Work health and safety procedure

Working near utilities

Managing the risk of working near overhead, above-ground or underground utilities (electricity, gas, water, sewerage and telecommunications).

Note: this procedure is under review. This version (2.1) is a reformatted copy of the version published in March 2013 – no process changes have been made.
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Overview

There are inherent risks in working near utilities, especially where cables and pipes are energised (e.g., live electric cables and gas mains).

Workers should be able to conduct their work without any risk to their health and safety. Managers and workers need to take necessary precautions to eliminate or minimise and effectively manage any hazards and risks, especially when working near above-ground, overhead and underground utilities.

This procedure covers the key areas related to Roads and Maritime Services (Roads and Maritime) working near utilities. These include:

- Identifying the presence of all utilities near Roads and Maritime worksites (or proposed worksites)
- Assessing risks related to working near utilities, and applying risk control measures that are essential for effectively managing work health and safety (WHS) risks
- Working near different types of utilities
- Recommended safe working distances (especially from energised electric lines)
- Telecommunications infrastructure and cables.

Roads and Maritime must consult with workers about working near utilities. If potential WHS hazards are identified, appropriate control measures must be used to eliminate these hazards so far as is reasonably practicable. Where it is not practicable to eliminate the hazards, then minimise it by using the hierarchy of controls (see Definitions).
# Contents

<table>
<thead>
<tr>
<th>Section</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>Overview</td>
<td>3</td>
</tr>
<tr>
<td><strong>Introduction</strong></td>
<td>6</td>
</tr>
<tr>
<td>Purpose</td>
<td>6</td>
</tr>
<tr>
<td>Scope</td>
<td>6</td>
</tr>
<tr>
<td><strong>Working near utilities</strong></td>
<td>7</td>
</tr>
<tr>
<td>1  Identifying utilities</td>
<td>7</td>
</tr>
<tr>
<td>1.1 Planning</td>
<td>7</td>
</tr>
<tr>
<td>1.2 Unscheduled work</td>
<td>8</td>
</tr>
<tr>
<td>2  Above-ground and overhead services</td>
<td>8</td>
</tr>
<tr>
<td>3  Excavation near underground services</td>
<td>8</td>
</tr>
<tr>
<td>4  Risk assessment</td>
<td>9</td>
</tr>
<tr>
<td>5  Generic control measures</td>
<td>10</td>
</tr>
<tr>
<td>5.1 At the worksite</td>
<td>10</td>
</tr>
<tr>
<td>6  Working near underground services</td>
<td>10</td>
</tr>
<tr>
<td>6.1 Safe digging practices</td>
<td>10</td>
</tr>
<tr>
<td>6.2 Exploratory boring practices</td>
<td>11</td>
</tr>
<tr>
<td>6.3 Types and uses of locating devices</td>
<td>11</td>
</tr>
<tr>
<td>7  Underground electricity cables</td>
<td>12</td>
</tr>
<tr>
<td>7.1 Locating underground electricity cables</td>
<td>12</td>
</tr>
<tr>
<td>7.2 Precautions for working near underground electricity cables</td>
<td>12</td>
</tr>
<tr>
<td>8  Overhead electric lines</td>
<td>14</td>
</tr>
<tr>
<td>8.1 Approach distance</td>
<td>14</td>
</tr>
<tr>
<td>8.2 Assessing the approach distance</td>
<td>15</td>
</tr>
<tr>
<td>8.3 Zone access</td>
<td>17</td>
</tr>
<tr>
<td>8.4 Approach distance for vehicles</td>
<td>18</td>
</tr>
<tr>
<td>8.5 Controls to prevent energy transfers from electric lines</td>
<td>18</td>
</tr>
<tr>
<td>8.6 Plant requirements near energised electric lines</td>
<td>19</td>
</tr>
<tr>
<td>8.7 Working inside safe approach distances for electric lines</td>
<td>20</td>
</tr>
<tr>
<td>9  Gas pipes</td>
<td>21</td>
</tr>
<tr>
<td>9.1 General hazards</td>
<td>21</td>
</tr>
<tr>
<td>9.2 Use of plant</td>
<td>21</td>
</tr>
<tr>
<td>9.2.1 Plant crossing points</td>
<td>21</td>
</tr>
<tr>
<td>9.2.2 Precautions for excavations</td>
<td>21</td>
</tr>
<tr>
<td>9.2.3 Hazardous processes</td>
<td>22</td>
</tr>
<tr>
<td>9.2.4 Prohibited work processes</td>
<td>22</td>
</tr>
</tbody>
</table>
9.2.5 Consultation with owner 22

10 Water pipes and sewers ................................................................. 23
11 Telecommunications infrastructure and cables .............................. 23
12 Emergency response ..................................................................... 24
12.1 Striking above-ground or underground utilities .......................... 24
12.2 Electrocution risk where plant strikes an electric line ..................... 25
13 Training ......................................................................................... 26

Roles and responsibilities .................................................................. 27

Definitions .......................................................................................... 28

References .......................................................................................... 30
  Roads and Maritime references ......................................................... 30
  External references ........................................................................... 30

Document control ............................................................................... 31
  Change history ................................................................................ 31
  Feedback .......................................................................................... 31
Introduction

Purpose

Roads and Maritime is committed to the health and wellbeing of all its workers and others, such as visitors. A safe and healthy workplace is the right of every worker.

Roads and Maritime’s safe systems of work aim to eliminate the risk to workers engaged in working near utilities, and to others. In locations where the risks cannot be eliminated, controls must be implemented to minimise the risks.

It is intended that as an outcome of this procedure:

• The risk of injury to workers and contractors will be managed
• Workers will be consulted in the risk management process
• Roads and Maritime will provide appropriate WHS training, instruction, information and supervision
• Safe systems for working near utilities will be established, especially in relation to:
  − Emergency planning
  − Emergency procedures
• The costs associated with utility strikes will be avoided.

Scope

This procedure covers all Roads and Maritime workplaces and is relevant for:

• All workers
• Other duty holders who carry out work for Roads and Maritime
• Those (such as visitors) who are likely to be directly affected by safety issues involved with working near utilities.

All workers must comply with this procedure. Industry partners are also required to have in place an equivalent procedure for managing risks associated with working near utilities.

