

**Electrical safety code of practice 2010**

# **Working near overhead and underground electric lines**

The Queensland *Electrical safety code of practice 2010 – Working near exposed live parts* was made on 18 December 2009 and commenced on 1 January 2010.

This Queensland code of practice was amended and renamed the *Electrical safety code of practice 2010 – Working near overhead and underground electric lines* by the Attorney-General and Minister for Justice on 2 December 2013.

This amended and renamed code takes effect on 1 January 2014.

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## LEGISLATIVE FRAMEWORK

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The *Electrical Safety Act 2002* (the ES Act) is directed at eliminating the human cost to individuals, families and the community of death, injury and destruction that can be caused by electricity. The ES Act establishes a legislative framework for preventing persons from being killed or injured by electricity, and preventing property from being destroyed or damaged by electricity. The ES Act places the primary electrical safety duty on a person conducting a business or undertaking, who must ensure the business or undertaking is conducted in a way that is electrically safe. Duties are also placed on officers of a person conducting a business or undertaking, workers and other persons at a workplace, as well as electricity entities, designers, manufacturers, importers, suppliers, installers, repairers and persons in control of electrical equipment.

The *Work Health and Safety Act 2011* (WHS Act) requires persons who have a duty to ensure health and safety to 'manage risks' by eliminating health and safety risks so far as is reasonably practicable, and if it is not reasonably practicable to do so, to minimise those risks so far as is reasonably practicable. The WHS Act provides a framework to protect the health, safety and welfare of all workers at work. It also protects the health and safety of all other people who might be affected by the work. The WHS Act places the primary health and safety duty on a person conducting a business or undertaking, who must ensure, so far as is reasonably practicable, the health and safety of workers at the workplace. Duties are also placed on officers of a person conducting a business or undertaking, workers and other persons at a workplace.

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

## FOREWORD

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This Code of Practice on managing risks when working near overhead and underground electric lines is made under section 44 of the ES Act.

A code of practice is a practical guide to achieving the standards of electrical safety required under the ES Act and the Electrical Safety Regulation 2013 (the ES Regulation).

A code of practice applies to anyone who has an electrical safety duty in the circumstances described in the code. In most cases, following a code of practice would achieve compliance with the electrical safety duties in the ES Act, in relation to the subject matter of the code. Like regulations, codes of practice deal with particular issues and do not cover all hazards or risks that may arise. Health and safety and electrical 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 ES Act and ES Regulation. Courts may regard a code of practice as evidence of what is known about a hazard, risk or control and may rely on the code in determining what is reasonably practicable in the circumstances to which the code relates.

Compliance with the ES Act and ES Regulation may be achieved by following another method, such as a technical or an industry standard, if it provides an equivalent or higher standard of electrical safety than the code.

An inspector may refer to a code of practice when issuing an improvement or electrical safety protection notice.

## SCOPE AND APPLICATION

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This Code provides practical guidance for persons conducting a business or undertaking on managing electrical risks when working near energised (live) overhead or underground electric lines. It should be used by persons conducting a business or undertaking to ensure, so far as is reasonably practicable, that no person, plant or thing at the workplace comes within an unsafe distance of an overhead or underground electric line.

This Code should be read in conjunction with the *Electrical safety code of practice 2013 – Managing electrical risks in the workplace*, which provides guidance on managing general workplace electrical risks, risks associated with working around exposed energised parts and risks associated with electrical work.

This Code applies to a range of persons including plant operators, painters, sign makers, persons erecting (or working on) scaffolds, and persons working with irrigation pipes near energised electric lines.

This Code does not apply to:

- Electrical work on energised (live) electrical equipment.
- Mobile plant or vehicles operating on a public road where the design envelope is not greater than the transit envelope and is also not greater than 4.6 metres in height. For example, a side loading waste collection vehicle collecting waste bins from the side of a public road under overhead electric lines.
- A crane or mobile plant when they are retracted and correctly stowed for travelling on a public road.
- Work carried out by emergency services personnel, including state emergency services, fire, police, volunteer rescue associations and ambulance personnel during a declared emergency or other local emergency incident.
- Work involving low flying aircraft like crop dusting, pesticide or herbicide spraying.

### ***How to use this Code of Practice***

This Code should be read in conjunction with the ES Act, the ES Regulation, the WHS Act, the Work Health and Safety Regulation 2011 (the WHS Regulation) and other relevant codes of practice.

In providing guidance, 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. The terms 'health and safety' and 'work health and safety' are used in this Code to indicate a wider application than just 'electrical safety'. However, 'electrical safety' should be taken as being included when the terms 'health and safety' and 'work health and safety' are used.

This Code also includes various references to provisions of the ES Act, the ES Regulation, the WHS Act and the WHS Regulation which set out the legal requirements. These references are not exhaustive. The words 'must', 'requires' or 'mandatory' indicate that a legal requirement exists and must be complied with.

This Code also includes various references to standards (using the designated 'AS') and joint standards (using the designated 'AS/NZS'). In this Code, unless otherwise stated, a reference to a standard (or joint standard) is a reference to that standard (or joint standard) as in force from time to time under that designation. For example, 'AS/NZS 3760' is a reference to the joint standard that is currently in force under that designation.

Key terms used in this Code are defined at Appendix A.

# 1 INTRODUCTION

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## 1.1 *What are electrical risks?*

Electrical risks are risks of death, electric shock or other injury caused directly or indirectly by electricity. The most common electrical risks and causes of injury associated with working near overhead or underground electric lines are:

- electric shock causing injury or death. The electric shock may be received by direct or indirect contact, tracking through or across a medium, or by arcing
- arcing, explosion or fire causing burns. The injuries are often suffered because arcing or explosion or both occur when high fault currents are present
- electric shock from 'step-and-touch' potentials
- fire resulting from an electrical fault.

Contact with overhead or underground electric lines can be fatal, whether the lines are carrying a voltage as high as 330,000 volts or as low as 230 volts.

Contact with overhead electric lines is not necessary to result in electric shock. A close approach to the line conductors may allow a 'flashover' or arc to take place. The risk of flashover increases as the line voltage increases.

## 1.2 *Who must manage electrical risks?*

A **person conducting a business or undertaking** has the primary duty under the ES Act to ensure the person's business or undertaking is conducted in a way that is electrically safe. This duty includes:

- ensuring that all electrical equipment used in the conduct of the person's business or undertaking is electrically safe; and
- if the person's business or undertaking includes the performance of electrical work, ensuring the electrical safety of all persons and property likely to be affected by the electrical work; and
- if the person's business or undertaking includes the performance of work, whether or not electrical work, involving contact with, or being near to, exposed parts, ensuring persons performing the work are electrically safe.

The ES Regulation includes more specific requirements for managing electrical risks, including to ensure, so far as is reasonably practicable, that no person, plant or thing at the workplace comes within an unsafe distance of an overhead or underground electric line.

**Officers**, such as company directors, have a duty to exercise due diligence to ensure the business or undertaking complies with the ES Act and ES Regulation. This includes taking reasonable steps to ensure the business or undertaking has and uses appropriate resources and processes to eliminate or minimise risks associated with working near overhead and underground electric lines.

**Workers** have a duty to take reasonable care for their own electrical safety and to not adversely affect other people's electrical safety. Workers must co-operate with reasonable policies or procedures relating to electrical safety at the workplace and comply, so far as they are reasonably able, with reasonable instructions.

**Other persons at the workplace**, like visitors, must take reasonable care for their own electrical safety and must take reasonable care not to adversely affect other people's electrical safety. They must comply, so far as they are reasonably able, with reasonable instructions given by the person conducting the business or undertaking to allow that person to comply with the ES Act.

**Duty holders** will have additional legal duties under the WHS Act and the WHS Regulation.

### 1.3 What is required to manage electrical risks?

**ES Regulation s11** A person conducting a business or undertaking must manage risks to health and safety associated with electrical risks at the workplace in accordance with the WHS Regulation, chapter 3, part 3.1.

**WHS Regulation s34-38** In order to manage risk, a duty holder must:

- identify reasonably foreseeable hazards that could give rise to the risk
- eliminate the risk, so far as is reasonably practicable
- if it is not reasonably practicable to eliminate the risk, minimise the risk so far as is reasonably practicable by implementing control measures
- maintain the implemented control measure so that it remains effective
- review, and if necessary revise, all risk control measures so as to maintain, so far as is reasonably practicable, a work environment that is without risks to health and safety.

The hierarchy of risk control is described at Chapter 2.3 of this Code.

This Code includes guidance on how to manage electrical risks associated with working near overhead and underground electric lines by following a systematic process that involves:

- identifying hazards
- if necessary, assessing the risks associated with these hazards
- implementing and maintaining risk control measures (e.g. inspecting and testing specified electrical equipment, using safety switches), and
- reviewing risk control measures.

