessment requirements for trained persons, including safety observers, are outlined in Chapter 5 of this code.

7.5 Tree management inside the no-go zone – approval of the electricity supply authority

The "no-go zone" is the area around electric lines into which no part of a person, material, crane, vehicle, or item of plant may encroach without obtaining written approval from the electricity supply authority. It is crucial to maintain a safe distance from electric lines, extending vertically to the sky above.

Note:

- Person - includes hand tools, equipment or any other material held by a person.
- Plant - includes the load, controlling ropes and any other accessories associated with the plant.

Work required on trees and vegetation within the no-go zone (closer to live electric lines than the approach distances specified in Table 2 of this code) must only be performed by authorised persons approved by the electricity supply authority.

7.6 Trees or branches contacting live electric lines

When working near trees that might fall on electric lines, it is crucial to know what to do if a branch or tree contacts live electric lines, whether due to pruning, wind, storm, or other damage.

1. **Do Not Touch:** If any part of a branch is touching live electric lines, the entire branch may be 'live,' including the leaves. Touching any part resulting in an electric shock, or an arc flash explosion that may result in a serious injury or death.
2. **Contact the electricity supply authority:** Immediately inform the electricity supply authority about the situation. Keep all individuals clear of the area while waiting for assistance.

For more guidance on safe work practices and procedures in tree and vegetation management, refer to the *Code of Practice: Amenity tree industry.*

8 Work involving scaffolding near electric lines

This chapter outlines specific considerations for the erection, dismantling, and use of scaffolding near electric lines with an operating voltage up to and including 33 kV A.C. If scaffolding work involves voltages above this limit, consultation with the electricity supply authority is mandatory, and compliance with any specified conditions is required.

For guidance refer to *AS/NZS 4576:2020 – Guidelines for Scaffolding* and the SafeWork *NSW Scaffolding Industry Safety Standard.* These prescribe a 4-metre approach distance for conductive material scaffolding near electric lines, serving as a key reference for those planning and executing scaffolding activities as detailed in this chapter.

This chapter also applies to temporary edge protection and any other system that involved the erection or dismantling of conductive components.

8.1 Hazard identification

Before starting any scaffolding work that may encroach within the 4-metre approach distance defined in Australian Standard *AS 4576:2020 – Guidelines for Scaffolding*, a risk assessment must be undertaken. Take reasonable care to identify potential hazards, which may include:

- live electric lines and associated electrical apparatus,
- deteriorated or broken insulation on conductors or electrical apparatus,
- scaffolding coming into contact with electric lines,
- possibility of hand-held tools, equipment, or materials contacting electric lines.

For any work involving the erection, use and dismantling of temporary edge protection within 4 metres of electric lines, you must consult the relevant electricity supply authority and follow any requirements set by the authority.

8.2 Risk assessment

If there is a hazard related to electric lines, the PCBU must conduct a written risk assessment to evaluate the risk to individuals within the 4-metre approach distance. This process assists to determine the level of risk associated with identified hazards and establishes a priority list based on risk levels.

The following factors should be considered in the risk assessment:

- the nature of work activities, tools, equipment, scaffolding, and materials used,
- the proximity of the work or scaffolding to overhead electric lines,
- environmental conditions, such as rain, wind, or uneven terrain, which may pose a risk of unexpected movement of tools, equipment, scaffolding, or materials held by workers.

8.3 Eliminating or minimising risks – general risk factors

Once the hazards associated with scaffolding work near overhead electric lines are identified and assessed, control measures must be implemented to eliminate or, if not reasonably practicable, minimise the risks linked to the hazard. The use of specific control measures should align with the risk assessment. The following should be considered:

1. *Eliminate the hazard*
   This may involve de-energising overhead electric lines prior to commencing work.

Consultation with the electricity supply authority may allow for re-routing electric lines away from the scaffold or replacing existing overhead lines with underground cables.

2. *Minimise risks*
    - Erect a physical barrier on the scaffold to prevent individuals or items within the 4-metre approach distance.
    - Substitute the scaffold with alternative access and egress methods, like an elevated work platform, or use non-conductive hand tools.
3. *Introduce administrative controls*
   Plan and document safe work method statements before starting work, use a safety observer to warn workers on the scaffolding carrying material that may encroach the 4-metre distance, and make the hazard visible with approved visual indicators arranged by the electricity supply authority
4. *Use appropriate personal protective equipment.*

Use a combination of these control measures to minimise the risk to the lowest level, so far as reasonably practicable, when no single measure is sufficient.

8.4 Control measures for the erection and dismantling of scaffolding near overhead electric lines up to and including 33KV

- Before starting any scaffold work near overhead electric lines, conduct a thorough examination of the surroundings. A competent person must determine the presence, location, type, and operating voltage of all overhead electric lines before commencing scaffold work.
- If the scaffold has the potential to come within the 4-metre approach distance of overhead electric lines, those electric lines should be de-energised. An access authority or written documentation from the electricity supply authority is required. See Figure 12 below.
- If maintaining the 4-metre approach distance is challenging, contact the electricity supply authority. Develop a written risk assessment, a safe work method statement, and safe systems of work for scaffold erection, use, and dismantling.

Consideration should also be given to the sag and swing of conductors.

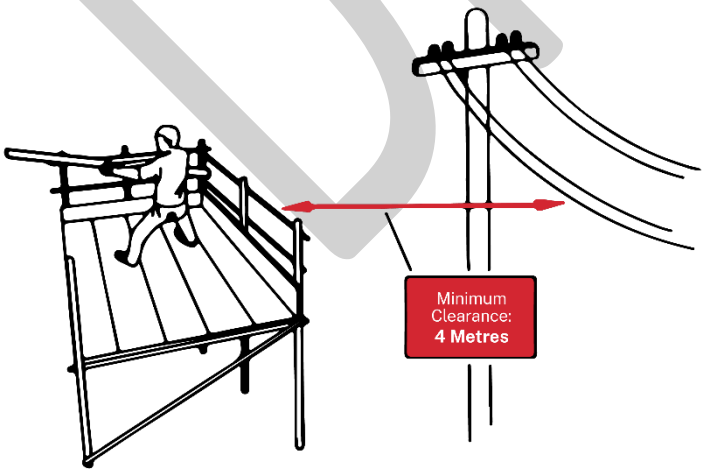

Figure 12: A 4 metre approach distance applies in any direction where conductive material scaffold is erected, used or dismantled near overhead electric lines

- Electrical wires passing through a scaffold must be de-energised or fully enclosed (de-energised for enclosure installation) as per electricity supply authority requirements. Enclosure should use non-conductive materials approved by the electricity supply authority, such as moisture-resistant particle board, dry timber, dry plywood, or similar.
- The electricity supply authority may require external hoarding and, if applicable, an internal enclosure on the scaffold. Refer to Chapter 8.5 and Figure 13.

Note: Tiger tails serve as a visual indication and provide some mechanical protection but do not provide any electrical protection. Refer to Chapter 12.1 for guidance.

Example of live low voltage overhead electric lines passing through a scaffold fully enclosed in a non-conductive material according to electricity supply authority requirements.

8.5 Erected scaffolding – Use of a hoarding and enclosure for reduced safety clearances

This section outlines the requirements for using a hoarding and, if needed, an enclosure between erected scaffolding and live overhead electric lines. The non-conductive hoarding and enclosure serve as a barrier to people, tools, materials, and equipment.

Figure 13 displays A and B clearances, which are horizontal safety and vertical mechanical clearances from the conductors. These clearances will be specified by the electricity supply authority before scaffolding is erected near overhead electric lines.