Working near utilities refers to any Roads and Maritime work activity conducted near underground, above-ground or overhead utilities. These may also include redundant or disused services at worksites. Utilities include underground electricity cables, overhead electric lines, gas pipes, water pipes, sewers, telecommunications infrastructure and cables.
Working near utilities

WHS risk management is integral to Roads and Maritime’s planning and operational processes. Effective risk management requires managers, supervisors and workers to understand the nature of hazards while working near utilities. They should be able to systematically identify, assess, control and organise emergency responses to WHS risks in such situations. Good WHS outcomes depend on everyone’s commitment and cooperation.

1 Identifying utilities

1.1 Planning

The presence of above-ground, overhead and underground utilities near roads and footways is widespread, and it should be assumed that these services will be present at worksites unless proven otherwise.

Work should be designed and planned to avoid utilities wherever possible, or to manage the risk associated with them.

At the planning stage, identify the presence of all underground, above-ground or overhead utilities or services, including redundant or disused services at the intended site using:

- Dial Before You Dig (telephone service 1100)
- Site surveys (including of underground cable or utility locations)
- Checks with all utility providers.

The location, clearance distance, alignments and other relevant information relating to identified services must be shown on utilities drawings for the work before work begins on the site.

Utilities drawings must be obtained or refreshed from Dial Before You Dig not more than 30 days before work begins.

Such detail must be clearly marked – graphically and by notations – on these documents. The detail must be clear on any photocopy, device screen or other representation of the original utilities drawings for the work.

Contact details for all authorities responsible for the utilities at the site must be annotated on the Utilities Sheet(s) for the work proposed and within the specifications.

The utility owner must be consulted regarding any precautions to be taken to avoid damage to the utility or disruption of service to users:

- Communicate the presence of utilities on planned worksites to the Roads and Maritime project manager and the principal contractor responsible for the actual work
If encroachment of, or damage to, above-ground, overhead or underground services is possible and could result in an energy transfer or release:

- The work group undertaking the work must include a trained first aider
- If required by risk assessment, emergency response plans must be prepared and must specify:
  - Site evacuation and the protection of other persons near the worksite
  - Safety equipment and personal protective equipment (PPE) requirements, including its procurement, before work begins.

1.2 Unscheduled work

If drawings are not available – as may be the case when unscheduled emergency or other unforeseen work has to be undertaken – indicators of underground services should be taken into account.

These may include:

- Posts supporting electrically powered services or equipment
- Alignment markers
- Valve pits
- Pit covers
- Tracer-devices, including buried marker-tapes or cable protectors.

Authorities that may have utilities at the site should be contacted using emergency or after-hours telephone numbers before work proceeds.

**NOTE:** Contact details for Roads and Maritime’s Utility Locations Survey Unit are: PO Box 3035, Parramatta NSW, 2124; Tel: (02) 8837 0450; Fax: (02) 8837 0043

2 Above-ground and overhead services

Protection of overhead services must be considered prior to work commencing. Elimination of work involving plant under an overhead service must be the first consideration. Consultation with the utility owner may be necessary where only lower level controls are practicable yet the risk remains high.

Ground-level markings for all overhead services should be installed prior to starting work.

Ground-level services must be protected from damage by barriers, fencing, exclusion zones or other means.

3 Excavation near underground services

When excavation work is to be undertaken near underground services, all such services must be:

- Visually located using safe digging practices before power tools or mechanical equipment are used for excavation (see section 6.1)
• Considered to be electrically energised (in the case of underground cables) until proven otherwise.

If utilities near a proposed excavation cannot be visually located, excavation work must not proceed until the services are de-energised. If this is not reasonably practicable, the risks and controls must be re-evaluated.

If there is disagreement between Roads and Maritime and the relevant utility authority on the need to de-energise the service, the matter must be referred to higher-level Roads and Maritime management for resolution before the work proceeds.

Suitable devices and instrumentation must be used to accurately determine the presence and location of underground services (see section 6.3). (Note: such devices cannot detect plastic pipes.)

4 Risk assessment

Where above-ground, overhead or underground utilities are present at a worksite, a risk assessment must be performed:

• Before work begins
• Whenever the validity of the original risk assessment might be affected by any change at the site
• After any unintended detection or contact with underground, above-ground or overhead utilities.

The risk assessment outcomes must be communicated to those who will be carrying out the work.

Safe work method statements (SWMS) specific to the services present must be developed. On the basis of this risk assessment, the likelihood and consequences of potential occurrences must be considered.

If required by the risk assessment, arrangements must be made with each utility owner to disconnect, de-activate, isolate or discontinue the utility service before commencement of any work that may precipitate a transfer or release of energy.

The risk assessment should include consideration of the factors listed in the following table.

<table>
<thead>
<tr>
<th>Likelihood factors</th>
<th>Consequence factors</th>
</tr>
</thead>
<tbody>
<tr>
<td>Proximity of work to the utility service under which an energy transfer is possible</td>
<td>The nature of the utility service(s), including their state of activation</td>
</tr>
<tr>
<td>The exactness with which the location of the service is determined</td>
<td>The energy potential of the utility service and its exclusion zones</td>
</tr>
<tr>
<td>The work method to be used</td>
<td>Energy transfer arising from contact with, damage to or proximity to the service(s)</td>
</tr>
<tr>
<td>The effectiveness of exclusion zones surrounding energy fields encroached on by personnel, plant or other energy conductors</td>
<td>Workplace characteristics</td>
</tr>
<tr>
<td></td>
<td>The type and method of work being carried out.</td>
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</tbody>
</table>
5 Generic control measures

Control measures should be applied to all types of above-ground, overhead and underground services and should form a standard part of safe working procedures when working near utilities. Refer to local and agency risk registers.

5.1 At the worksite

The utility owner must be consulted on precautions to be taken to avoid damage to the utility and disruption of services to their users:

- Review drawings and documentation for the work to determine what utilities are present at the worksite
- Use Dial Before You Dig (phone 1100) not more than 30 days before work begins
- Mark the position of known utilities at the worksite, using the information obtained in the planning phase
- Arrange underground utility detection by the utility owner, or hire detection equipment and use this to locate utilities
- Verify the position of utilities at the worksite and highlight on working documentation any variations from locations originally specified in the documentation received
- Advise designers, planners and utility owners of actual locations of utilities (particularly underground) when variations are detected or alterations made
- Review SWMS and work practices, including emergency response and occurrence reporting requirements
- Report any damage caused to the service, however slight, to the utility owner; in the case of electricity cables, gas pipes or high pressure water mains, implement emergency arrangements until the services have been made safe or repaired by the utility owner
- Report and investigate occurrences, including near misses, to identify and correct any deficiencies in safe working procedures
- Ensure reinstatement of safety devices and utility markers on completion of work
- Backfill exposed underground utilities in accordance with utility owners’ requirements.