Guidance on the general risk management process is available in the *How to Manage Work Health and Safety Risks Code of Practice 2011*.

### 1.4 Information, training, instruction and supervision

**WHS Act s19** A person conducting a business or undertaking must ensure, so far as is reasonably practicable, the provision of any information, training, instruction or supervision that is necessary to protect all persons from risks to their health and safety arising from work carried out.

**WHS Regulation s39** You must ensure that information, training and instruction provided to a worker is suitable and adequate having regard to:

- the nature of the work carried out by the worker
- the nature of the risks associated with the work at the time the information, training or instruction is provided
- the control measures implemented.

You must ensure, so far as is reasonably practicable, that the information, training and instruction is provided in a way that is readily understandable by any person to whom it is provided.

Formal or on-the-job training may be appropriate depending on the circumstances. Examples of training are:

- induction training—to ensure new starters or workers new to a job are trained on safe systems of work and other relevant health and safety matters
- supervisor and management training—to ensure that safety issues are appropriately managed at the workplace
- work-specific training—to ensure that workers carrying out particular work are trained on any electrical and other risks specific to the work, as appropriate
- ongoing or refresher training—to ensure that any training on work health and safety matters is repeated as appropriate on a periodic basis

- emergency procedure training—to ensure workers know what to do in the event of an emergency, for example procedures to follow if a person receives an electric shock
- first aid training—to ensure appropriate procedures are followed for administering first aid, for example proper treatment for electric shock
- electrical rescue and resuscitation training for safety observers.

Special needs of workers should be taken into account in deciding the structure, content and delivery of training, including literacy levels, work experience and specific skills required to carry out the work.

## 2 THE RISK MANAGEMENT PROCESS

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A person conducting a business or undertaking must manage risks by identifying reasonably foreseeable hazards that could give rise to a risk, eliminating those risks so far as is reasonably practicable, or if that is not possible, minimising those risks by implementing control measures.

### 2.1 *Identify the hazards*

Identifying hazards involves finding all of the tasks, situations and sequences of events that could potentially cause harm.

Before carrying out work near overhead or underground electric lines, a worksite inspection should be conducted to identify potential hazards including energised overhead electric lines or associated electrical equipment and the whereabouts of any underground electric lines.

Hazards from overhead or underground electric lines may arise from:

- a person or something the person is holding, or is in contact with, coming closer than the relevant exclusion zone distance to an overhead electric line
- operating plant coming closer than the relevant exclusion zone distance to an overhead electric line
- damage to overhead electric lines or related equipment
- damage to underground electric lines exposing live parts.

Exposure to high electromagnetic fields may also present a potential hazard for workers with some medical conditions, for example pace makers. You must inform workers and other persons at the workplace of any potential electromagnetic hazards at the workplace that may affect a medical condition. You must also manage risks to health and safety arising out of electromagnetic hazards, including eliminating the risk so far as is reasonably practicable. If that is not reasonably practicable you must minimise the risk so far as is reasonably practicable.

Potential electrical hazards may be identified in a number of different ways including:

- talking to workers and observing where overhead electric lines are located
- getting advice regarding the location of any underground electric lines (e.g. by contacting “Dial before you dig” by phoning 1100 or online via the website at [www.1100.com.au](http://www.1100.com.au))
- talking to electricity entities regarding electric lines the entity is responsible for
- reviewing incident reports.

Electric lines must be treated as live until they have been:

- proven to be de-energised;
- isolated so that they cannot be inadvertently re-energised; and
- if a high voltage line, effectively earthed.

The person conducting a business or undertaking should obtain written confirmation from the person with management or control of the electric line that the line is de-energised before commencing work.

### 2.2 *Assess the risks*

Risk assessment involves considering what could happen if someone is exposed to a hazard (consequence) and the likelihood of it happening.

For work near overhead or underground electric lines, this determines the risk of:

- injury to a worker;
- damage to property, plant or equipment; and
- coming within an unsafe distance for an electric line.

This step will help to determine the level of associated risk for each task and in selecting control measures based on that risk level. A copy of the assessment should be kept for future reference.

The risk assessment should consider:

- the location, height, arrangement and visibility of overhead electric lines and supporting structures like poles, towers and stay wires
- the voltage of electric lines and exposed energised parts and whether electric lines and parts are insulated or bare
- possible sway or sag of the electric line caused by wind or temperature changes
- environmental conditions like storm activity, heavy rain or lightning in the area
- site conditions including
  - prevailing or unexpected winds their strength and direction
  - the terrain and possibility of unexpected ground surface movement under plant
  - vehicular traffic, pedestrians or livestock that could interfere with the work
- the type of plant and machinery required including
  - their design envelope, inherent stability and that of a suspended load
  - their dimensions and their operating characteristics, ease of manoeuvrability and conductivity if they are earthed
  - the minimum clearance distances from the closest part of the plant to electric lines
  - the possibility they may become energised by proximity to high voltage lines
- nature, size and shape of loads to be moved
  - load stability, dimensions and surface area facing the wind
  - whether loads are conductive—all materials should be treated as such unless a competent person can confirm otherwise
  - non-conductive material may become conductive when in contact with high voltage material
  - how loads are secured and if any part of the load may move and enter within an unsafe distance
  - whether loads being carried above electric lines may accidentally fall onto them e.g. when moving a swimming pool from the street over energised electric lines into the yard of a home
- the type of work activities required and the frequency of the work tasks
- qualifications, competency, skill and experience of the people doing the work
- setting up and packing up processes
- work practices and procedures.

## **2.3 Control the risks**

### ***The hierarchy of control measures***

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

The ways of controlling risks are ranked from the highest level of protection and reliability to the lowest. This ranking is known as the hierarchy of risk control. You must work through this hierarchy to choose the control that most effectively eliminates or minimises the risk in the circumstances, so far as is reasonably practicable. This may involve a single control measure or a combination of two or more different controls.

### ***Elimination***

The most effective control measure is to remove the hazard or hazardous work practice. By designing-in or designing-out certain features, hazards may be eliminated.

This is the most effective control measure and must always be considered before anything else.

The best way of eliminating these hazards is to prevent people, plant, equipment and materials from coming close enough to energised overhead electric lines for direct contact or flash over to occur.

This may include:

- de-energising the electric line for the duration of the work
- isolating and earthing the line (or equivalent for low voltage or rail) so it is not live for the duration of the work
- re-routing the electric line away from the work area, or
- replacing existing overhead electric lines with underground electric cables.

*Note: de-energising or moving electric lines should be arranged with the electricity entity as soon as possible because, depending on the circumstances, it may take some time to arrange.*

If eliminating the risk is not reasonably practicable, you must consider using substitution, isolation or engineering controls, or a combination of these control measures, to minimise the risk.

### **Substitution**

Minimise the risk by substituting or replacing a hazard or hazardous work practice with a safer one.

This may include performing the work another way for example:

- using alternative plant which cannot enter an exclusion zone
- using non-conductive tools designed to reduce the possibility of direct contact with the overhead electric line
- using ultrasonic measuring devices instead of the mechanical types for measuring heights of overhead lines

### **Isolation**

Minimise the risk by isolating or separating the hazard or hazardous work practice from people. For example, erecting a physical barrier to prevent any part of the plant or equipment or a person or anything held by a person, or attached to a person entering an unsafe distance. A physical barrier should consist of non-conductive material like wood or plastic. The barrier should be erected safely which may entail isolating the electricity supply while the barrier is installed.

### **Engineering controls**

Engineering controls are physical control measures to minimise risk, for example:

- limiting movement of plant with mechanical stops
- fitting plant with programmable zone limiting devices
- mechanically limiting slew speed of a crane to slow
- using electrically insulated plant and equipment

If a risk then remains, the duty holder must minimise the remaining risk, so far as is reasonably practicable, by using:

### **Administrative controls**

Administrative controls should only be considered when other higher order control measures are not reasonably practicable, or to increase protection from the hazard. These are work methods or procedures designed to minimise the exposure to a hazard, for example:

- fitting proximity sensors and a warning device to plant to alert operators when they are about to enter an unsafe distance.
- making hazards more visible by:
  - using warning signs to indicate the location of overhead electric lines and defined work areas

- arranging for the electricity entity to identify exposed energised low voltage conductors, up to and including 1000 volts and fitting them with approved visual indicators like sheeting or sleeves e.g. tiger tails
  - a competent person should inspect visual indicators each day before starting plant operations
  - if visual indicators have moved or been damaged the electricity entity should be contacted so they are replaced or located in the correct position
- managing and supervising the work to ensure
  - safe work practices and procedures are followed
  - safe work method statements (SWMS) are developed where required
  - appropriately trained and qualified people are authorised to carry out the work
  - emergency equipment is provided and readily accessible on site, including first aid kits and fire-fighting equipment suitable for electrical fire
  - emergency plan and rescue procedures are followed if there is contact with overhead electric lines
  - an emergency plan including contact with energised electric lines is developed and documented
  - it is done very carefully and in an un-hurried considered manner, haste can be dangerous
  - a safety observer is used to warn people and plant operators when they are likely to come closer within an unsafe distance of an electric line
  - exclusion zone distances are strictly maintained.