Installation conditions for reduced safety clearances with a hoarding and enclosure include:

- gaps between hoarding sheets should not exceed 3mm,
- no exposed cut or drilled holes in the hoarding sheets,
- the scaffolder is responsible for attaching hoarding to the scaffold, ensuring it can withstand wind loads,
- placing warning signs on the safe side of the hoarding, cautioning about the electrical hazard on the other side and emphasizing that the hoarding must not be removed.

Hoarding must be of non-conductive material of adequate durability and mechanical strength for the work being performed to prevent inadvertent protrusion of construction materials. It serves as containment sheeting positioned on the external face of scaffold and serves as a physical barrier between the worker and electrical conductors installed in a manner to minimise any gaps (See Australian Standard *AS 4576:2020 - Guidelines for Scaffolding*).

The types of hoardings that should be used depend on the application and include the following:

- Rigid applications may include marine ply, fibreglass sheeting, or similar material of adequate durability and mechanical strength for the work being performed.
- Flexible applications may include re-enforced plastic / rubber products that achieve an equivalent level of safety to that provided by plywood.

A competent worker should conduct a daily visual inspection of the hoarding and enclosure to ensure that the hoarding and enclosure are in a satisfactory condition, and have not been tampered with, remains impenetrable and fit for purpose.

For more guidance on erecting, dismantling, and using scaffolding, refer to the Australian Standard *AS 4576:2020 – Guidelines for Scaffolding*.

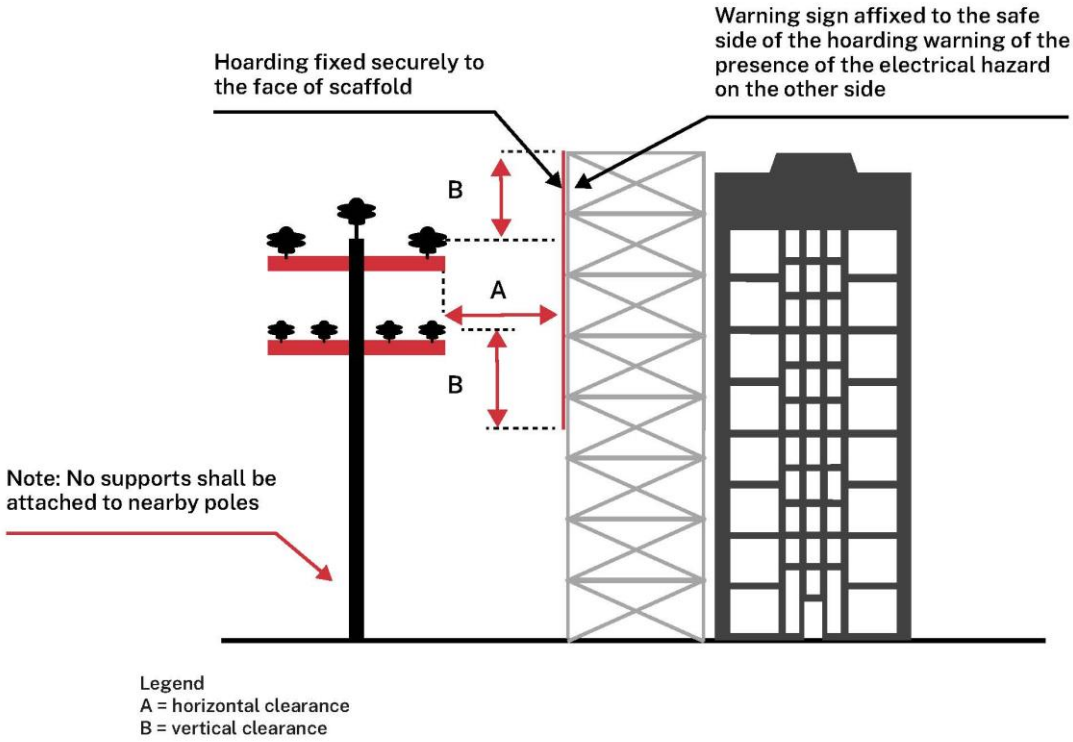

Figure 13: Scaffolding with hoarding

9 Agricultural work near electric lines

In addition to the general guidelines outlined in Chapter 4, the following outlines specific requirements for work conducted in rural workplaces when:

- a worker, or plant they operate or hold, may contact overhead and underground electric lines or come too close, as specified in Table 1 of this Code,
- the work poses a risk of damaging overhead and underground electric lines or electrical apparatus.

Examples of such work include:

- Working near and around machinery operating close to electric lines.
- Driving machinery with tall attachments through fields with existing electric lines.
- Using lifting or elevating equipment in agriculture, like grain augers, hay bale elevators, excavators, tippers and livestock transport trucks, mobile silos, field bins, travelling irrigators, or harvesters near overhead and underground electric lines.
- Moving, repositioning or handling metallic irrigation pipes under or near overhead and underground electric lines, especially those covered with or damaged by roots.
- Moving agricultural equipment, such as folding cultivators, where the transit (stowed) height exceeds the operating height.

Any other work that involves the risk of a person, or anything held or attached to them, coming into contact with electric lines.

9.1 Hazard identification

Many fatalities have occurred due to electric shock incidents involving metal parts of agricultural equipment, such as augers, field bins, harvesters, excavators, or tip trucks, coming into contact with or getting close to live overhead and underground electric lines. Typically, these accidents happen when operators fail to lower the equipment before moving it or raise it into live electric lines.

When working near live electric lines, it is crucial to identify the height and location of the electric lines as part of the overall site hazard identification process. Contacting the electricity supply authority is essential for assistance in this process.

Operators of agricultural equipment should also be informed about the design height and transit (stowed) height of the mobile plant they are operating.

9.2 Risk assessment

When a hazard involving electric lines is identified, a written risk assessment must be conducted to evaluate the risk of any part of agricultural equipment coming close to or contacting the electric lines. This assessment is crucial for understanding the level of risk associated with identified hazards and establishing a priority list based on risk levels.

Key factors that should be considered in the risk assessment include:

- the nature of the work activities or agricultural equipment in use,
- the proximity of the work to electric lines and the height of these electric lines and the depth of any electric lines that may be in the work area,
- environmental conditions, such as rain, wind, or uneven terrain, that may increase the risk,
- visibility of electric lines and the location of their supporting structures like poles and towers in relation to the agricultural work,
- frequency of work that needs to be performed near electric lines,

- proximity of stationary or fixed plant and equipment to electric lines.

9.3 Control measures for agricultural work near electric lines

After identifying and assessing hazards associated with agricultural work near electric lines, it is essential to implement control measures to eliminate or minimise risks. If elimination is not reasonably practicable, effective control measures must be employed based on the risk assessment. The following measures should be considered:

1. *Eliminating the Hazard:*
    - Relocate plant and equipment away from overhead and underground electric lines.
    - Lower augers before transport to avoid contact with electric lines.
    - Maintain a safe distance (at least 10 metres) for mobile irrigators from electric lines.
    - Explore options for relocating or running electric lines underground after consulting with the electricity supply authority.
2. *Minimizing risks:*
    - Erect physical barriers to prevent agricultural plant parts from encroaching within the specified approach distance (Table 1)
    - Substitute with less hazardous materials, processes, or equipment.
    - Adopt ground-level filler pipes for silos instead of truck-mounted augers.
    - Limit the height of mobile plant to ensure safety clearances from electric lines.
3. *Administrative Controls:*
    - Plan and document a safe work system before commencing.
    - Develop procedures and travel routes to ensure safe distances from electric lines.
    - Assign an observer to prevent work activities from breaching specified approach distances.
    - Install warning signs on gates and roadways near electric lines (see Figure 14). Use markers on electric lines for better visibility.