6 Working near underground services

6.1 Safe digging practices

Where a mechanical excavator is used near cables, the work must be conducted in a way that prevents damage to the pipes or cables. All persons must be kept well clear of the mechanical excavator while it is operating.

- Manual tools must be used near a pipe or cable:
  - Spades and shovels with non-conductive handles should be used rather than other tools
Star pickets and hand tools, particularly picks, should not be driven forcefully into the ground. They should be eased in with gentle pressure.

Picks, pins or forks should be used with great care and only when it is necessary to free lumps of stone or to break up hard layers of ground.

Picks should not be used in soft clay or other soft soils near underground services.

- Digging must be done alongside the service rather than above it
- Continued observation of service-locaters must be made to pinpoint the services as the digging proceeds
- Any indication of the presence of services must be noted (eg marker tapes, marker tiles)
- Final exposure of the service, if required, must be done:
  - Carefully by removing the spoil
  - Using manual methods
  - Digging in a horizontal, rather than a vertical, direction.

### 6.2 Exploratory boring practices

Where underground services might exist that have not been positively identified, before penetrating sub-surface soils with tools or materials – such as in pile-driving, post installation and boring operations – small-diameter exploratory pilot holes should be made. These will assist in determining safe locations for the work to be performed.

Where underground electrical services are involved, these services should be de-energised whenever possible beforehand.

When electrical services remain energised, use:

- Non-destructive penetration methods, such as hydro-excavation techniques
- Insulated tools, PPE and safety devices.

Where flammable gases or vapours may be released from underground utilities that may be broached or where leaks may be present, non-sparking tools must be used and all potential ignition sources removed from the area.

There is a no-smoking policy at all Roads and Maritime worksites. This includes anywhere near excavations that may have gas pipes nearby (refer Roads and Maritime procedure PN066P20: *Smoke-free workplaces*).

### 6.3 Types and uses of locating devices

Detectors must be used to locate cables and other underground service conduits. The common types of cable detectors are:

- **Metal detectors**, which are more effective at locating flat metal objects, such as metal covers and junction boxes, than detecting round cables and pipes
- **Magnetic-field detectors**, which determine current flow in live electrical cables (these detectors do not detect live cables in which there is no flow of electrical
current, eg cables to street lights during daytime, direct current cables, lightly loaded low-voltage cables or well-balanced high-voltage cables)

- **Radio frequency detectors**, which identify low-frequency radio signals picked up and re-emitted by cables and long metallic pipes

- **Transmitter–receivers**, which transmit signals along an underground service and use a receiver to detect the utility service location; these devices require the utility service to be uncovered at some point to connect the transmitter

- **Ground penetrating radar**, which can be used to locate cables and pipes beneath layers of pavement and underlying material.

The accuracy of the information provided by detectors will depend on:

- The skill of the operator
- The correct detection device being used for the service that must be located
- The presence of other objects in the ground, including redundant utilities
- The proximity of separate services to each other, either horizontally or vertically.

7 Underground electricity cables

7.1 Locating underground electricity cables

Cable-locating devices must be used to determine the actual position of cables (despite plans indicating cable locations), because:

- Plans may be inaccurate due to drafting errors, boundary changes or change of scale during copying of the plans
- The positions of the reference points may have changed after the plan was drawn
- Re-grading or other movement of the surface may have altered the indicated depths
- Services may have shifted because of ground movement
- Service connectors may not be marked
- Underground services may not have been laid in straight runs
- Excess cable lengths may have been coiled near terminating points
- Although the position of services on plans indicates the centre-line of the service, variations from the reference line may, in reality, exceed 1 metre.

If a cable marked on an electricity authority plan cannot be located, assistance must be sought from that electricity authority to locate it.

7.2 Precautions for working near underground electricity cables

Where a mechanical excavator is used near cables, the work must be conducted in a way that prevents damage to the cables, and all persons must be kept well clear of the mechanical excavator while it is operating.
Occasionally, cables are terminated in-ground by means of a seal and some mechanical protection. Whenever found, these cables must be treated as ‘live’ (energised) until proven otherwise.

During the progress of work, a careful watch must be kept for evidence of further cables. Repeated checks must be made using location devices to determine precisely the position of any additional cables.

Where it is necessary to use power tools to break up concrete near electrical cables, a SWMS must be developed and must cover the following:

- Clearly defining and marking areas where work can and cannot be undertaken
- De-energising all conductors before work begins
- Covering any exposed cable with heavy protection material to safeguard it from tool penetration
- Using insulated power tools, which prevent electricity being conducted from the tip of the tool to the operator
- Insulating all external conductive surfaces of the tool that the operator may contact
- Electrically earthing the power tool (advice from a qualified electrician should be sought)
- Installing vertical insulation blankets and matting within excavations to prevent conduction pathways between power tool operators and earth
- Training the operator in safe working procedures and methods
- Ensuring the operator wears effective, electrically-insulating footwear and PPE
- Ensuring that SWMS are followed, by closely supervising workers.

Electrical cables must not be used as hand-holds or foot-holds by anyone climbing into or out of excavations.

All cables exposed for more than 1 metre must be supported.

Cables exposed within excavations must be protected from:

- Damage by sharp objects
- Access by unauthorised workers or members of the public.

Hard or sharp objects, such as stones, must not be tipped into excavations. Advice from utility owners must be obtained on the type of backfill to be used and cable markers and protective covering to be installed.
8 Overhead electric lines

8.1 Approach distance

Electrical energy can transfer by direct contact with electric lines and by arcing between electric lines and conductive materials, eg plant, tools and people. Safe approach distances are calculated to manage the risk of electrocution resulting from either direct contact or arcing.