Any remaining risk must be minimised, as far as is reasonably practicable, by providing and ensuring the use of:

### ***Personal protective equipment***

Personal protective equipment (PPE) is the lowest order control measure in the hierarchy of controls. PPE should also only be considered when other higher order control measures are not reasonably practicable or to increase protection from the hazard. Examples of PPE include:

- insulating gloves which are effectively electrically tested
- rubber soled boots
- safety helmets
- standing on a rubber insulating mat
- standing on an equipotential conductive mat
- dry clothes especially in wet or humid conditions

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

You should check that your chosen control measure does not introduce new hazards.

When implementing control measures, you should develop a plan that:

- specifies the preferred control measures;
- sets out the steps that need to be taken to implement the control measures;
- identifies and allocates the resources necessary to implement the control measures (i.e. time and expenses);
- allocates responsibilities and accountabilities (i.e. who does what and when);
- sets the timeframe for implementation (i.e. when it is to be completed by); and
- sets a date for reviewing the control measures.

## 2.4 *Reviewing the control measures*

The controls that are put in place to ensure electrical safety must be reviewed regularly to make sure they work effectively.

**WHS Regulation s38** A person conducting a business or undertaking must review and as necessary revise a control measure in the following circumstances:

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

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

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

## 3 UNSAFE DISTANCES

**ES Regulation s68** A person conducting a business or undertaking at a workplace must ensure, so far as is reasonably practicable, that no person, plant or thing at the workplace comes within an unsafe distance of an overhead or underground electric line.

If it is not reasonably practicable to ensure a safe distance; the person must ensure that a risk assessment is conducted for the proposed work and control measures implemented are consistent with the risk assessment and, if an electricity entity is responsible for the electric line, any requirements of the electricity entity.

### 3.1 *What is an unsafe distance for an overhead electric line?*

**ES Regulation s69** A person comes within an unsafe distance of an overhead electric line if the person is within the exclusion zone for the person for the line.

Any operating plant, or a vehicle, comes within an unsafe distance of an overhead electric line if the operating plant or vehicle is within the exclusion zone for the operating plant or vehicle for the line.

A person includes any article of clothing worn by the person, and any conductive object the person is handling. Operating plant includes anything the operating plant is handling (other than a person or a hand held object the person is handling). A vehicle includes anything the vehicle is carrying or otherwise handling.

However, the person, operating plant or vehicle does not include an object that alone or with another object, or objects, is an extension from the person, operating plant or vehicle if the object is insulated and the object has been tested and found to be safe for use on and near the electric line. For example a specifically designed insulated tool which has been tested and found to be safe for use on and near the electric line.

### 3.2 *What is an exclusion zone?*

**ES Regulation s69** An exclusion zone, for a person, operating plant or vehicle for an overhead electric line, means the distance from the line stated for the person, plant or vehicle in Schedule 2 (of the ES Regulation).

The exclusion zone distances from Schedule 2 of the ES Regulation are replicated in Appendix B of this Code.

An exclusion zone is a safety envelope around an overhead electric line. No part of a worker, operating plant or vehicle should enter an exclusion zone while the overhead electric line is energised (live).

Exclusion zones keep people, operating plant and vehicles a safe distance from energised overhead lines.

You must keep yourself and anything associated with the work activity out of the exclusion zone (i.e. a safe distance) unless it is not reasonably practicable to do so; and the person conducting a business or undertaking complies with the requirements of section 68(2) of the ES Regulation in relation to:

- conducting a risk assessment;
- implementing control measures; and
- adhering to any requirements of an electricity entity responsible for the line.

### **3.3 A guide to exclusion zones**

Exclusion zones apply whenever you need to carry out work, or operate plant or a vehicle, around a live overhead electric line and you cannot eliminate the risk by turning off the power.

Exclusion zones extend in all directions, not just sideways. The exclusion zone will vary depending on the:

- voltage of the line
- whether the line is insulated or bare
- the level of competence, training and authorisation of the person carrying out the work

#### ***Voltage of the line***

Higher voltage electric lines carry greater risk. For this reason it is important to determine what the voltage is present on the line. Where there is more than one electric line it is important to determine the voltage of each line as there may be low voltage and high voltage lines present on the same pole.

#### ***Whether the line is insulated or not***

Different approach distances apply if an electric line is insulated. Before work is carried out near an insulated line, the insulation must be inspected by a competent person as insulation can deteriorate over time. Insulation that looks intact may fail if accidentally touched exposing a previously insulated part of the line. Where insulation has not been determined as safe the line must be treated as uninsulated.

#### ***Competence and training of the person carrying out the work***

A person who has received additional skills and training relevant to the type of work performed may be able to work within a closer distance to an energised line than an untrained person. The exclusion zones in Appendix B of this code (see also Schedule 2 of the ES Regulation) provide different distances for persons working near energised electric lines depending on whether they are untrained, authorised or instructed.

### **3.4 Which exclusion zone applies?**

Different exclusion zones apply depending on the level of competence, training and skills of the worker and whether the worker has been authorised by the owner or person in control of the electric line to work within a closer distance. In some cases the applicable exclusion zone will also depend on whether a safety observer or “spotter” is utilised.

#### ***Untrained person***

An untrained person, for an electric line, means a person who is not an authorised person or an instructed person for the electric line. The greatest exclusion zone distances apply to untrained persons.

#### ***Authorised person***

An authorised person, for an electric line, means a person who:

- (a) has enough technical knowledge and experience to do work that involves contact with, or being near to, the electric line; and
- (b) has been approved by the person in control of the electric line to do work that involves contact with, or being near to, the electric line, or is authorised to act for the person in control of the electric line.

In order to authorise a worker, the person conducting the business or undertaking must first gain approval from the person in control of the electric line to do the work that involves being near to the

electric line. The person conducting the business or undertaking would need to ensure that the worker has enough technical skill and knowledge to carry out the work.

In many instances, approval would need to be sought from an electricity entity. However, if it is a private electric line, the owner would need to approve the person to work near the line. For example, if the private electrical line is on a farm, the person conducting the business or undertaking would need to seek approval from the farm owner before the worker can be authorised. Once the approval is gained from the person in control, the person conducting the business or undertaking would need to authorise the worker to carry out the work.

### ***Instructed person***

An instructed person, for an overhead electric line, means a person who is acting under the supervision of an authorised person for the electric line.

Authorised and instructed persons can work at closer exclusion zone distances than untrained persons.

### ***Safety observer***

A safety observer or “spotter”, for the operation of operating plant, means a person who:

- (a) observes the operating plant; and
- (b) advises the operator of the operating plant if it is likely that the operating plant will come within an exclusion zone for the operating plant for an overhead electric line.

Typically this is a person who has undergone specific training and is competent to perform the role in observing, warning and communicating effectively with the operator of the operating plant.

## **4 OPERATING PLANT NEAR OVERHEAD ELECTRIC LINES**

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### **4.1 Scope**

This chapter applies to persons operating plant near live overhead electric lines. It can sometimes be difficult for crane or plant operators to see these lines and to judge distances from them. It is also easy for an operator to be distracted as they are often concentrating closely on the activity they are carrying out and can forget about the closeness of an overhead line.

#### ***Operating plant***

Operating plant means plant being operated for its intended purpose unless the operation of the plant can not materially affect the distance between the plant and any electric line in relation to which there is an exclusion zone.

Examples of operating plant:

- a tip truck tipping a load;
- a fixed crane operating at a building site;
- a vehicle that includes an elevated work platform being used for clearing vegetation from around overhead electric lines;
- a concrete pumping truck pumping concrete; and
- a harvester with height changeable attachments being used to transfer grain to a truck.

Example of plant that is not operating plant:

- a furniture removal van under an electric line raising or lowering the electrically or hydraulically operated platform located at the rear of the van, if neither the platform nor anything on the platform rises above the roof of the van.

### **4.2 Risk management process for operating plant working near overhead electric lines**

This chapter should be read in conjunction with Chapter 2 of this Code.