Use a combination of these control measures to minimise the risk to the lowest level, so far as reasonably practicable, when no single measure is sufficient.

Figure 14: Overhead electric lines warning sign

10 Work near low voltage service lines

This chapter outlines specific considerations when an ordinary person engages in work near low voltage overhead and underground service lines, encompassing activities like maintenance work (e.g., painting), operating motor vehicles (e.g., concrete trucks), or any non-electrical work with a risk of contact with low voltage overhead and underground service lines.

In this code, 'low voltage overhead service lines' (depicted in Figure 15) refer to:

- Covered low voltage service mains and associated electrical apparatus connecting from the supply point (overhead electric lines) to the point of attachment on the consumer's building, pole, or structure.
- Covered low voltage consumer sub mains and related electrical apparatus within the consumer's electrical installation.

Note: When dealing with cranes, mobile plant, or work involving metal materials (e.g., scaffolding), roofing materials, and guttering, adhere to risk control measures and increased approach distances outlined in other chapters of this code.

Figure 15: Low voltage overhead service lines

To enhance safety protocols, consider integrating the "Look up and Live" tool into overhead planning tools. “Look up and Live” provides the location of electric lines in different regions across Australia and PCBUs can access critical data about the location, height, and voltage of electric lines in their vicinity, enabling them to plan work activities safely and avoid potential hazards.

10.1 Approach distances for work near low voltage service lines

Table 4 outlines approach distances for ordinary persons when:

- performing work near low voltage overhead service lines (including hand tools),
- operating cranes and mobile plant near low voltage overhead service lines,

- handling conductive materials (e.g., scaffolding, roofing materials) near overhead service lines,
- handling non-conductive materials (e.g., timber, plywood, PVC pipes) near overhead service lines,
- driving or traversing of mobile plant or stowed position operating a vehicle, trailer, mobile plant under overhead service lines.

Note: The approach distance in Table 4 is based on the vehicle's design or transit envelope, ensuring no part comes within the specified 0.6-metre approach distance for Ordinary persons.

Table 4: Ordinary Persons approach distances (in metres) for work near low voltage overhead service lines

Work including hand held tools	Operation of crane or mobile plant	Handling of conductive materials (Scaffolding, roofing, guttering, pipes, etc.)	Handling of non-conductive materials (Timber, plywood, PVC pipes and guttering, etc.)	Driving or traversing of mobile plant or stowed position.
0.5	3.0	4.0	1.5	0.6

10.2 Work inside the relevant approach distances

When work necessitates operating within the specified approach distances listed in Table 4, the PCBU must adhere to the following steps before commencing work:

- identify the hazards associated with the proximity to low voltage overhead service lines,
- comply with the written requirements from the relevant electricity supply authority or in the case of overhead service lines forming part of the consumer's electrical installation, the controller of the premises,
- conduct a written risk assessment for the proposed work,
- implement a safe system of work.

10.3 Hazard identification

Before commencing any work that may breach the specified approach distances, a risk assessment must be undertaken. During this inspection, reasonable care must be exercised to identify potential hazards related to low voltage overhead service lines, including:

- exposed live conductors without insulation,
- deteriorated or damaged insulation,
- faulty overhead service line mains connection boxes or compromised insulation around conductor clamps,
- weakened earthing of exposed conductive parts mandated for grounding,
- risk of hand-held tools and equipment making contact with exposed live parts.

10.4 Risk assessment

Upon identifying a hazard related to low voltage overhead service lines, a written risk assessment must be undertaken to evaluate the risk for individuals approaching within the specified approach distance during work. This process aids in determining the risk level associated with identified hazards, forming a priority list based on risk levels.

The following should be considered in the risk assessment:

- the nature of work activities, including safe access and egress planning to the work area,
- tools or equipment in use, assessing the risk of mechanical damage to low voltage overhead service lines in case of inadvertent contact with conductors and electrical apparatus. Examples include:
    - Handling roofing material that accidentally contacts the service lines.
    - Use of cutting or grinding tools, where the operator may lose control and breach the 0.5-metre approach distance.
- proximity of the work to low voltage overhead service lines,
- environmental conditions, like rain, wind, or uneven terrain, which may pose a risk of unexpected movement of tools or equipment held by workers,
- changes in site conditions that may affect the safety of work near low voltage overhead service lines, such as ground subsidence, construction activities altering the landscape, or temporary structures impacting visibility and access,

Note: For more information work on underground service lines refer to Chapter 11.

10.5 Control measures for work near low voltage service lines

Upon identification and assessment of hazards associated with work near low voltage overhead service lines, control measures must be implemented to either eliminate or manage the risks. If total elimination is not reasonably practicable, the risks linked to the hazard should be effectively controlled.

Utilise specific control measures based on the risk assessment, taking into account the following:

1. *Eliminate the Hazard*
    - De-energise low voltage overhead service lines by coordinating with the electricity supply authority or, if part of the consumer's electrical installation, the controller of the premises.
    - Isolate the supply for the duration of the work in accordance with the requirements of the relevant electricity supply authority.
    - Explore re-routing low voltage overhead service lines away from the work area.
2. *Minimising risks*
    - If work is close to the point of attachment and electrical isolation is not possible, arrange for a person authorised by the electricity supply authority to inspect and fit necessary mechanical protection such as matting, tubes, covers (known as 'tiger tails'), or a combination thereof, at the point of attachment and over the overhead service lines before the work commences. See Figure 16 for reference. Note: Those persons must be authorised to provide this service to a third party and comply with the electricity supply authorities conditions.
    - Substitute hazardous materials, processes, or equipment with safer alternatives. For instance, use an insulated fibreglass extension handle on a paint roller instead of a conductive aluminium extension handle.
    - Choose manual sanding near the point of attachment rather than using an electric disc sander.