The approach distance, sometimes called critical clearance distance (CCD), is the minimum distance from an energised overhead electric line that should be maintained by a person or an object held by or in contact with that person (including machinery, operating plant and plant being transported on another vehicle).

The approach distance is greater for unauthorised persons (Zone A) than it is for authorised persons (Zone B) (see Definitions). Approval from the electricity supply authority is required to grant closer access to the electricity network (Zone C). (See following diagram.)
8.2 Assessing the approach distance

Before starting work, it is essential the height and voltage of the overhead electric lines (and, if applicable, horizontal safety clearance for non-overhead cables) be assessed at the site. The following diagram shows the distances that must be assessed:

**Important:** Being metallic, overhead electric lines expand when heated and contract when cooled. This can be caused by changes in ambient air temperatures and electrical current. An expansion will result in the electric lines sagging closer to the...
ground. Additionally, wind can make the electric lines swing from side to side (see the following diagram). For these reasons the CCD should be increased by the amount of sag or sway at the point of work and recalculated if atmospheric conditions change throughout the course of the work.

![Diagram of electric lines with sag and sway](image)

**Electric line ‘sag’ due to heat**  
**Electric line ‘sway’ due to wind**

To calculate the approach distance for the electric line:

1. Seek advice from the utility owner to determine the voltage of the electric line (overhead power routes and inexperience make it difficult to determine the actual voltage) and the surrounding clearance zone that is required:
   a) 3 metres (≤132,000 volts)  
   b) 6 metres (>132,000 volts, but ≤330,000 volts)  
   c) 8 metres (>330,000 volts to 500,000 volts)

2. Determine the distance between each electric line and ground level **at the closest point of that electric line to the ground** on the site (this may need to be recalculated if hot weather is likely to affect the electric lines). Use the distance measured of the electric line that is lowest in the next step as appropriate.

3. Calculate the approach distance by subtracting the distance, in metres, of the clearance zone (see step 1) for the electric line, as confirmed by the utility owner, from the height, in metres, of the electric line above the ground (determined in step 2).

For more details, refer to the Safe Work Australia *General guide for working in the vicinity of overhead and underground electric lines.*
## 8.3 Zone access

<table>
<thead>
<tr>
<th>Zone A</th>
<th>Zone B</th>
<th>Zone C</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Unauthorised persons</strong>&lt;br&gt;Persons without the relevant technical knowledge and experience of electricity transmission and distribution networks and associated electrical equipment and so will not be able to identify the operating voltage of electric lines and recognise the dangers from overhead electric lines and associated electrical equipment.</td>
<td><strong>Authorised persons</strong>&lt;br&gt;Persons who have successfully completed a recognised training course relating to work near overhead electric lines conducted by a registered training organisation and, as such, have the necessary technical knowledge and skills to be able to identify the operating voltage of electric lines and recognise the dangers from overhead electric lines and associated electrical equipment.</td>
<td><strong>Requires Electricity Supply Authority approval</strong>&lt;br&gt;The no go zone around overhead electric lines and associated electrical equipment.</td>
</tr>
</tbody>
</table>

### Applies to:
- Unauthorised persons performing work in the vicinity of overhead electric lines, including plant, hand tools, equipment or other material held by them.
- Cranes and their loads and mobile plant operated by an unauthorised person in the vicinity of overhead electric lines.

### Requirements:
- Use a risk assessment to decide whether a safety observer is necessary. The safety observer should monitor work close to Zone B to ensure no unauthorised workers, plant or equipment enters Zone B.

### Applies to:
- Authorised persons, with a safety observer, performing work in the vicinity of overhead electric lines, including plant, hand tools, equipment or other material held by them.
- Cranes, their loads and mobile plant operated by an authorised person, with a safety observer, in the vicinity of overhead electric lines.

### Requirements:
- Approach distances based on the results of a written risk assessment.
- Written safe system of work based on the risk assessment and in consultation with the Electricity Supply Authority about the proposed works.
- Should comply with each work condition imposed by the Electricity Supply Authority.

### Applies to:
- All parts of a person, hand tools, equipment or other materials held by them.
- Cranes, vehicles or mobile operating plant, including the load, controlling ropes and other accessories associated with the plant.

### Requirements:
- Electricity turned off and tested or the lines moved, if reasonably practicable. This will rule out the need for a no go zone.
- If the electrical part is high voltage, it must be earthed.
- If electricity cannot practicably be turned off or the lines cannot be moved, a no go zone applies.
- No go zones apply whenever work is done or plant, like a tip truck, crane, elevating work platform or a concrete pumping truck, is operating around energised overhead electric lines and associated electrical equipment.
- No one must enter a no go zone without written approval from the Electricity Supply Authority.
- A written safe system of work based on the risk assessment and in consultation with the Electricity Supply Authority about the proposed works.

For more details, refer to the Safe Work Australia *General guide for working in the vicinity of overhead and underground electric lines.*
8.4 **Approach distance for vehicles**

The following table sets out approach distances for vehicles and mobile plant stowed for transit, or with a design envelope up to and including 4.6 metres in height, that are driven by or operated by people under overhead electric lines. The design envelope varies, though it is generally between 4.3 to 4.6 metres in height.

<table>
<thead>
<tr>
<th>Nominal phase to phase voltage (AC volts)</th>
<th>Distance (m)</th>
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</thead>
<tbody>
<tr>
<td>Low-voltage conductors up to 1000 volts</td>
<td>0.6</td>
</tr>
<tr>
<td>Above LV, up to and including 33,000 volts</td>
<td>0.9</td>
</tr>
<tr>
<td>Above 33,000 volts, up to and including 132,000 volts</td>
<td>2.1</td>
</tr>
<tr>
<td>Above 132,000 volts, up to and including 220,000 volts</td>
<td>2.9</td>
</tr>
<tr>
<td>330,000 volts</td>
<td>3.4</td>
</tr>
<tr>
<td>500,000 volts</td>
<td>4.4</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Nominal pole to earth voltage (DC volts)</th>
<th>Distance (m)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Up to and including +/- 1,500 volts</td>
<td>0.9</td>
</tr>
</tbody>
</table>

For more details, refer to the Safe Work Australia *General guide for working in the vicinity of overhead and underground electric lines*.