Before setting up a crane or other operating plant such as an elevating work platform (EWP) near overhead electric lines, the person conducting a business or undertaking should conduct an inspection to identify the presence of overhead electric lines that may pose a risk. Consultation regarding the work and the related risks should occur between the person conducting a business or undertaking and the crane or operating plant operator. Electric lines should always be treated as live.

If a risk involving live overhead electric lines has been identified, the person conducting a business or undertaking should conduct a written risk assessment to determine the risk of encroaching on the exclusion zone. A copy of this assessment should be kept for future reference.

In assessing the risk the person conducting a business or undertaking should consider:

- Identifying the minimum clearance distance from the closest part of the crane or other operating plant to the power line.
- In the case of a crane, the nature of the load to be moved e.g. dimensions and whether the load is conductive. When in contact with high voltage, material that would normally be non-conductive may become conductive. All materials should be assumed to be conductive unless a competent person can confirm otherwise.
- Whether the load is being carried above the electric lines and may accidentally fall onto the live lines e.g. moving a swimming pool from the street over live electric lines into the yard of a home.

- Unexpected movement of the terrain, ground or surface upon which the crane or plant is located, possibly resulting in a corresponding surge or sudden movement towards live electric lines.
- Prevailing or unexpected wind strength and direction and weather conditions.
- The possibility of sway and sag of the overhead powerlines (sway of overhead powerlines is usually caused by wind, while sag may vary as temperatures vary).
- In the case of a crane, the size and shape of the load, particularly the surface area facing the wind.
- Functional behaviour of the crane, load or plant that could result in inadvertent contact with electric lines.
- Possibility of crane or plant becoming live through voltage induced by adjacent electric lines, especially high voltage lines.
- How the load being carried by a crane is secured and whether any part of the load may inadvertently move during the operation and encroach on the exclusion zone.

The outcome is a priority list of control measures based on risk levels.

### **4.3 Working in the safety observer zone**

#### **4.3.1 What is the safety observer zone?**

A crane or plant is considered to be in the safety observer zone when, by the position the crane or plant is located, it is possible that any of the following could enter the exclusion zone of live electric lines during operation:

- any part of the crane or operating plant;
- any person on or working on an EWP;
- any hand tools or other equipment held by anyone involved with the operation; and
- the load being moved.

The safety observer zone concept is designed:

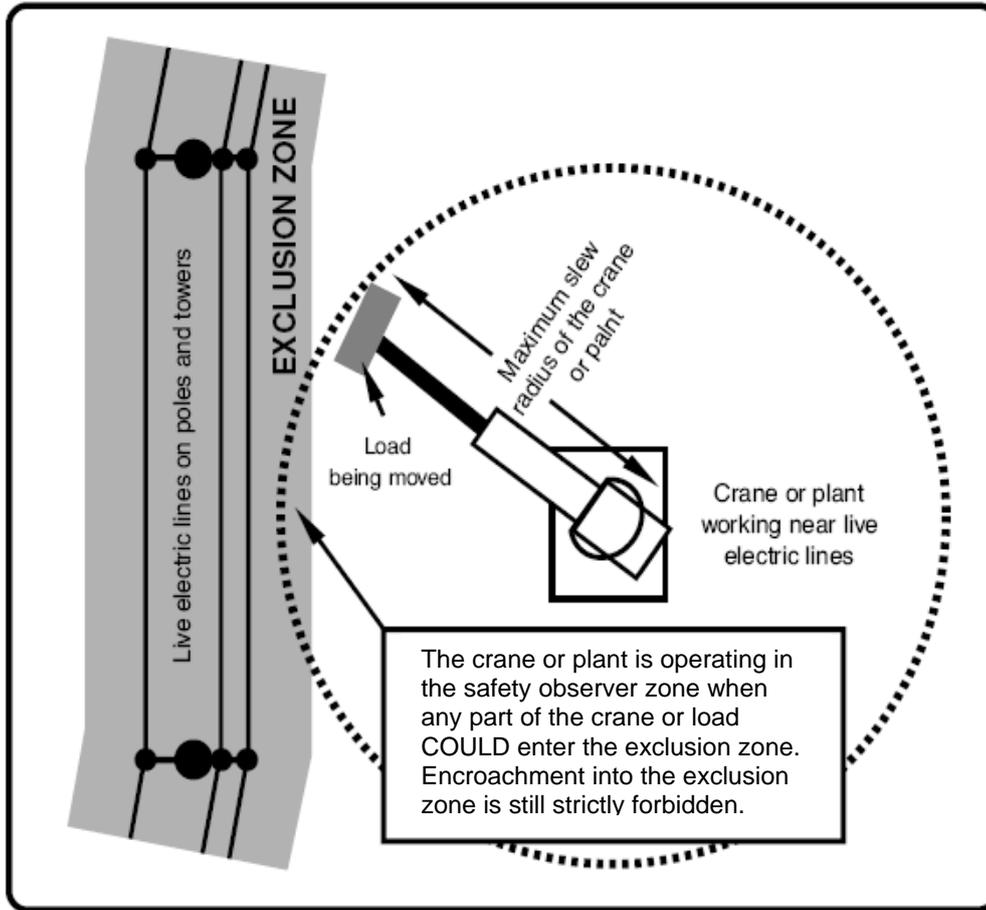
- to encourage operating plant operators to locate their equipment away from the possibility of encroaching into the exclusion zone; and
- when that is not possible, adopt other suitable precautions to prevent encroachment.

A crane or operating plant is not operating in a safety observer zone when:

- high voltage electric lines have been de-energised and earthed;
- limiting devices have been installed to warn the operator or prevent any part of the crane, plant or load being moved from entering the exclusion zone; or
- any part of the crane, plant or load being moved is prevented from entering the exclusion zone by physical barriers.

The safety observer zone for overhead electric lines is illustrated in Figure 1. While this figure illustrates a crane operating, the example applies to all operating plant.

Figure 1: Safety observer zone for overhead electric lines



### 4.3.2 Special provisions for working in the safety observer zone

#### **Safety observer for the safety observer zone**

A safety observer should be employed when a crane or operating plant is operating within the safety observer zone as defined in 4.3.1 above.

The following special provisions apply:

- The person conducting a business or undertaking is responsible for appointing a safety observer. If any part of the crane or plant or load is about to enter the exclusion zone, the safety observer should warn the operator. Encroachment into the exclusion zone is strictly forbidden.
- The operator should not operate a crane or plant without a safety observer in situations where an observer is required.
- The safety observer should not carry out any other work or function that compromises their role as a safety observer.
- The safety observer should not be required to observe more than one crane or operating plant at a time.
- The safety observer should be able to communicate effectively with the operator of the crane or operating plant at all times and should warn the operator about the approach to the exclusion zone. Specialist communication equipment may be necessary where there is a barrier to communication.
- Except where rail mounted elevating work platforms are being used for working on rail traction electrical apparatus, the safety observer should not be located on the work basket of an elevating work platform.
- The safety observer should be trained to perform the role.

- The safety observer should have the authority to stop the operation of the crane or operating plant.
- The safety observer should mark the border of the exclusion zone with suitable markers e.g. red warning tapes, which can be easily viewed by the crane or plant operator.

## **4.4 Working in the authorisation zone**

### **4.4.1 What is the authorisation zone?**

A crane or other operating plant is in the authorisation zone when it is operated by an authorised or instructed person.

When a crane or other operating plant is in the authorisation zone, or when it is intended to operate in the authorisation zone, a safety observer or another safe system of work must be used which will prevent contact with the overhead line.

Another safe system of work may include one or more of the following precautions:

- Use of limit switches to prevent the crane or operating plant from contacting the line.
- Positioning and design of the crane or operating plant which will prevent the plant from contacting the line.

*Note: for operating plant operated by an authorised person or instructed person who does not have a safety observer or another safe system as required under the schedule, the authorised person or instructed person must be taken to be an untrained person.*

### **4.4.2 Special provisions for working in the authorisation zone**

#### **Safety observer for the authorisation zone**

A safety observer should be used when a crane or other operating plant is operating within the authorisation zone as defined in 4.4.1 above.

The following special provisions apply:

- The person conducting the business or undertaking is responsible for appointing a safety observer. If any part of the crane or operating plant or load is about to contact the line, the observer should warn the operator.
- The crane or operating plant must not be operated in the authorisation zone without a safety observer or another safe system of work that prevents contact with the line.
- The safety observer should not carry out any other work or function that compromises their role as a safety observer.
- The safety observer should not be required to observe more than one crane or operating plant at a time.
- The safety observer should be able to communicate effectively with the operator of the crane or operating plant at all times. Specialist equipment may be necessary where there is a barrier to communication.
- The safety observer should have the authority to stop the operation of the crane or operating plant.
- Except where rail mounted elevating work platforms are being used for working on rail traction electrical apparatus, the safety observer should not be located on the work basket of an elevating work platform.
- The safety observer should be trained to perform the role.
- The safety observer should mark the border of the exclusion zone with suitable markers e.g. red warning tapes, which can be easily viewed by the crane or plant operator.