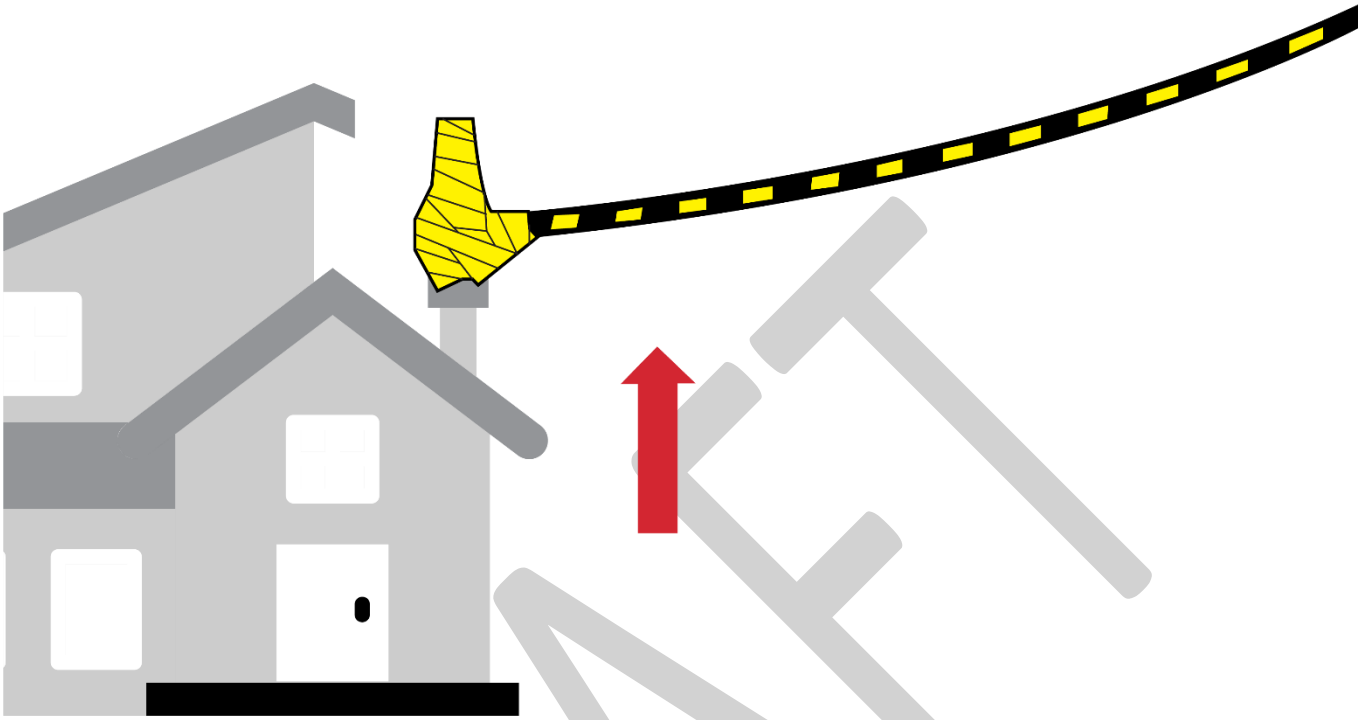

Figure 16: Approved matting and tiger tails fitted to overhead service line

3. *Introduce Administrative Controls:*
    - Plan and document work procedures before initiation.
    - Deploy another worker as an observer to warn individuals before encroaching into the relevant approach distance.

Use a combination of these control measures to minimise the risk to the lowest level, so far as reasonably practicable, when no single measure is sufficient.

11 Work near underground cables

This chapter applies to any work that involves risk of contact with energised underground electric lines. Examples of such work include:

- a builder excavating a trench as part of construction work,
- a fencing contractor digging holes where an electrical cable could be a buried,
- rural workers driving star pickets into the ground.

11.1 Underground electricity assets

Electrical assets have been installed underground for over 100 years, as such, a large variety of cables, materials, supporting structures, protective barriers and conduits may be encountered.

The table below gives an overview of different techniques. It is not exhaustive and keep in mind that some underground assets may have no barrier protection or other indication of their presence, such as those installed for underboring.

Table 5: Types of underground electricity authority assets

Asset	Traditional Techniques	Current Techniques	New Technologies
Transmission: Extra High Voltage (EHV) **Distribution**: High Voltage (HV) and Low Voltage (LV) **Supervisory and signalling cables**	Buried direct, conduits (orange PVC), ductlines, concrete encased, fibro asbestos cement, steel, earthenware or encased in bitumen. Protective covers - bricks/tiles, terracotta, concrete, polymeric Marker tapes – polymeric.	Direct burial in trench, ducts. Some thrust boring across roads. Marker tape – polymeric. Protective covers – polymeric and concrete. Surface markers.	Trench-less technology including directional drilling. Conduits installed by directional drilling. Variations in alignment and depth may occur. Multiple conduits can be installed using this method.
Cathodic protection	May be direct buried.	N/A	N/A
Earthing rods and conductors	Direct buried.	Direct buried.	N/A
Conduits and ducts	Conduits (orange PVC), ductlines, concrete encased, fibro asbestos cement, steel, earthenware or encased in bitumen.	Orange PVC.	N/A
Electric poles and lattice towers	Risk assess to ensure that: 1) structure will not be undermined, and 2) cable is not coiled around base of pole.	N/A	N/A

11.2 Excavation work

This chapter should be read in conjunction with Chapter 2 of this Code, the WHS Regulation, and the *Code of Practice: Excavation Work.*

Clauses 304 and 305 of the WHS Regulation have specific requirements relating to excavation work near underground essential services (which includes underground electric lines).

Before directing or allowing work to start, a person with management or control of the workplace must take all reasonable steps to get current information about underground essential services in the areas at the workplace where the excavation work is to be carried out. They must also obtain information about underground essential services in areas adjacent to the site of excavation and have regard for all the information.

If excavating in a public place the PCBU must take all reasonable steps to identify all electrical cables present. Information should be obtained by contacting:

- Before You Dig Australia (BYDA):
    - Is a free inquiry service for information on underground assets anywhere in Australia. Contact can be made to BYDA via phone, web or the app.
    - Asset owning members of Before You Dig Australia will be notified of the inquiry and the intention to disturb the ground and provide maps indicating the approximate location of underground assets in the vicinity.
- Relevant authorities about all cables they may have placed in the vicinity of the excavation works. Authorities may include:
    - electricity supply authorities
    - communication companies
    - local government authorities
    - gas suppliers
    - water authorities.

In some cases, customers of electricity supply authorities have authority to place electricity cables in public places. If excavating on private property, contact the owner or occupier of the premises about buried cables before starting work. Any underground service plans that are obtained, including information on underground essential services, must be provided to the principal contractor and/or the excavation contractor. Other relevant parties, including any subcontractors and plant operators carrying out the excavation work, should also be provided with information about essential services and other plans so the information is considered when planning all work in the area.

Underground essential services and information obtained must be:

- made available to any worker, PCBU (including principal contractor and subcontractors),
- readily available for inspection, and
- retained until the excavation work is completed or, if there is a notifiable incident relating to the excavation work, five years after the incident occurs.

Verification and pot holing

Any available information about existing underground essential services is diagrammatic only and may not be spatially accurate. More accurate location data can be obtained by engaging a professional, competent utility locator who can trace the electrical assets. Potholing (with the asset owner's permission and/or supervision) by non-destructive means should then be utilised to verify the assets' location if required.

If it cannot be determined exactly where an underground cable is, always contact the asset owner for further advice.

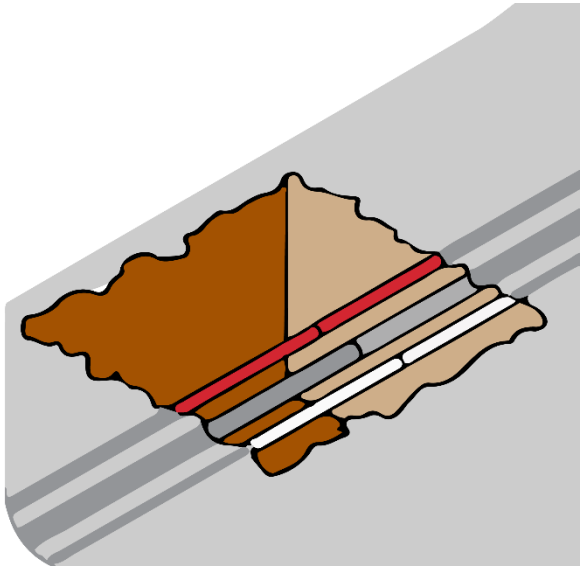

Figure 17 - Underground essential services exposed by potholing

Potholing involves digging with hand tools to a pre-determined depth to either verify the location of mapped assets or absence of services in the immediate location. Hand digging tools suitable for the voltage concerned may be used or a vacuum pumping excavation device in the potholing process may also be used to locate the underground cable. Always contact the asset owner for advice prior to any potholing.

Excavation and general working practices near underground electrical cables

During potholing, boring, and general excavation PCBU's responsible for the work should prevent powered excavation or powered tools or plant being operated in the no-go zone identified in table 6 for the relevant asset. PCBUs must also ensure that the tools and work techniques in close proximity to the cable(s) are unable to pierce or cut through the cable outer sheath.