8.5 **Controls to prevent energy transfers from electric lines**

The following specific controls apply to prevent energy transfers from overhead electric lines:

- De-energise overhead electric lines before work begins wherever possible and if the risk of energy transfer is high
- Observe required CCD restrictions that apply to energised electric lines
- Annotate vehicle management plans (VMPs) for the site and all drawings for the work with required CCD restrictions and prevent any vehicle, plant or equipment from entering the protection zone that may, in any operating configuration, exceed the height restriction
- Review risk assessment of the hazards associated with overhead electric lines whenever variations are made to ground levels, particularly where fills are introduced to worksites or when weather conditions force changes that may not have been reflected in VMPs.

Different approach distances apply for scaffolding work and work near low-voltage overhead service lines. These distances are outlined in the Safe Work Australia information sheet *Scaffolding work near overhead electric lines* and guide *Working near low voltage overhead electric lines near structures*. 
8.6 Plant requirements near energised electric lines

The Work Health and Safety Regulation 2017 requires that any work intended to be conducted in proximity to energised overhead electric lines must not proceed without a written risk assessment and a SWMS. These must comply with the requirements of the electrical authority responsible for that infrastructure being developed and employed (the network operator):

- All overhead electric lines must be treated as live (energised) unless the operator of the crane or mobile plant has received an access authority or other form of written certification to the contrary from the network operator.
- Where plant must be operated near overhead services, a risk assessment focused on clearance distance requirements must be undertaken.
- Select plant that cannot exceed, in any operating configuration, the required clearance distance restrictions applying to electric lines that coexist with the worksite.
- Install insulators and/or visual warning devices (‘tiger tails’) on electric lines that co-exist with worksites (this does not mean that the CCD should be encroached).
- Install barriers or fencing to prevent access by plant, vehicles and equipment below electric lines, or access by personnel within clearance zones for electric lines that co-exist at worksites.
- Where operations are conducted near overhead electric lines and other overhead utilities, ensure a ‘qualified person’ is posted as a safety observer and has positive communications with the plant or machinery operator.
- Trucks with long tipping trays commonly come into contact with electric lines or other overhead utilities when transiting sites with elevated trays. Procedures to ensure such vehicles do not move from the dumping point until their trays are fully lowered must be developed as part of the SWMS, addressed in VMPs and communicated to operators entering the worksite.
- Observers (or other safety measures) must be used to prevent tipping trucks from moving from the tipping point before their trays are fully lowered and before they encroach on clearance distances applying to overhead electrical services and other utilities.
- Ensure that cranes and similar high-reach plant are not permitted to operate outside the constraints of VMPs.
- Ensure warnings about the hazards of overhead electric lines are included in site-specific induction training and that the control of the associated risks is included in the site safety rules and SWMS.
- All plant operating near energised electric lines must be fitted with electrical hazard warning signs to remind operators of the danger from overhead electric lines.
- Required clearance distances must take into account:
  - The voltage carried by the electric lines.
  - Cable sagging (particularly when insulating sleeves are fitted).
  - Cable displacement (swing) by wind force, etc.
  - The absolute peripheral dimensions of plant and vehicles in all of their various operating modes and configurations (the design envelope).
Operators of plant and vehicles must be made aware that direct physical contact does not have to be made with an overhead electric line for energy transfer to occur. Dangers other than electrical energy transfer alone may arise from contact with energised electric lines. These include plant and vehicle tyre explosions giving rise to high-velocity projectiles.

8.7 Working inside safe approach distances for electric lines

No work is permitted within CCDs of energised electric lines, unless performed by authorised persons\(^1\) with a safety observer. They must both have successfully completed the *Working safely near live electrical apparatus* training. There must also be an applicable:

- Documented risk assessment
- SWMS.

Where work is approved on energised electric lines within CCDs, the following minimum conditions apply:

- All work within ‘near’ proximity must be done in accordance with the requirements of the electrical network owner responsible for the utility concerned
- Onsite availability of, and full compliance of all work with:
  - SafeWork NSW code of practice: *Managing electrical risks in the workplace*
  - Safe Work Australia guide: *Working in the vicinity of overhead and underground electric lines*.
- Compliance with the safe approach distances as set out in the guide *Working in the vicinity of overhead and underground electric lines*. This guide specifies different approach distances for:
  - Authorised and unauthorised persons
  - Plant and hand tools
- Conducting and documenting a risk assessment before work commences
- A safe system of work must be developed in consultation with the electrical network operator
- Only persons trained and holding current qualifications as an ‘authorised person’ with a ‘safety observer’, who also hold current qualifications, are permitted to undertake such work
- All cranes and plant are stable, properly labelled and signposted, and, together with tools and other equipment, are effectively insulated
- All required insulation tests are certified and recorded in accordance with:
  - SafeWork NSW code of practice: *Managing electrical risks in the workplace*
  - Safe Work Australia guide: *Working in the vicinity of overhead and underground electric lines*
  - Relevant Australian Standards (see References).

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\(^1\) See *Definitions*
• All conditions of the code of practice applying to personnel, and the personnel requirements of the operation, are fully complied with.

9 Gas pipes

9.1 General hazards
Underground pipelines may be used to carry natural gas or liquid petroleum gas (LPG). LPG imposes greater risks than natural gas because it:
• Is heavier than air and does not disperse as readily as natural gas
• Can travel great distances below ground level, before accumulating at a low point.

Gas pipelines are normally located close to the ground surface.

Any hazardous chemical contained in an enclosed system (such as a pipe or piping system, or a process or reactor vessel) also needs to be identified with a safety data sheet (SDS) being made available. If gas pipelines are identified, the appropriate SDS should be obtained from the utility owner.

9.2 Use of plant
Where a mechanical excavator is used near gas pipes, the work must be conducted in a way that prevents damage to the pipelines. All persons must be kept well clear of the mechanical excavator while it is operating.

Hand-held power tools may be used to break a paved or concrete surface above the gas pipeline, provided the pipeline is not close to the surface that is to be broken up.

A mechanical excavator must not to be used within one metre of a gas pipeline. However, if the utility owner requires greater safety clearance distances, these distances should be adopted.

A mechanical excavator has a capacity not only to cause damage/leakage at the point of impact, but it may also cause unseen damage further along the pipeline because of displacement of the pipeline.

9.2.1 Plant crossing points
Where heavy plant is required to traverse the alignments of gas pipelines, it should only do so at approved crossing points.