## **4.5 Personnel in contact with the crane, load or operating plant**

When the crane or operating plant is operating in the safety observer zone or authorisation zone, only the following persons should be allowed to touch any part of the crane, plant or load being moved:

- (a) The operator, while not in contact with an electrical earth e.g. operator remaining in the cabin instead of standing on the ground beside the crane or plant.
- (b) The operator, while standing on the ground or while in contact with an earthed situation, may operate the crane or operating plant under any of the following conditions, when used appropriately:
  - the controls are effectively insulated<sup>1</sup>;
  - the operator wears insulating gloves<sup>1</sup> where the voltage of any of the overhead electric lines does not exceed 1000 volts; or
  - the operator stands on an equipotential metallic mat, which is electrically connected to all metalwork associated with the controls.

Other personnel who are essential to the particular operation of the crane or operating plant e.g. dogger, crane chaser or other worker helping to set up the crane or operating plant, are permitted to work within the safety observer zone, provided these persons are not required to have direct contact with any part of the crane, operating plant or load. However, where direct contact is necessary:

- suitable insulating gloves<sup>1</sup> should be worn; or
- such contact should be via a non-conductive object e.g. pole or tail rope used to control load movement.

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<sup>1</sup> Insulation must at least be effective against the maximum voltage of the particular overhead electric line. The person conducting a business or undertaking operating the crane is responsible for ensuring the effectiveness of the insulation in accordance with the relevant Australian Standard.

## **5 WORK NEAR LOW VOLTAGE OVERHEAD ELECTRIC LINES NEAR BUILDINGS AND STRUCTURES**

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### **5.1 Scope**

This chapter applies to:

- painting or maintenance work near low voltage overhead lines;
- erection of scaffolding near a low voltage overhead line;
- building work near low voltage overhead lines; or
- any other non-electrical work where there is a risk of contact with a low voltage overhead line.

Electric lines covered by this chapter are:

- electricity distributors' low voltage overhead lines including service lines;
- low voltage overhead lines forming part of consumers' installations; and
- any low voltage overhead line within the jurisdiction of the ES Regulation.

Please refer to Appendix C for examples/case studies of work near overhead electric lines near buildings and structures.

### **5.2 *The no-touch and exclusion zones for low voltage lines near buildings and structures***

Guidance in this chapter, taken from Appendix B, is based on no-touch and exclusion zone concepts, defined as follows.

For an authorised person, a no-touch zone applies to an insulated low voltage overhead line that has been examined for visible defects. You may go as close to the line as you need to but do not touch the line. (See ES Regulation 2013, Schedule 2 – “no exclusion zone prescribed”)

#### **5.2.1 Exclusion zones for low voltage overhead lines near buildings and structures**

For an untrained person, the exclusion zone for low voltage overhead lines near buildings and structures is as follows:

- Without consultation, the exclusion zone is three metres from the lines.
- With consultation, the exclusion zone is specified in Appendix B. The purpose of the consultation is to determine the voltage of the line and inform the owner of the line that you are carrying out work near the line.
- The exclusion zone applies to bare or covered low voltage and insulated lines not examined for visual defects.

The following table illustrates exclusion and no touch zones for low voltage lines near buildings and structures.

**Table 1:** Exclusion zones and no-touch guidance for low voltage lines near buildings and structures

<b>Types of electrical service lines near buildings and structures</b>	Insulated low voltage (examined for visual defect )	Covered low voltage	Insulated low voltage lines - NO visual examination conducted	Bare low voltage
<b>Designated zones</b>	No-touch zone. Go as close as you need to but do not touch.	Without consultation* with electricity entity, exclusion zone is 3000mm from the live electrical line. With consultation*, refer to Appendix B for allowable safe approach distances.		

\* Note: the purpose of the consultation is to determine the voltage of the line and inform the person in control of the electric line that you are carrying out work near the line.

### **5.3 Risk management process for work near low voltage overhead electric lines near buildings and structures**

This chapter should be read in conjunction with Chapter 2 of this Code.

Before carrying out work where a person might unintentionally encroach into the exclusion zone, the person conducting the business or undertaking should make an inspection to identify any potential risks. This step will help to determine the level of risk and establish a priority list based on that risk. A copy of the assessment should be kept for future reference.

Risks may include:

- bare exposed live lines;
- broken down insulation;
- deterioration of earthing of exposed conductive parts that are required to be earthed;
- voltage of the line is higher than the expected low voltage; and
- possibility of equipment, such as a portable powered saw, coming into contact with exposed live parts.

*Note:*

- 1. If the overhead line is found to be a high voltage line, this chapter of the Code does not apply.*
- 2. If the voltage of the line cannot be determined, the line should be deemed as a high voltage line and note 1 will apply.*
- 3. If you cannot determine whether the line is effectively insulated, the line should be treated as being bare.*

If a risk involving electric lines has been identified, a written assessment should then be conducted to determine the risk to a person (or something he or she is carrying, or something attached to that person) encroaching into the exclusion zone. This step will help to determine the level of associated risk and establish a priority list based on that risk level. A copy of the assessment should be kept for future reference.

The following factors may be included in a risk assessment:

- Type of work being carried out, tools or equipment being used, and the risk of mechanical damage to the line if contact were made. Examples may include:
  - Handling a sheet of roofing material where loss of control could occur and the material could come within the exclusion zones.
  - Using a cutting or grinding tool where loss of control of the tool is a risk and where the tool could come within exclusion zones through loss of control or from inadvertent movement.
  - Using a heavy electric disc sander to sand timber near the point of attachment of a service line may impose a high risk of encroaching the no-touch zone if control were lost. The risk of damage to and contact with the line and consequent electric shock is high if the sander touched the line. Manual sanding should be considered.
- Proximity of the work to the overhead line.

- Environmental conditions, such as rain, wind or uneven terrain, which may bring a risk of unexpected movement of tools or equipment held by workers.

### **Visual examination of low voltage overhead line**

An insulated low voltage overhead electric line should be examined for visible defects. The line is generally divided into two portions:

- (a) The overhead, aerial line portion of the overhead line up to, but not including, the point of connection to the fixed wiring of the structure to which the overhead line connects.
- (b) The means of connection e.g. mains connection box or line clamps insulated with tape or heat-shrink or other means, and where applicable, the fixed wiring tails of the circuit to which the line is connected.

The following assessment procedure should be adopted to ensure that an overhead line has no defects as assessed visually. If the line is part of a customer's installation, a licensed electrical worker should assess the line. If the line is the property of an electricity entity, either an electrical worker with relevant experience or the entity should be engaged to have the line assessed.

The line is visually checked to ensure that:

- the insulation is intact, with no tears, cracks or other physical defects and there are no exposed live parts along the line; and
- there are no exposed live parts anywhere on the line.

## 6 CLEARING VEGETATION NEAR OVERHEAD ELECTRIC LINES

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### 6.1 Scope

This chapter of the Code applies to untrained persons who cut and trim or treat with chemicals or other processes, trees and other foliage near overhead electric lines where:

- the person or something the person is holding or is in contact with, could come within the exclusion zone of an overhead electric line; or
- the work creates risk of damage to electric lines or apparatus.

Examples of untrained persons performing vegetation management near electric lines include:

- a local government work crew (other than those who are authorised persons for clearing of vegetation around electric lines) performing vegetation clearing or planting or vegetation treatment;
- a building or road construction contractor performing vegetation clearing or trimming work; and
- a person employed to pick fruit from trees.

Please refer to Appendix C for examples/case studies of work near overhead electric lines.

### 6.2 Requirements for untrained persons

An untrained person must not allow any part of their body or anything they are handling or wearing to go into the relevant exclusion zones. The only exception is if the person is handling an insulated device which has been tested and found to be safe for use on and near the electrical part.

A person should not undertake tree trimming or vegetation management where any part of the tree or vegetation to be treated or cut or otherwise worked on is within the exclusion zones.

A person should not undertake tree trimming or vegetation management where any part of the tree or vegetation could fall or otherwise be carried within the exclusion zones.

### 6.3 Risk management process for clearing vegetation near overhead electric lines

This chapter should be read in conjunction with Chapter 2 of this Code.

Before carrying out any vegetation management work, the person conducting a business or undertaking should identify potential risks of the task. If a risk involving overhead electric lines has been identified, a written assessment should then be conducted to determine the risk to a person (or something he or she is carrying, or something attached to that person) encroaching into the exclusion zone. This step will help to determine the level of associated risk and establish a priority list based on that risk level. A copy of the assessment should be kept for future reference.