Table 6: Limits of approach to underground electricity assets

Category	Clearances	No Go Zone for Powered Excavation	Controls	Typical Depths
General Advice	The owners of assets registered with the Before You Dig Australia service and covered by this code of practice require an enquiry through this free service and the compliance with any directive issued with information regarding the asset).	The minimum approach distance in any direction for Individuals carrying out work near underground electricity assets with powered plant including excavators, directional borers, jackhammers and hand-held power tools. For directional boring parallel to the asset and at the level of the	If the risk assessment identifies a potential risk of making contact with both underground and overhead assets, two safety observers would be required. One observer to ensure that the machinery maintains a safe distance from underground assets, the other observer to ensure a safe distance from the	Variable

Category	Clearances	No Go Zone for Powered Excavation	Controls	Typical Depths
		asset, a minimum clearance of 500 mm shall be maintained from the edge of the nearest asset. It may be necessary to dig trial holes to prove the location of the nearest asset at points along the route.	overhead electric lines. Where gas and/or or electricity assets are present, an appropriate fire extinguishing system must be at the worksite. If the width and/or depth of the excavation will expose the asset, the asset owner must be contacted prior to commencing work.	
Low Voltage cables – voltages less than or equal to 1000V	0-300mm with use of hand tools unable to damage or pierce the cable outer sheath	300 mm	Must observe asset owners specified conditions	450 – 750 mm
High Voltage Distribution cables **(11,000V - 33,000V)**	0-600mm with use of hand tools unable to damage or pierce the cable outer sheath	600 mm	Must observe asset owners specified conditions	600 – 1000 mm
High Voltage Sub-transmission cables **(33,000V - 132,000V)**	Must contact asset owner	Must contact asset owner	Must be carried out under the supervision of the asset owner	800 -1200 mm
High Voltage Transmission cables – voltages above 132,000V	Must contact asset owner	Must contact asset owner	Work must be carried out under the supervision of the asset owner	800 – 1200 mm

11.3 Work around excavated/exposed underground cables and conduits

Once exposed and / or protective covers and / or protective ground cover have been removed, underground cables are subject to direct mechanical damage. Controls must be considered to ensure that the actions of workers near those cables does not place them at risk of damaging or piercing those cables. The following are examples of controls that may be considered:

- Do not use powered hand-held tools (e.g. reciprocating saws, jackhammers) near energised underground cables.
- Solid non-conductive barriers should be considered (e.g. plywood sheets, approved cable mats) to provide separation from work activities and/or limit exposure to arc flash explosion.

Cutting into existing conduits is a particularly hazardous activity that should not be attempted without an agreed plan and/or supervision on site by the local electricity supply authority.

12 Visual indicators

12.1 Tiger tails

“Tiger tails”, as shown in Figure 18 below, also known as tarapoli pipes serve as a visual indicator and provide some mechanical protection for crane operators, mobile plant operators, and others near live overhead electric lines. It's important to note that while they offer visibility, they do not safeguard against electric shock.

Tiger tails and visual indicators must only be fitted to overhead electric lines or service electric lines by and electrically qualified person who is authorised by the electricity supply authority. A competent person should visually inspect visual indicators on the worksite on a regular basis prior to commencing crane, scaffolding or mobile plant operations.

If the visual indicators have been moved or damaged, the electricity supply authority must be contacted to ensure the visual indicators are replaced or are in the correct locations. Adherence to the approach distances outlined in this code is crucial.

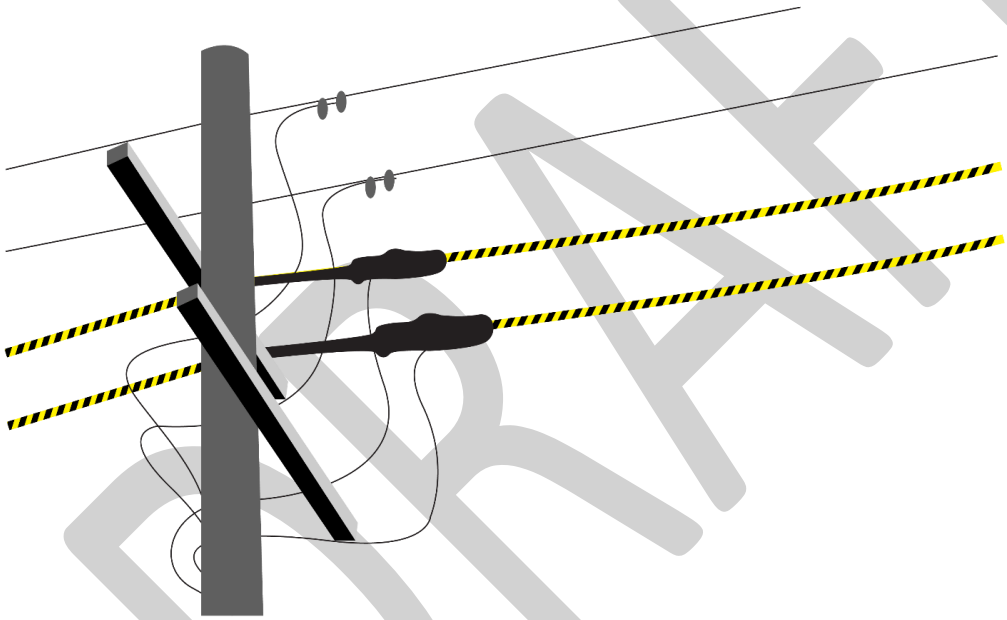

Figure 18: Tiger tails fitted to overhead electric lines

12.2 Visual indicators

Visual indicators are employed as part of safety measures to highlight the presence of overhead electric lines to individuals working or operating machinery in proximity. The primary function of the visual indicators is to enhance visibility, thereby reducing the risk of accidental contact with live electrical lines.

These indicators come in various forms, including:

- flags,
- bunting,
- tiger tails (also known as tarapoli pipes),
- mats,

- material rotating markers,
- reflective markers or beacons,
- warning signs with high-visibility colours and reflective materials,
- lighted warning devices for nighttime or low-visibility conditions,
- conspicuity tape to outline equipment or hazardous areas,
- barrier tapes to demarcate safe distances from electric lines,
- coloured sleeves or wraps that can be placed on electric lines for increased visibility,
- electronic warning systems that alert workers when they approach too close to overhead lines,
- overhead line covers that provide physical as well as visual barriers to entry,
- ground-level signs that indicate overhead hazards, including the height of clearance,
- phosphorescent (glow-in-the-dark) tags for low-light conditions,
- ariel flags signage such as “disco man”, and more.

A common misconception is that the presence of tiger tails or other visual indicators somehow reduces the electrical hazard. This belief can lead to complacency and increased risk of accidents.

It must be clearly communicated in all safety protocols and training sessions that visual indicators do not alter the physical properties of the electrical lines nor provide any form of insulation or protection against electric shock.

Visual indicators must only be fitted to overhead electric lines or service electric lines by and electrically qualified person who is authorised by the electricity supply authority.

13 Notification of incidents

Part 3 of the WHS Act

WHS Act section 35
What is a "notifiable incident"

WHS Act section 38
Duty to notify of 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.

A PCBU must ensure that SafeWork NSW is notified immediately after becoming aware that a notifiable incident has occurred. Notifications can be made by contacting SafeWork NSW on 13 10 50 or via the SafeWork NSW website: *Notify SafeWork*.

When a PCBU is made aware that a notifiable incident has occurred, the PCBU must:

- report it to SafeWork NSW immediately, and
- preserve the incident site until an inspector arrives or directs otherwise. This doesn't prevent help being provided to an injured person, removing a deceased person, making the site safe to minimise the risk of a further notifiable incident, or to facilitate a police investigation.