Crossing points should be kept to a minimum and should be clearly marked.

Crossing points must be appropriately reinforced where the cover provided by the existing roadway does not adequately protect the pipeline.

9.2.2 Precautions for excavations
Where a gas pipeline is uncovered during an excavation, backfilling of the pipeline must be carried out in accordance with the utility owner’s requirements.
Since excavations can cause changes to the support provided by backfill of the pipeline, the utility owner should be consulted and appropriate measures implemented to divert it or to ensure its correct support.

No concrete or other hard material should be placed or left under or adjacent to a gas pipe. Concrete backfill must only be used with the utility owner's permission.

Where the uncovered gas pipe shows damage to its wrapping, the owner must be notified. Gas pipeline repairs must not be carried out without the utility owner's approval.

9.2.3 Hazardous processes
If welding or other hot work involving a naked flame is to be carried out close to the gas installation or pipes, and the presence of gas is suspected, the utility owner must be asked to measure and confirm the safety of the atmosphere before the work begins.

Even if the atmosphere is gas-free, care should be taken to ensure that no damage occurs to plastic pipes, particularly from heat, sparks or naked flames.

9.2.4 Prohibited work processes
The following activities must not be carried out near gas pipelines or above-ground gas installations without the permission of the utility owner:

- Work involving explosives – within 30 metres
- Piling and vertical boring work – within 15 metres
- Excavation work using a mechanical excavator – within 1 metre.

9.2.5 Consultation with owner
If work is required close to a gas pipeline, a minimum of two business days’ notice of intended activities near a pipeline must be given to the utility owner so they can consult on the precautions necessary for the work to be undertaken safely and without damage to the pipeline.

Plans must be obtained from the gas pipeline owners to locate and verify the position of the pipelines on the site.

No mechanical excavation equipment may be used within 1 metre of the pipeline in any direction, even after the pipeline location has been proven. An exception to this is when the activity has been approved by, and is under explicit ‘on-site’ direction from, the utility owner’s inspector.

Under no circumstances is mechanical excavation equipment to be used closer than 30 centimetres to the pipeline. Safe digging practices must be used, to minimise the risk of damage to the pipeline or its coating.

If a gas leak is detected or suspected, the person in control of the site is to ensure that:

- No attempt is made to repair the leak
- All persons are removed from the vicinity of the leak
- Emergency services are immediately notified
• Members of the public in adjacent buildings and locations are notified immediately by the supervisor on site and advised to leave the vicinity

• All naked flames, including smoking and other sources of ignition, are extinguished and prohibited.

Pipeline restraints or thrust blocks close to the gas pipeline must not be moved without the owner’s permission.

10 Water pipes and sewers

When it is necessary to work near underground water pipes and sewers, the following precautions must be taken:

• At bends in the water mains, where concrete thrust blocks have been used, the blocks, and the ground supporting them, must not be disturbed under any circumstance, as this can cause sudden failure of the mains. Exposed pipes should be supported as necessary and the correct method of backfilling used.

• If the pipeline or its wrapping is damaged, the utility owner, as well as owners of other utilities that may be affected, must be notified immediately.

Rupture of underground water pipes and sewers may result in:

• Severe damage locally to the work area (particularly trenches) and other properties through inundation, flooding or undermining.

• Release of flammable gases, oxidising gases and – in some locations – hazardous chemicals in the form of industrial waste.

• Exposure of personnel to biological hazards.

Any hazardous chemical contained in an enclosed system (such as a pipe or piping system, or a process or reactor vessel) also needs to be identified with an SDS being made available. If sewage pipelines are identified, the appropriate SDS should be obtained from the utilities owner.

The manager in control of the site is to develop an emergency response plan for the worksite and train workers in the execution of this plan before work begins. If required by the emergency response plan, PPE must be obtained and kept at the site, and workers must be trained and drilled in its use. (See section 12.)

11 Telecommunications infrastructure and cables

Telecommunications infrastructure assets are commonly deployed along road corridors and in some cases may be mounted on road structures, such as bridges and tunnel entrances.

Some telecommunications antennas may be sources of microwave or radio frequency (RF) radiation and workers should be made aware of these potential energy sources.

The placement of such antennas and the extremely directional nature of their emissions would normally preclude exposure by personnel and equipment to these energy fields.
Where a mechanical excavator is used near telecommunications cables, the work must be conducted in a way that prevents damage to the cables. All persons must be kept well clear of the mechanical excavator while it is operating.

While all underground cables are regarded as being electrically energised until proven otherwise, communications cables require no special precautions to prevent danger to workers.

The utility owner must be consulted on precautions to be taken to avoid damage to the utility and disruption of services to their users.

The site risk assessment is to include the identification of the potential hazards and their assessment.

Where elevated work is to be undertaken within 30 metres of telecommunications infrastructure, the telecommunications utility owner must be consulted before work begins.

Any safety measures that might be required to prevent personnel being exposed to telecommunications hazards or to prevent interference to telecommunication services must be determined and implemented.

Persons fitted with pacemakers and prosthetic implants must be precluded from elevated work in proximity to these telecommunications antennas, as the prosthetics may be heated or affected by exposure to the energy fields.

12 Emergency response

12.1 Striking above-ground or underground utilities

If an above-ground or underground utility is unintentionally uncovered, displaced or struck in the course of work activities, all work in the vicinity must stop immediately.

If there is any risk of energy transfer the matter should be reported immediately to the utility owner with a request to isolate the service.

Managers and supervisors must take immediate emergency response action to protect persons at the site. This includes an 8-metre separation from any active electricity cable.

Note that, under Section 37 of the WHS Act, the escape of gas from a gas main is a 'dangerous incident' and is thereby (under Section 35) a 'notifiable incident', meaning that SafeWork NSW must be notified as soon as possible and site preservation requirements come into effect.

That is, the site cannot be disturbed until a SafeWork inspector attends the site or advises that site preservation can be lifted. Site preservation requirements do not prevent actions being taken to make the site safe, such as the utility owner carrying out emergency repair work.

The Roads and Maritime WHS reporting line must be contacted on 1300 131 469.
Once the safety of the location is made good, managers and supervisors must ensure a risk assessment is undertaken before any work proceeds. Safe work method statements must be modified to include controls for any additional risks arising from unintended contact with underground or above-ground services.