Risks to be considered include, but are not limited to, the following:

- Proximity of vegetation and proposed work activity to electric lines. For example:
  - the vegetation involved is located within exclusion zones;
  - that vegetation or part of the vegetation may fall or otherwise be carried into the area within exclusion zones;
  - carrying out the task would cause a person or anything a person may be handling, or in contact with, to intrude into exclusion zones; and
  - wind causing intermittent encroachment of vegetation into the exclusion zone or wet weather making the situation more dangerous.

- Operational characteristics of equipment. Some examples of operational characteristics that may present a risk are:
  - knuckle boom EWP's where convenient placement of the basket can have part of the boom intruding into roadways or other hazardous areas;
  - cutting equipment such as chain saws, which may 'kick back', causing equipment to move inadvertently; and
  - site conditions such as weather (wind), terrain, vehicular and other traffic. For example, heavy traffic on an adjacent roadway could prevent safe access to vegetation.

If a risk involving overhead electric lines has been identified, a written assessment should then be conducted to determine the risk to a person (or something he or she is handling, or something attached to that person) or plant or equipment coming into contact with electric lines. This step will help to determine the level of risk associated with the identified risks and establish a priority list based on that risk level. A copy of the assessment should be kept for future reference.

The following factors may be included in a risk assessment:

- voltage of the exposed live part e.g. electric line;
- height of the lines;
- whether the lines are insulated or bare;
- proximity of vegetation;
- insulating properties of the tools (devices) and whether the devices have been tested and found to be electrically safe;
- heights of any tools, equipment or machinery to be used, placed or operated near the line
- size of equipment being operated near the line and the equipment's operating characteristics, ease of maneuverability and conductivity;
- location of overhead electric line supporting structures such as poles and towers in relation to the work to be performed e.g. vegetation may have attached itself to a pole;
- particular arrangement of supporting structures, e.g. there may be stay wires that are hard to see;
- unexpected movement of the terrain, ground or surface upon which the equipment or plant is located, perhaps resulting in a corresponding surge or sudden movement of the load towards live electric lines;
- prevailing weather e.g. strong wind or water affecting the movement of the plant or its parts; and
- visibility of the overhead lines and their associated support structures, such as poles, and particularly stay wires on poles.

## **7 AGRICULTURAL WORK NEAR OVERHEAD ELECTRIC LINES**

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### **7.1 Scope**

This chapter is for agricultural workers working near overhead electric lines. Examples of such work include:

- handling irrigation pipes under or near an overhead electric line;
- using lifting or elevating plant or equipment such as grain augers, hay bale elevators, travelling irrigators or harvesters near or under an overhead electric line; or
- any other work that involves the risk of a person or anything attached to or held by a person, coming into contact with overhead electric lines.

Please refer to Appendix C for examples/case studies of work near overhead electric lines.

### **7.2 Risk management process for agricultural work near overhead electric lines**

This chapter should be read in conjunction with Chapter 2 of this Code.

Before carrying out any agricultural work near overhead electric lines, a person should identify potential risks of the task. If a risk involving overhead electric lines has been identified, a written assessment should then be conducted to determine potential risks relating to a person or plant encroaching into the exclusion zone. This step will help to determine the level of associated risk and establish a priority list based on that risk level. A copy of the assessment should be kept for future reference.

Risks for agricultural work near live overhead electric lines occur when people are:

- working nearby and in the process may come into contact with signs, scaffolding or machinery such as augers and elevating work platforms near electric lines;
- moving or rearranging long aluminium irrigation pipes; or
- operating high machinery or machinery with height changeable attachments in paddocks where electric lines exist.

If a risk involving overhead electric lines has been identified, a written assessment should then be conducted to determine the risk to a person (or something he or she is carrying, or something attached to that person) or plant or equipment coming into contact with electric lines. This step will help to determine the level of risk associated with the identified risks and establish a priority list based on that risk level. A copy of the assessment should be kept for future reference.

The following factors may be included in a risk assessment:

- voltage of the electric line;
- height of the line;
- whether the lines are insulated or bare;
- height of any tools, equipment or machinery to be used, placed or operated near the line;
- size of equipment being operated near the line and the equipment's operating characteristics, ease of maneuverability and conductivity;
- proximity of stationary or fixed plant and equipment to overhead lines, e.g. grain silos and stock crate gantries;
- location of overhead electric line supporting structures such as poles and towers in relation to the work to be performed e.g. a pole may be located where a large self propelled machine, such as a harvester, is required to reverse or turn;

- the possibility of sway and sag of the overhead powerlines (sway of overhead powerlines is usually caused by wind, while sag may vary as temperatures vary);
- particular arrangement of supporting structures, e.g. there may be stay wires that are hard to see;
- unexpected movement of the terrain, ground or surface upon which the equipment or plant is located, perhaps resulting in a corresponding surge or sudden movement of the load towards live electric lines;
- prevailing weather e.g. strong wind or water affecting the movement of the plant or its parts; and
- visibility of the overhead lines and their associated support structures, such as poles, and particularly stay wires on poles.

## 8 TRANSPORTATION OF HIGH LOADS NEAR OVERHEAD ELECTRIC LINES

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### 8.1 Scope

This chapter has been drawn up for road transport operators exposed to the risk of contacting live overhead electric lines e.g. when moving a high load with a vehicle near electric lines of an electricity entity. The chapter provides guidance on responsibilities and safe procedures to these operators, their workers and others.

Apart from electrical risks, there may be other obstacles or risks associated with transporting such loads e.g. clearance from trees and traffic lights. This Code does not cover such risks. This Code also does not cover permits and other requirements in relation to the transport of over dimension loads from other authorities e.g. local council, Queensland Rail, or Queensland Transport.

### 8.2 Meaning of particular terms used in this chapter

#### **Assessing**

Checking the suitability of and the requirements necessary for, safe transport of a proposed high load by reference to the electricity entity's records. If this is not possible, scoping should be undertaken.

#### **Escorting**

Facilitating safe passage of a high load through an electricity entity's network, including any activities necessary to achieve safety.

#### **Escort service provider**

A person or company providing services to escort a vehicle in accordance with an electricity entity's electrical safety precautions.

#### **Notification**

Road transport operator's advice to the electricity entity of the intended route and specification of a high load.

#### **Road transport operator (RTO)**

A person or company transporting a load more than 4.6 metres high.

#### **Scoping**

Checking the suitability of, and the requirements necessary for, safe transport of a proposed high load by physically checking the intended route. Allowances should be made for changes in the road profile e.g. dips and the distance between front and rear wheel axles. (Refer to Figure 2 for an example of a problem caused by changes to the road profile.) Scoping may not be required where the suitability for transporting a high load over a particular route can be determined by assessment.

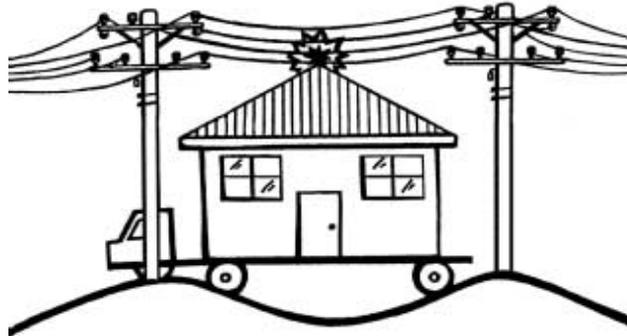
#### **Scoping service provider**

An electricity entity, a person or a company who carries out scoping or assessing in accordance with an electricity entity's requirements.

### Qualified person

A person who has successfully completed a high load transportation scoping course or its equivalent provided or authorised by an electricity entity. The evaluation of the person's qualification will be made by the relevant electricity entity.

Figure 2: Illustration on how a dip in the road profile can affect the clearance height of over dimension loads



## 8.3 Transport requirements for high load categories

Electricity entities have certain requirements that must be met before high loads can be moved with a vehicle near electric lines of an electricity entity's network. The rest of Chapter 8 is devoted to these requirements.

### 8.3.1 What is a high load and what requirements apply?

There are four categories of high load. The transport requirements of high loads depend on the height of the load above the roads. Three of these categories have special requirements. Categories and requirements are set out in Table 2 below.