Incidents involving multiple businesses or undertakings

If a 'notifiable incident' arises out of more than one business or undertaking then each must ensure that the incident has been notified to SafeWork NSW.

There is no need for all duty holders to notify — only one needs to. However, all duty holders retain their responsibility to ensure SafeWork NSW is notified, regardless of any agreement between them.

In these circumstances the duty holders must, so far as is reasonably practicable, consult, cooperate and coordinate to put appropriate reporting and notification arrangements in place.

Examples of these incidents are available in Safe Work Australia's I*ncident notification fact sheet*.

Enforcement action may be taken and penalties may be applied for not notifying notifiable incidents to SafeWork NSW. For more information see the SafeWork NSW website.

14 Appendices

14.1 Appendix A: Glossary

Term	Description
Access authority	A written permission granted by an electricity supply authority, allowing individuals to work within designated no-go zones.
Approach distance	The minimum air separation required from an exposed overhead conductor, either by a person or any object they are holding. Note: Refer to Chapter 4 for relevant approach distances.
Authorised person	An authorised person possesses technical knowledge or enough experience and has received approval from the electricity supply authority.
Competent person	A person who has acquired through training, qualification or experience the knowledge and skills to carry out the task.
Conductor	A wire, cable, or metal form specifically designed for carrying electric current.
Conductive components	Items made of material that can conduct electricity
Conductive medium	Is a material/environment that allows the flow of electric current.
Construction work	Means any of the following: • Excavation, including the excavation or filling of trenches, ditches, shafts, wells, tunnels, and pier holes, and the use of caissons and cofferdams; • Building, including the construction (including the manufacturing of prefabricated elements of a building at the place of work concerned), alteration, renovation, repair, maintenance, and demolition of all types of buildings; • Civil engineering, including the construction, structural alteration, repair, maintenance, and demolition of, for example, airports, docks, harbours, inland waterways, dams, river and avalanche and sea defence works, roads and highways, railways, bridges and tunnels, viaducts, and works related to the provision of services such as communications, drainage, sewerage, water and energy supplies.
Control measures	Control measures are actions taken to minimise risk to the lowest reasonably practicable level, ensuring a safer work environment.
Crane	A lifting device for moving loads vertically and horizontally. It includes the crane's supporting structure and foundations but excludes certain machinery like industrial lift trucks, earthmoving equipment, and suspended scaffolds.
Covered	A cable system with insulating material applied to the conductor. Example ABC (Aerial Bundled Cable).

Term	Description
Dangerous incident	An incident in relation to a workplace that exposes a worker or any other person to a serious risk to a person's health or safety emanating from an immediate or imminent exposure to — (a) an uncontrolled escape, spillage or leakage of a substance, or (b) an uncontrolled implosion, explosion or fire, or (c) an uncontrolled escape of gas or steam, or (d) an uncontrolled escape of a pressurised substance, or (e) electric shock, or (f) the fall or release from a height of any plant, substance or thing, or (g) the collapse, overturning, failure or malfunction of, or damage to, any plant that is required to be authorised for use in accordance with the regulations, or (h) the collapse or partial collapse of a structure, or (i) the collapse or failure of an excavation or of any shoring supporting an excavation, or (j) the inrush of water, mud or gas in workings, in an underground excavation or tunnel, or (k) the interruption of the main system of ventilation in an underground excavation or tunnel, or (l) any other event prescribed by the regulations, but does not include an incident of a prescribed kind.
De-energised	Not connected to any electrical source, though not necessarily isolated.
Duty holder	Any person who owes a work health and safety duty under the WHS Act including a PCBU, a designer, manufacturer, importer, supplier, installer of products or plant used at work (upstream duty holder), officer or a worker.
Earthed	Directly connected to the general mass of the earth to effectively dissipate electrical energy.
Earthmoving machinery	Operator-controlled equipment used for excavation, loading, transport, and spreading of materials. It excludes tractors and industrial lift trucks.
Electrical apparatus	Electrical apparatus includes live or potentially live electrical equipment, encompassing overhead and underground electric lines and cables.
Electric line	Conductors that transmit electricity from generation facilities to substations and end-users. These include high-voltage transmission lines, transporting electricity over long distances, and distribution lines, distributing electric at lower voltages to various consumers. Electric lines facilitate the movement and accessibility of electrical energy and can be installed either overhead or underground.

Term	Description
Electricity supply authority/Electricity network operator	Electricity supply authority means a person or body engaged in the distribution of electricity (also known as an electricity network operator) to the public or in the generation of electricity for supply, directly or indirectly, to the public whether by statute, franchise agreement or otherwise and includes — (a) an energy services corporation within the meaning of the Energy Services Corporations Act 1995, and (b) a network operator within the meaning of the Electricity Supply Act 1995, and (c) the Country Rail Infrastructure Authority constituted by the Transport Administration Act 1988, and (d) Rail Corporation New South Wales, and (e) Sydney Trains, and (e1) Sydney Metro, and (f) Transport for NSW, and (g) the Water Administration Ministerial Corporation constituted by the Water Management Act 2000.
Electricity network	Systems that transmit and distribute electricity between generators' and customers' points of connection. Note: Electric lines on private property come under the control of the controller of the premises.
Elevating work platform	Elevating work platforms, like telescoping or scissor devices, move persons equipment, or materials to and from elevated work locations.
Envelope	The space encapsulating a plant item, including attachments such as rotating / flashing lights or radio aerials and is categorised as: **Design:** the space encapsulating all possible movements of the plant and any load attached under maximum reach. **Transit:** the area encompassing the normal height and width of a vehicle or plant when traveling to or from a worksite'.
Energised	Connected to a source of electrical supply.
Hazard	A situation or thing that has the potential to harm a person. Hazards at work may include: noisy machinery, a moving forklift, chemicals, electricity, working at heights, a repetitive job, bullying and violence at the workplace.
Health and safety committee	A consultative body established under the WHS Act. The committee's functions include facilitating cooperation between workers and the PCBU to ensure workers' health and safety at work, and assisting to develop work health and safety standards, rules and procedures for the workplace.
Health and safety representative	A worker who has been elected by their work group under the WHS Act to represent them on health and safety matters.
High Voltage (HV)	A nominal voltage exceeding 1,000 V A.C. or exceeding 1,500 V D.C.

Term	Description
Hoarding	For this code, hoarding is the containment sheeting on a scaffold's external face, acting as a physical barrier between a worker and live overhead electric lines and associated electrical apparatus.
Insulated	Separation from adjacent conducting material by a non-conducting substance, providing resistance to current passage. It mitigates the risk of shock or injurious current leakage at the operating voltage.
Live	Being connected to an electrical supply source or exposed to hazardous induced or capacitive voltages.
Low Voltage (LV)	A nominal voltage exceeding 50 V A.C. or 120 V D.C. but not exceeding 1000 V A.C. or 1500 V D.C.
May	'May' indicates an optional course of action.
Mobile crane	A crane capable of travelling over a supporting surface without the need for fixed runways and relying only on gravity for stability.
Mobile plant	Mobile plant includes machinery that either moves independently or is pulled/pushed by other mobile machinery. It operates within, enters/exits, or passes a worksite. Note: This definition has been adopted for the purposes of this code of practice. This includes items such as earthmoving machinery, concrete boom pumps, and tipper trucks operating at a worksite.
Must	'Must' indicates a legal requirement exists that must be complied with.
Near	A situation where there's a reasonable chance of a person, directly or through any conducting medium, approaching closer than the approach distances outlined in this code.
No-Go zone	The area around overhead and underground electric lines where no person, material, cranes, vehicles, or mobile plant parts may enter without written approval by the electricity supply authority. Note: "Person" includes hand tools, equipment, or any material held by a person. Plant covers the load, controlling ropes, and other accessories.
Officer	An officer under the WHS Act is: • an officer under section 9 of the Corporations Act 2001 (Cth) • an officer of the Crown within the meaning of section 247 of the WHS Act, and • an officer of a public authority within the meaning of section 252 of the WHS Act. A partner in a partnership, or an elected member of a local authority while acting in that capacity, are not 'officers'.
Operator	The person(s) that is in control of the moving plant.