The risk assessment must be undertaken in consultation with employees involved in the work and then implemented when the site is released from any SafeWork NSW restrictions.

Expert advice must be sought from representatives of the utility owner on emergency response measures, risk assessment and safe working methods.

12.2 Electrocution risk where plant strikes an electric line

If plant strikes an overhead, above-ground or underground electric line, an attempt should be made to break the machinery’s contact with the electric line.

Section 37 of the WHS Act includes:

Serous risk to person’s health and safety emanating from an imminent or immediate exposure to:

(e) electric shock

and is thereby (under Section 35) a ‘notifiable incident’, meaning that SafeWork NSW must be notified as soon as possible and site preservation requirements come into effect.

The Roads and Maritime WHS reporting line must be contacted on 1300 131 469.

If it is not possible to break contact with the electric line, the operator must remain within the plant and not attempt to leave the cabin until the power has been disconnected and the ‘all clear’ has been given (see note below).

All persons must be kept a minimum of 8 metres clear of the machine and the cable until the utility provider has made the electric line safe.

Untrained, unequipped persons should not attempt to rescue a person receiving an electric shock, as this may also result in injury to the person rendering assistance.

An operator should not attempt to jump clear of the machine, because simultaneous contact with the machine and the ground will result in an energy transfer, possibly even without a direct contact being made with the ground.

Only if an immediate evacuation of the plant cabin is essential (as in the case of a fire) should an operator attempt to jump clear.

To minimise the risk of making simultaneous contact with the plant and the ground, this should be done by jumping well clear of the plant with their legs together and keeping their legs as close together as possible with both feet in continuous contact with the ground while shuffling away from the machine.
Operators must be familiar with this technique and should practise it regularly.

13 **Training**

Workers must be trained in managing risks arising from the presence of above-ground, overhead and underground services near workplaces and, in particular, developing and using SWMS.

Site specific inductions must focus on the presence of overhead, above-ground and underground services on the site, and their potential for energy transfer.

Additionally, procedures, controls and emergency response requirements for the hazards present at the site, determined through risk assessment and SWMS development, must be reinforced through toolbox training sessions.

Make sure information, training and instruction provided to workers is suitable for the type of work being done by the worker, the associated risks and the control measures used. Make sure workers are trained and have the necessary technical skills, knowledge and competence to be authorised to work in Zone B (see section 8.3).

People who work closer than the approach distances specified in Zone C and safety observers who observe the work in Zone B or closer than the specified distances in Zone C must have successfully completed relevant training. This training is in addition to the requirements for plant operators to be competent and, in the case of high-risk plant, to hold a high risk work licence.

Safety observers must be competent to implement control measures in an emergency and to rescue and resuscitate the worker who is carrying out the work, if necessary. A safety observer must have been assessed in the previous 12 months as competent to rescue and resuscitate a person.
## Roles and responsibilities

<table>
<thead>
<tr>
<th>Role</th>
<th>Responsibilities</th>
</tr>
</thead>
</table>
| Managers                    | ▪ Implement the requirements of this procedure  
▪ Ensure all drawings have been obtained less than 30 days before work begins  
▪ Ensure the position of above-ground, overhead and underground services at the site, including redundant or disused utilities, is conspicuously annotated on all plans for the worksite  
▪ Verify the actual position of above-ground, overhead and underground services at the site and advise designers of any variations from the locations shown on plans  
▪ Ensure workers undertaking the work receive information, instruction and training in safe working procedures before any work begins  
▪ Supervise work to ensure that SWMS are implemented at all stages  
▪ Ensure ‘work as executed’ (WAE) plans are produced when any variation to utilities occurs as a result of the work. |
| Surveyors                   | ▪ Determine during the pre-planning stage for the work what utilities co-exist in the work area – this includes the presence of redundant or disused services  
▪ Mark services on the ground.                                                                                                                                                                                                                                           |
| Project designers and planners | ▪ Ensure that all utilities are conspicuously marked on a utility sheet within a set of drawings for the work and that all of these drawings are cross-referenced to the utility sheet for the worksite, especially on copies of drawings provided to the field  
▪ Amend records to reflect any variations to the location of utilities determined and to record actual location details accurately on completion of work  
▪ Advise utility owners when variations to the location of their utilities have been detected or not previously charted.                                                                                      |
| Workers                     | ▪ Participate in training  
▪ Work in compliance with the SWMS that is applicable to the job.                                                                                                                                                                                                                   |
| WHS Branch                  | ▪ Facilitate implementation of the above-ground, overhead and underground services procedure  
▪ Monitor worksites for the proper implementation of this procedure.                                                                                                                                                                                                          |
## Definitions