Table 2: Categories and requirements for high loads being transported

Category No.	Maximum Transport Height of Load Above Road	Transport Requirements
1	Up to 4.6 metres	Transport can be carried out without any notification.
2	Over 4.6 metres, but not exceeding 5.0 metres	<ul style="list-style-type: none"> <li>Notification to the electricity entity is required.</li> <li>The route should be scoped / assessed by a qualified person taking into account the electricity entity's safety advice.</li> <li>Generally no escorting will be required, depending on the outcome of scoping / assessment.</li> </ul>
3	Over 5.0 metres, but not exceeding 5.5 metres	<ul style="list-style-type: none"> <li>Notification to the electricity entity is required.</li> <li>The route should be scoped / assessed by a qualified person taking into account the electricity entity's safety advice.</li> <li>An escort may be required in accordance with the electricity entity's requirements or depending on outcome of scoping/assessment.</li> </ul>
4	Exceeding 5.5 metres	<ul style="list-style-type: none"> <li>Notification to the electricity entity is required.</li> <li>The route should be scoped / assessed by a qualified person taking into account the electricity entity's safety advice.</li> <li>An escort is required.</li> </ul>

**Category 1** (height of 4.6m or less): Transport can be carried out without any notification to the electricity entity.

**Category 2, 3, 4:** Notification must be forwarded to the electricity entity. Notification about transporting a high load should contain the following:

- Dimensions of the load. The maximum travel height of the load should be determined by combining the height of the object and the vehicle used for transportation. If unable to predetermine the exact measurement, the maximum possible height should be used for scoping or assessing purposes.
- Route specification.
- Time or times during which transport is required to take place.
- Details of the service provider responsible for facilitating the transport of the high load and providing safety precautions.

Copies of the notification form can be obtained directly from the electricity entity or their website.

## **8.4 Responsibilities – electrical safety**

### **8.4.1 Electricity entity**

The electricity entity's responsibilities regarding transport of high loads include:

- provide relevant electricity network information to transport operators and escort service providers;
- advise precautions for scoping/assessing high loads and escorting high loads, which address the electricity risks of these activities; and
- provide authorisation in writing.

### **8.4.2 Escort service provider – electrical safety**

The escort service provider's responsibilities in relation to the transport of high loads include:

- understand exclusion zone concepts and their application;
- ensure that only persons with appropriate training are engaged to perform relevant activities associated with escorting the high load;
- inform the electricity entity if load and route do not conform to the notification details;
- use only specialised equipment, especially where the equipment may and can come into contact with exposed live parts;
- notify electricity entity of operational electrical safety problems that have been identified e.g. damage to network assets; and
- direct road transport operators to ensure electrical safety is maintained.

### **8.4.3 Road transport operator (RTO) – electrical safety**

Road transport operators' responsibilities in relation to the transport of high loads include:

- notify the electricity entity of the intention to move a high load near network assets;
- provide accurate information about high loads to electricity entity;
- comply with precautions required by the electricity entity;
- comply with directions of escort provider; and
- where an escort service provider is not required, the RTO must contact the electricity entity about operational matters affecting electrical safety.

An example of an operational matter, which would affect electrical safety, would be if the high load transport encountered electric lines lower than the minimum clearance prescribed in the regulation. See section 207 and schedule 4(1) and (3) of the ES Regulation

#### **8.4.4 Scoping service provider or network assessor – electrical safety**

The scoping service provider's or network assessor's responsibility in relation to the transport of high loads is to provide accurate information about the network through which the high load is to be transported.

## 9 WORK NEAR UNDERGROUND ELECTRIC LINES

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### 9.1 Scope

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 buried
- rural workers driving star pickets into the ground

### 9.2 Risk management

This chapter should be read in conjunction with Chapter 2 of this Code, and the WHS Regulation.

Before carrying out any work such as digging, excavation or tunnelling near an underground electric line, a person conducting a business or undertaking should identify any potential risks associated with the work. A person conducting a business or undertaking must also comply with any requirements under the WHS Regulation in relation to the work (e.g. Excavation work—underground essential services).

Where a risk has been identified, a risk assessment should be conducted to determine the risk to a person (or something the person is carrying, or something attached to that person) being exposed to an electrical risk from the underground electric line.

The assessment should consider:

- The risk of tools damaging cables or apparatus, for example:
  - when digging, driving equipment or excavating where buried electrical cables may be present.
- The risk of cables or apparatus being concealed in a work location:
  - If it is not known whether cables, conduits, apparatus or situations form an electrical safety risk, you should either assume that the risk exists, or have a qualified person investigate and report.
  - If excavating in a public place, suitable means must be used to identify any electrical cables that could be present. Suitable means may include:
    - (i) Call Dial Before You Dig, a free enquiry service for information on underground assets anywhere in Australia. This organisation will advise if electrical cables owned by one or more of its contributory members are located near your worksite. In addition, definite cable locations can be determined by special arrangement with the organisations. For further information, contact Dial Before You Dig by any of the following methods:
      - phone 1100; or
      - submit an enquiry online at [www.1100.com.au](http://www.1100.com.au)
    - (ii) Contact relevant authorities about any cables they may have placed near the excavation. Authorities may include:
      - (a) electricity entities such as Energex or Ergon;
      - (b) communication companies such as Optus and Telstra;
      - (c) local government authorities; and
      - (d) water authorities.

In some instances, customers of electricity entities have authority to place electricity cables in public places. If excavating on private property, you should first contact the owner or occupier of the premises about buried cables.

### **9.3 WHS requirements for excavation work**

The Work Health and Safety Regulation 2011 has specific requirements relating to excavation work near underground essential services (which includes underground electric lines).

Where excavation work is being carried out at a workplace the person with management or control of the workplace must take all reasonable steps to obtain current underground essential services information before directing or allowing the excavation work to commence. The person with management or control of the workplace must provide this information to any person engaged by the person to carry out the excavation work.

The person with management or control of the workplace and any person conducting a business or undertaking who is given the information must have regard to the information when carrying out or directing or allowing the carrying out of the excavation work.

Additional legislative requirements relating to the essential services may also impose duties on the person conducting the business or undertaking and the persons carrying out the work.

The person with control or management of the workplace must ensure that this information is available for inspection until the excavation work is completed. However if a notifiable incident (see section 35 of the WHS Act) occurs in connection with the excavation work, it must be available for at least two years after the incident occurs.

For further guidance, refer to the *Excavation work code of practice 2013*

## APPENDIX A MEANING OF KEY TERMS

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**Another safe system**, for the operation of operating plant, means a system of work that—

- (a) has been developed in consultation with persons who are broadly representative of industrial organisations of employees whose members commonly operate operating plant of the operating plant's type; and
- (b) provides, for persons and property, the same level of electrical safety as, or a greater level of electrical safety than, the level of electrical safety provided with a safety observer.

**Authorised person**, see Chapter 3.4 of this Code.

**Competent person** (Schedule 9 of the ES Regulation), in relation to a task, means a person who has acquired, through training, qualifications, experience or a combination of these, the knowledge and skill to carry out the task.

*Note: for the purpose of working near overhead or underground electric lines, the competent person should have sufficient knowledge about relevant Australian Standards, relevant codes of practice, and other relevant legislation.*

**Earthed** means connected to the general mass of the earth (see Schedule 9 of the ES Regulation).

**Elevating work platform** means a telescoping device, scissor device, or articulating device or any combination of those devices used to move and position personnel, equipment and materials to and from or at work locations above or below the support surface.

**Essential services** (Schedule 19 of the WHS Regulation) means the supply of:

- (a) gas, water, sewerage, telecommunications, electricity and similar services; or
- (b) chemicals, fuel and refrigerant in pipes or lines.

**Excavation** (Schedule 19 of the WHS Regulation) means a trench, tunnel or shaft, but does not include:

- (a) a mine; or
- (b) a water bore to which the *Water Act 2000* applies; or
- (c) a trench for use as a place of interment.

**Excavation work** (Schedule 19 of the WHS Regulation) means work to:

- (a) make an excavation; or
- (b) fill or partly fill an excavation.

**Exclusion zone**, see Chapter 3.2 of this Code.

**High voltage** (Schedule 2 of the ES Act) means voltage greater than low voltage.

**Instructed person**, see Chapter 3.4 of this Code.

**Low voltage** (Schedule 2 of the ES Act) means voltage greater than extra low voltage, but more than 1000V AC RMS or 1500V ripple-free DC.

**Operating plant**, see Chapter 4.1 of this Code.

**Safety observer**, see Chapter 3.4 of this Code.

**Tiger tails (Torapoli pipes)** are plastic pipe type cable covers, used as a warning to visually indicate the position of overhead power lines or stay wires. Tiger tails do not insulate wires.

**Underground essential services** (Section 304(7) of the WHS Regulation) means essential services that use pipes, cables or other associated plant located underground.