Term	Description
	"In control" can includes direct control from the moving plant, control via a pendant, remote control from site, and remote control from a distance.
Operating voltage	The A.C. voltage (phase to phase RMS) or D.C. voltage by which a system of supply is designated.
Ordinary person	A person without sufficient training or experience to enable them to avoid the dangers which overhead electric lines and associated electrical apparatus may create.
Overhead electric line	Any bare or covered aerial conductors and other associated electrical parts that make up an aerial line for the distribution and transmission of electrical energy.
Person conducting a business or undertaking (PCBU)	A PCBU is an umbrella concept which intends to capture all types of working arrangements or relationships. A PCBU includes a: • company • unincorporated body or association • sole trader or self-employed person. Individuals who are in a partnership that is conducting a business will individually and collectively be a PCBU. A volunteer association (defined under the WHS Act) or elected members of a local authority will not be a PCBU. *Note –* A person may be both a PCBU, within the meaning of section 5 of the WHS Act, and a worker within the meaning of section 7 of the WHS Act.
Personal protective equipment (PPE)	Items that workers can use to protect themselves against hazards. PPE includes insulating gloves, mats or sheeting, glasses, and face protection. Note: A number of items of PPE are made and tested to Australian Standards. PPE that is not designated as meeting a recognised Standard may be unreliable in service, as its performance is unknown.
Plant	Includes any machinery, equipment, or appliance. Note: For the purposes of this code, the definition includes a broad range of machinery and equipment, but not limited to, cranes, mobile plant, scaffolding, load shifting equipment, industrial lift trucks, earth-moving machinery, amusement devices, tractors, rural machinery, vehicles, conveyors, building maintenance equipment, suspended scaffolds or lifts, implements or tools, and any component or fitting of those things.
Premises	Includes any place and particularly includes any: • Land, building, or part of a building • Vehicle, vessel, or aircraft • Installation on land, on the bed of any waters or floating on any waters

Term	Description
	• Tent or movable structure.
Psychosocial hazard	A psychosocial hazard is a hazard that — (a) arises from, or relates to — (i) the design or management of work, or (ii) a work environment, or (iii) plant at a workplace, or (iv) workplace interactions or behaviours, and (b) may cause psychological harm, whether or not it may also cause physical harm.
Psychosocial risk	A risk to the health or safety of a worker or other person arising from a psychosocial hazard.
Risk	The possibility harm (death, injury or illness) might occur when exposed to a hazard.
Safety observer	A trained person specifically assigned the duty of observing and warning against unsafe approach to overhead electric lines and associated electrical apparatus, or other unsafe conditions.
Safe work method statement (SWMS)	A written statement that: • Describes how the work is to be carried out • Identifies the work activities assessed as having safety risks • Identifies the safety risks; and • Describes the control measures that will be applied to the work activities. It must include: - a description of the equipment used in the work, - the standards or codes to be complied with, - the qualifications of the personnel doing the work, - and the training required to do the work.
Serious injury or illness	An injury or illness requiring the person to have – (a) immediate treatment as an in-patient in a hospital, or (b) immediate treatment for — (i) the amputation of any part of his or her body, or (ii) a serious head injury, or (iii) a serious eye injury, or (iv) a serious burn, or (v) the separation of his or her skin from an underlying tissue (such as degloving or scalping), or (vi) a spinal injury, or (vii) the loss of a bodily function, or (viii) serious lacerations, or (c) medical treatment within 48 hours of exposure to a substance, and includes any other injury or illness prescribed by the regulations but does not include an illness or injury of a prescribed kind.

Term	Description
Service line	Electrical cables that connect the utility's distribution system to the user's premises, supplying electricity directly to homes or businesses. These lines, which can be overhead or underground, carry lower voltages and are essential for the localised delivery of electric, enabling the use of electrical devices and lighting within properties. Service lines are NOT the same as electric lines.
Should	'Should' indicates a recommended course of action.
Tiger tails	Pipe-type cable covers used as a warning to visually indicate the position of overhead electric lines. Note: A tiger tail is also known as a tarapoli pipe.
Trained person (or equivalent)	An individual who has completed an approved training course on working near overhead electric lines conducted by a registered training organisation.
Underground essential services	Means essential services that use pipes, cables or other associated plant located underground.
Vehicle	A truck (non-tipping), car, or utility or other general-purpose conveyance used for the carriage of persons, materials, or goods.
Voltage	A potential difference between conductors or between conductors and earth.
Volunteer association	A group of volunteers working together for one or more community purposes where none of the volunteers, whether alone or jointly with any other volunteers, employs any person to carry out work for the volunteer association.
Work group	A group of workers established to facilitate the representation of workers by one or more health and safety representatives. A work group may be all workers at a workplace but it may also be appropriate to split a workplace into multiple work groups where workers share similar work conditions or are exposed to similar risks and hazards. For example all workers on night shift.
Worker	Any person who carries out work for a PCBU, including work as an employee, contractor or subcontractor (or their employee), self-employed person, outworker, apprentice or trainee, work experience student, employee of a labour hire company placed with a 'host employer' or a volunteer. *Note –* A person may be both a worker, within the meaning of section 7 of the WHS Act, and a PCBU within the meaning of section 5 of the WHS Act.
Workplace	Any place where work is carried out for a business or undertaking and includes any place where a worker goes, or is likely to be, while at work. This may include offices, factories, shops, construction sites, vehicles, ships, aircraft or other mobile structures on land or water.

14.2 Appendix B: Example risk assessment checklist

Risk assessment checklist for cranes and mobile plant working near overhead and underground electric lines

This checklist is designed to help identify the hazards associated when operating cranes or mobile plant near overhead electric lines that may encroach on the approach distances specified in Table 1 of this code. The checklist covers the main items described in Chapter 4 of this code. This checklist is not designed to cover all of the risks of working near overhead electric lines and should be adapted as appropriate to meet the particular circumstances.

Worksite location:	
PCBU:	
Crane / Plant contractor:	
Site Supervisor:	
Electricity supply authority:	
Contact phone:	

If you mark a NO box on the checklist, you need to take appropriate action to eliminate or control the hazard.

Section 1. Project Planning and Initial Assessment	Yes	No
Has the electricity supply authority been consulted regarding the proposed work?		
Have you identified all the overhead electric lines using the Look up and Live tool?		
Have you considered the potential presence of underground service using Before You Dig Australia (BYDA)		
Do you know the height of the overhead electric lines at the worksite?		
Is the voltage of the overhead electric lines and associated electrical apparatus known?		
Can the overhead electric lines be safely de-energised to allow work to proceed?		
Can the work be rescheduled to another time so that the overhead electric lines can be de-energised?		
Has the electricity supply authority agreed to de-energise the overhead electric lines and issued you with a documented clearance (access authority) so that work may proceed? Record N/A if not applicable.		
Have you ensured appropriate traffic management is in place at the worksite? Record N/A if not applicable.		
Have you assessed environmental conditions, including visibility and wind that could exist for the duration of the project that may adversely affect the work?		