<table>
<thead>
<tr>
<th>Term</th>
<th>Definition</th>
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</thead>
<tbody>
<tr>
<td>Authorised person</td>
<td>A person who has successfully completed a recognised training course relating to work near overhead electric lines conducted by a registered training organisation and, as such, has the necessary technical knowledge and skills to be able to identify the operating voltage of electric lines and recognise the dangers from overhead electric lines and associated electrical equipment.</td>
</tr>
<tr>
<td>Clearance zone</td>
<td>The safety protection zone surrounding energised electric lines prescribed to prevent energy transfers between the electric line and conductive pathways to earth. This zone varies in diameter depending on the voltage of the electric line it applies to.</td>
</tr>
<tr>
<td>CCD</td>
<td>Critical clearance distance – the distance from the outside perimeter of the imposed clearance zone of an electric line to ground level.</td>
</tr>
<tr>
<td>Control</td>
<td>A measure planned to manage the risk from a hazardous event. Controls include any process, policy, device, practice, or other actions that modify risk. Controls are selected from the 'hierarchy of controls'.</td>
</tr>
<tr>
<td>Hierarchy of controls</td>
<td>If a hazard cannot be eliminated, suitable controls are identified by moving down the hierarchy from Eliminate to PPE, as follows:</td>
</tr>
<tr>
<td></td>
<td><strong>ELIMINATE</strong></td>
</tr>
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<td></td>
<td>The most effective control measure involves eliminating the hazard and associated risk. If the hazard cannot be eliminated, then eliminate as many of the risks associated with the hazard as possible.</td>
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<tr>
<td></td>
<td><strong>SUBSTITUTE</strong></td>
</tr>
<tr>
<td></td>
<td>Substitute the hazard with something safer. This may not remove all of the hazards associated with the process or activity and may introduce different hazards, but the overall harm or health effects will be lessened.</td>
</tr>
<tr>
<td></td>
<td><strong>ISOLATE</strong></td>
</tr>
<tr>
<td></td>
<td>Isolating the hazard involves physically separating the source of harm from people by distance or by using barriers, eg restricting access to plant and equipment, or locking chemicals away under strict controls.</td>
</tr>
<tr>
<td></td>
<td><strong>ENGINEER</strong></td>
</tr>
<tr>
<td></td>
<td>An engineering control is a control measure that is physical in nature, including a mechanical device or process. This involves redesigning a process to place a barrier between the person and the hazard or to remove the hazard from the person.</td>
</tr>
<tr>
<td></td>
<td><strong>TRAINING &amp; ADMIN</strong></td>
</tr>
<tr>
<td></td>
<td>Administrative controls are work methods or procedures designed to minimise exposure to a hazard. They can include adopting standard operating procedures or safe work method statements (SWMS), or providing appropriate training, instruction or information to reduce the potential for harm and/or adverse health effects.</td>
</tr>
<tr>
<td></td>
<td><strong>PPE</strong></td>
</tr>
<tr>
<td></td>
<td>Personal protective equipment (PPE) includes safety gloves, protective eyewear/earmuffs, hard hats, aprons, safety footwear and dust masks. These are designed to reduce exposure to the hazard. PPE is the last line of defence and is used in conjunction with one or more of the other control measures.</td>
</tr>
<tr>
<td>Manager</td>
<td>A person responsible for planning and directing the work of a worker or group of workers, monitoring their work, and taking corrective action.</td>
</tr>
<tr>
<td>Term</td>
<td>Definition</td>
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</tr>
<tr>
<td>Occurrence</td>
<td>A series of events and conditions that results in, or has the potential to result in, a non-trivial amount of injury or damage. An occurrence that could have resulted in damage or injury but did not is generally referred to as a near-miss.</td>
</tr>
<tr>
<td>Qualified person</td>
<td>A trained person with technical knowledge and / or sufficient experience who has been approved to perform the duty performed, or has the delegated authority to act on behalf of a network operator (utility owner).</td>
</tr>
<tr>
<td>Safety observer</td>
<td>An accredited person competent for the task and specifically assigned the duty of observing and warning against unsafe approach to electrical apparatus or other unsafe conditions and not assigned any other duties whilst acting as a safety observer.</td>
</tr>
<tr>
<td>Unauthorised person</td>
<td>Any person who does not have the relevant technical knowledge and experience of electricity transmission and distribution networks and associated electrical equipment and so will not be able to identify the operating voltage of electric lines and recognise the dangers from overhead electric lines and associated electrical equipment.</td>
</tr>
<tr>
<td>VMP</td>
<td>Vehicle management plan.</td>
</tr>
<tr>
<td>Worker</td>
<td>Any person who carries out work in any capacity at a Roads and Maritime workplace including Roads and Maritime employees (including labour hire, apprentices and trainees); professional services contractors and consultants; contractors, subcontractors and their employees; outworkers; students gaining work experience; and volunteers.</td>
</tr>
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References

Roads and Maritime references

<table>
<thead>
<tr>
<th>Doc no</th>
<th>Title</th>
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<tr>
<td>PN066P02</td>
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<tr>
<td>PN066P11</td>
<td>Procedure <strong>Safe work method statements</strong></td>
</tr>
<tr>
<td>PN066P12</td>
<td>Procedure <strong>Excavation</strong></td>
</tr>
<tr>
<td>PN066P20</td>
<td>Procedure <strong>Smoke-free workplaces</strong></td>
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External references

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<thead>
<tr>
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<th>Source</th>
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</thead>
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<tr>
<td><strong>Electricity Supply (General) Amendment (Infrastructure Protection) Regulation 2010</strong></td>
<td><a href="http://www.austlii.edu.au">www.austlii.edu.au</a></td>
<td>Legislation</td>
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<tr>
<td>Working in the vicinity of overhead and underground electric lines</td>
<td>Safe Work Australia <a href="http://www.safeworkaustralia.gov.au">www.safeworkaustralia.gov.au</a></td>
<td>Guide</td>
</tr>
<tr>
<td>Working near low voltage overhead electric lines near structures</td>
<td>Safe Work Australia <a href="http://www.safeworkaustralia.gov.au">www.safeworkaustralia.gov.au</a></td>
<td>Guide</td>
</tr>
<tr>
<td>Scaffolding work near overhead electric lines</td>
<td>Safe Work Australia <a href="http://www.safeworkaustralia.gov.au">www.safeworkaustralia.gov.au</a></td>
<td>Information sheet</td>
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Document control

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<th>WHS Risk Manager</th>
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<td>Approval</td>
<td>General Manager Work Health and Safety</td>
</tr>
<tr>
<td>File name</td>
<td>procedure-pn066p16.pdf</td>
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<tr>
<td>Online location</td>
<td>Home (<a href="http://www.rms.nsw.gov.au">www.rms.nsw.gov.au</a>) → Safety → Work Health &amp; Safety → OneRMS safety management system → Procedures, forms and guidance</td>
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<tr>
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<td>A13984894</td>
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<tr>
<td>Publication n°</td>
<td>RMS 17.114</td>
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| Template            | Objective ID: A10508605
Objective label: WHS procedure template |

Change history

<table>
<thead>
<tr>
<th>Issue</th>
<th>Date</th>
<th>Description of change</th>
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<tbody>
<tr>
<td>2.2</td>
<td>1/9/2017</td>
<td>Updated following WHS Regulation 2017 superseding WHS Regulation 2011. No other changes.</td>
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</table>
| 2.1   | 2/2/2017| ▪ Reformatted to current WHS procedure template
▪ Updated definitions
▪ Updated references, codes of practice and guides
▪ Rewrote sections 6.1–6.4 (and parts of the remainder of s6) based on changes in the recently updated SWA code of practice and associated guide
▪ Removed out-of-date and irrelevant material |
| 2.0   | 5/3/2013| No change history available |

Feedback

Contact WHS Branch with feedback on this document at: onermssms@rms.nsw.gov.au