**Underground essential services information** (Section 304(7) of the WHS Regulation), in relation to proposed excavation work, means the following information about underground essential services that may be affected by the excavation:

- (a) the essential services that may be affected;
- (b) the location, including the depth, of any pipes, cables or other plant associated with the affected essential services;
- (c) any conditions on the proposed excavation work.

**Untrained person**, see Chapter 3.4 of this Code.

## APPENDIX B EXCLUSION ZONES FOR OVERHEAD ELECTRIC LINES

These tables are reproductions from Schedule 2, Parts 2 and 3 of the ES Regulation.

### Part 2 Overhead uninsulated (exposed) electric lines

#### Division 1 Exclusion zones for untrained persons

<b>Nominal phase to phase voltage of overhead uninsulated electric line</b>	<b>Untrained person for the electric line (mm)</b>	<b>Operating plant operated by untrained person for the electric line (mm)</b>	<b>Vehicle operated by untrained person for the electric line (mm)</b>
low voltage (with consultation with person in control of exposed electric line)	1000	3000	600
low voltage (without consultation with person in control of exposed electric line)	3000	3000	600
above low voltage, up to 33kV (with consultation with person in control of exposed electric line)	2000	3000	900
above low voltage, up to 33kV (without consultation with person in control of exposed electric line)	3000	3000	900
above 33kV up to 132kV	3000	3000	2100
above 132kV up to 220kV	4500	6000	2900
above 220kV up to 275kV	5000	6000	2900
above 275kV up to 330kV	6000	6000	3400
above 330kV up to 500kV	6000	8000	4400
<b>Nominal pole to earth dc voltage of exposed electric line</b>	<b>Untrained person for the electric line (mm)</b>	<b>Operating plant operated by untrained person for the electric line (mm)</b>	<b>Vehicle operated by untrained person for the electric line (mm)</b>
+/- 25kV	3000	3000	900
+/- 85kV	3000	3000	2100
+/- 150kV	3000	3000	2100
+/- 270kV	4500	6000	2900
+/- 350kV	5000	6000	2900
+/- 400kV	6000	6000	3400

## Part 2 Overhead uninsulated (exposed) electric lines

### Division 2 Exclusion zones for authorised or instructed persons

<b>Nominal phase to phase voltage of overhead uninsulated electric line</b>	<b>Authorised person or instructed person for the electric line (mm)</b>	<b>Operating plant operated by authorised person or instructed person for the electric line, with safety observer or another safe system (mm)</b>	<b>Vehicle operated by authorised person or instructed person for the electric line (mm)</b>
low voltage	(No exclusion zone prescribed)	1000	600
above low voltage, up to 33kV	700	1200	700
above 33kV up to 50kV	750	1300	750
above 50kV up to 66kV	1000	1400	1000
above 66kV up to 110kV	1000	1800	1000
above 110kV up to 132kV	1200	1800	1200
above 132kV up to 220kV	1800	2400	1800
above 220kV up to 275kV	2300	3000	2300
above 275kV up to 330kV	3000	3700	3000
above 330kV up to 400kV	3300	4000	3300
above 400kV up to 500kV	3900	4600	3900
<b>Nominal pole to earth dc voltage of exposed electric line</b>	<b>Authorised person or instructed person for the electric line (mm)</b>	<b>Operating plant operated by authorised person or instructed person for the electric line, with safety observer or another safe system (mm)</b>	<b>Vehicle operated by authorised person or instructed person for the electric line (mm)</b>
+/- 25kV	700	1200	700
+/- 85kV	1000	1800	1000
+/- 150kV	1200	1800	1200
+/- 270kV	1800	2400	1800
+/- 350kV	2500	3200	2500
+/- 400kV	2900	3600	2900

## Part 3 Overhead insulated electric lines

### Division 1 Exclusion zones for untrained persons

Nominal phase to phase voltage of overhead insulated electric line	Untrained person for the electric line (mm)	Operating plant operated by untrained person for the electric line (mm)	Vehicle operated by untrained person for the electric line (mm)
low voltage (with consultation with, and with insulation verified by, an authorised person for the electric line)	(No exclusion zone prescribed)	1000	300
low voltage (with consultation with, and without insulation verified by, an authorised person for the electric line)	3000	3000	600
above low voltage, up to 33kV (with consultation with person in control of electric line)	2000	3000	900
above low voltage, up to 33kV (without consultation with person in control of electric line)	3000	3000	900
above 33kV up to 66kV	3000	3000	2100
Nominal pole to earth dc voltage of electric line	Untrained person for the electric line (mm)	Operating plant operated by untrained person for the electric line (mm)	Vehicle operated by untrained person for the electric line (mm)
+/- 25kV	3000	3000	900
+/- 85kV	3000	3000	2100

## Part 3

## Overhead insulated electric lines

### Division 2

### Exclusion zones for authorised or instructed persons

<b>Nominal phase to phase voltage of overhead insulated electric line</b>	<b>Authorised person or instructed person for the electric line (mm)</b>	<b>Operating plant operated by authorised person or instructed person for the electric line, with safety observer or another safe system (mm)</b>	<b>Vehicle operated by authorised person or instructed person for the electric line (mm)</b>
low voltage (with consultation with, and with insulation verified by, an authorised person for the electric line)	(No exclusion zone prescribed)	(No exclusion zone prescribed)	(No exclusion zone prescribed)
low voltage (with consultation with, and without insulation verified by, an authorised person for the electric line)	(No exclusion zone prescribed)	(No exclusion zone prescribed)	600
above low voltage, up to 33kV (with or without consultation with person in control of electric line)	700	700	700
above 33kV up to 50kV	750	750	750
above 50kV up to 66kV	1000	1000	1000
<b>Nominal pole to earth dc voltage of electric line</b>	<b>Authorised person or instructed person for the electric line (mm)</b>	<b>Operating plant operated by authorised person or instructed person for the electric line, with safety observer or another safe system (mm)</b>	<b>Vehicle operated by authorised person or instructed person for the electric line (mm)</b>
+/- 25kV	700	700	700
+/- 85kV	1000	1000	1000

## **APPENDIX C INCIDENTS INVOLVING LIVE OVERHEAD ELECTRIC LINES**

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### ***C.1 Mobile crane operation***

A mobile crane contacted a 132,000 volt overhead electric line located adjacent to a worksite. At the time of the incident the crane driver had slewed the boom of the crane towards the line, which resulted in the lifting chains swinging outwards, making contact with the line.

No persons were injured; however the crane sustained extensive damage to the tyres, lifting rope and electrical system on the crane.

#### *Contributing factors*

Failure to:

- maintain exclusion zone distances for the line and take account of the possibility of the lifting chains swinging towards the lines when the crane was operated,
- carry out an adequate risk assessment of the worksite and implement suitable control measures,
- use a safety observer to observe the crane operations near the power lines.

### ***C.2 Scaffolding work***

A worker died and three apprentice roof plumbers were injured when attempting to move an 8.9 metre high aluminium scaffold at a construction site. At the time of the incident the workers were moving the mobile scaffold over soft sand when the castor wheels located at the base of the scaffold sunk into the sand causing it to fall and make contact with 33,000 volt overhead electric lines that were located adjacent to the construction site.

#### *Contributing factors*

Failure to:

- carry out an adequate risk assessment of the worksite to account of the ground conditions at the worksite'
- implement suitable control measures.

### ***C.3 Farm machinery***

A farmer operating a harvester on his property received a fatal electric shock when the raised delivery chute contacted 11,000 volt overhead electric lines. The farmer was aware of the lines and had previously warned others to stay clear.

#### *Contributing factors*

Failure to:

- maintain exclusion zone distances for the lines,
- carry out an adequate risk assessment of the worksite and implement suitable control measures to ensure exclusion zones were maintained.

## **C.4 Irrigation pipes on a rural property**

While attempting to remove vermin from metal irrigation pipes, a farmer working in a field received a fatal electric shock when he raised an irrigation pipe, into 22,000 volt overhead lines above trying to shake out the vermin blocking the pipe. The line height was correct.

### *Contributing factors*

Failure to:

- identify the risk of raising objects into the overhead electric lines,
- carry out a risk assessment of the worksite and implement suitable control measures.

## **C.5 Tip truck operation**

A tip truck contacted an 11,000 volt overhead electric line causing it to break and fall to the ground striking a worker who was at the worksite. At the time of the incident the tip truck was delivering a load of granulated bitumen to the worksite when the tip tray of the truck was raised upwards into the overhead lines.

### *Contributing factors*

Failure to:

- plan the work and identify the risk of the overhead lines,
- maintain the relevant approach distance to the overhead lines and take account of the height of the raised tray when the load was dumped at the worksite,
- carry out a risk assessment and implement suitable control measures, and
- use a safety observer to observe the truck operations near the power lines.