Section 1. Project Planning and Initial Assessment	Yes	No
Have you assessed the design and transit envelope of the crane or item of mobile plant being used for the proposed work in relation to the height of the overhead electric lines at the worksite?		
Have you assessed the worksite where the crane or item of mobile plant is to be set-up, used and dismantled in relation to the location of overhead electric lines?		
Additional planning and assessment factors:		

Section 2. Control Measures – Operating A Crane or Item of Mobile Plant Near Live Overhead Electric Lines	Yes	No
Have you completed a written risk assessment and identified all electrical hazards and non-electrical hazards, both actual and potential? All materials should be regarded as conductive unless you have definite knowledge to the contrary.		
Have you developed a safe system of work for the proposed work and determined the control measures required to eliminate or control the risks?		
Have you met the requirements of the Electricity supply authority for the proposed work?		
Are workers trained, competent and confident in applying the particular procedures or techniques that are required for the task at hand?		
Do workers carrying out prescribed work tasks hold the relevant certificates of competency, e.g., crane operator, dogman, scaffolder, rigger, EWP operator?		
Will a Trained Safety Observer be present during the work task and assigned the duty of observing and warning against unsafe approach to overhead electric lines?		
Have workers been authorised by the employer or person in control of the premises to work near live overhead electric lines?		
Has a safe work method statement (SWMS) been completed for the task? Note: High-risk construction requires that a SWMS is completed for the work. Refer clause 299 of the WHS Act for further information.		

Section 2. Control Measures – Operating A Crane or Item of Mobile Plant Near Live Overhead Electric Lines	Yes	No
Is the work area clear of obstructions and is there a safe entry and exit?		
Are the necessary first aid and emergency facilities provided and accessible?		
Will a Trained Safety Observer be present during the work task and assigned the duty of observing and warning against unsafe approach to overhead electric lines?		
Additional control measures for the work:		

Section 3 – After Completing the Work	Yes	No
Have all workers been advised to treat the electric lines as being live from this time?		
Has the Electricity supply authority and all other relevant parties been advised that the work is completed?		
Additional measures following completion of work:		

Checklist Completed By:	Signature	Date

14.3 Appendix C: Emergency procedure following contact with live electric lines

In the event of contact with a live overhead or underground electric line or a flash-over between the electric line and a crane or mobile plant, follow these steps:

1. Attempt to break machinery contact with the live electric line by moving the jib or driving the machine clear.
2. If breaking contact is not possible, the crane or plant operator should stay inside the cabin or on the plant item. You should immediately call 000 and emergency services will contact the Electricity supply authority to isolate power to the live overhead electric line. Don't panic, remain calm and stay inside the cabin. In case there is an immediate danger, only then should you attempt to break contact.
3. In cases of fire or life-threatening situations, if it becomes necessary to leave the cabin or operator's position, jump clear of the equipment. Do not touch the equipment and the ground simultaneously. Move away by hopping or shuffling (with both feet together) at least eight metres from the nearest part of the crane or plant. Avoid running or walking, as voltage gradients in the ground may cause electric shock.
4. Warn all workers and the public to stay at least 10 metres away from the crane or plant. Avoid touching any part of the equipment and prevent people from approaching or re-entering until the Electricity supply authority declares the site safe. Electricity can flow through the ground, posing a risk of electric shock.
5. Untrained and unequipped individuals should not attempt to rescue someone experiencing an electric shock. Secondary accidents can occur, leading to additional injuries. If the crane or plant operator is immobilised, ensure electric isolation and site safety before providing assistance.

Note: When a crane or item of plant inadvertently contacts overhead electric lines circuit protective devices may operate to automatically turn the power off. However, some protection devices are designed to automatically reclose thereby re-energising the electric lines after a short period of time, typically 1 – 4 seconds.

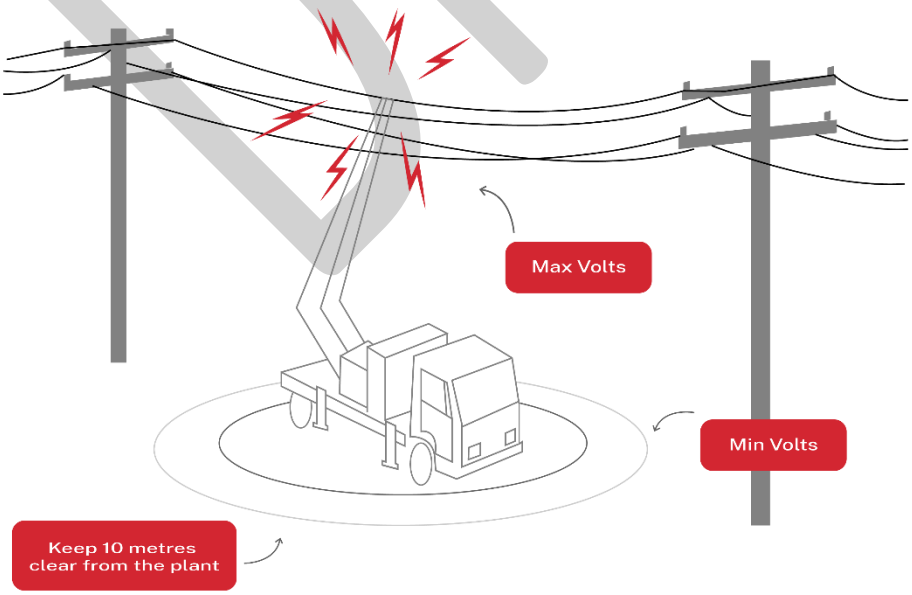

Figure 19: Affected area surrounding mobile plant when in contact with live overhead electric line

Post-Incident inspection by competent person

Following contact with a live overhead or underground electric line, a competent person should inspect the crane or mobile plant for any damage to its components. Any recommended actions by the competent person must be completed before the crane or mobile plant is put back into service.

Special attention should be given to the tyres on cranes and mobile plant that have experienced electrical flash-over and current flow through the rubber tyres. These tyres pose a potential hazard as they may catch fire, leading to the risk of explosion. Another less-known danger arises from combustion within the tyre, which may not show external signs. Contact with overhead electric lines can generate excessive heat, initiating a process called pyrolysis, causing the decomposition of substances by heat. This process can create flammable gases and pressure within the tyre, potentially resulting in rupture or explosion.

Tyre explosions can release vast amounts of energy, causing significant equipment damage, severe injuries, or even fatalities. These explosions are unpredictable and can occur immediately or up to 24 hours after initiation. An explosion may happen without visible fire, and the danger area can extend up to 300 metres from the tyre.

Any rubber-tyred crane or plant involved in an incident with overhead electric lines, leading to electrical discharges or flash-over through the tyres, should be treated as a potential hazard. If there is suspicion of a tyre explosion risk, such as in the case of a mobile crane contacting electric lines, the procedure should include:

1. Parking the crane in an isolation zone with a minimum 300-metre radius.
2. Evacuating all persons from the area and restricting access to the isolation zone for 24 hours.
3. Alerting fire-fighting services.

14.4 Appendix D: Reference and other information

Electricity supply authority – Contact Numbers

- *Emergency Services*: 000
- *Ausgrid: 13 13 88*
- *Endeavour Energy:13 10 03*
- *Essential Energy: 13 20 80*
- *Transport for NSW: 13 15 00*
- *Transgrid* is divided into three regional areas:
    - Central Region: 1800 625 108
    - Northern Region: 1800 998 049
    - Southern Region: 1800 654 195

Look up and live

For detail maps of network, please refer to look up and live online or on apps, https://www.byda.com.au/look-up-and-live/