Engineering Advice
Electrical Distribution Unit

EA D 19-02 V2.0

Work On or Near Cables: High Voltage, 1500V and LV Distribution Networks

This Engineering Advice is produced for information and guidance. Adherence to the information in this Advice is recommended but not mandatory.

Date in Force: 22 May 2020

Date of Review: 22 May 2021

Approved by:
Nadine Youssef
Associate Director
Electrical Distribution Unit

Authorised by:
Jonathon McKinnon
Engineering Technical
Publications Manager

Audience:

- All persons working or supervising or managing work in the railway corridor, including but not limited to:
  - Project teams – all disciplines
  - Maintenance personnel – all disciplines
  - Line managers – all disciplines
  - Project managers – all disciplines
  - Managers of Fleet Maintenance Centres
  - Station staff
  - Electrical workers
- SEQR

Main Points:

- Electrical work must only be performed by suitably authorised persons.
- Electrical work must be performed in accordance with Sydney Trains Electricity Network Safety Rules.
- Treat all cables as live until proven safe.
- Working on cables (including abandoned cables) is electrical work.
- Low voltage installations are outside the scope of this Engineering Advice.

Reference Document: **SMS-06-GD-0268 Working around Electrical Equipment**

Scope

All staff – including project teams, maintenance staff, project engineers and line managers - are required to observe Sydney Trains Electricity Network Safety Rules when working on, near or in the vicinity of cables – including abandoned cables.

Background

Buried cables – even abandoned cables – may pose hazards including contact with electricity, resulting in electric shock or death, as well as non-electrical hazards such as asbestos. In this context hazardous work includes:

- work on abandoned cables
- work in the vicinity of buried cables
- working with tools, plant and machinery in the vicinity of cables
- drilling holes in poles or walls where cables may be in the wall or on the back side
- moving live cables
- excavations in the vicinity of cables.

Action required

Line managers, project managers, project teams, maintenance managers, and managers of maintenance facilities and stations are reminded of the following mandatory obligations:

- You must search for cables and/or electrical conduits near, adjacent, in or behind walls, or under the worksite, using Dial-Before-You-Dig, Sydney Trains ISS and DSS – in addition to checking for overhead power lines in the vicinity of the worksite. This includes the access route used to move plant & machinery, tools, materials and personnel to/from the worksite.
- Treat all cables as live – and hazardous - until proven otherwise.
- Work on abandoned cables is considered "electrical work".
- Electrical work must only be performed by an Authorised Person in accordance with PR D 78000 Electricity Network Safety Rules published on the RailSafe website.
- Arrange for live cables and equipment in the vicinity of your work to be isolated BEFORE work commences.
- Any alternations to cables – including abandoned cables – must be documented and the changes submitted through the normal processes.

If you are in any doubt about how to deal with electrical risks at your worksite REQUEST ADVICE from any of the following:

- Associate Director Electrical Distribution Unit, Engineering System Integrity Division
- Professional Head Electrical Engineering, Engineering System Integrity Division
- Senior Manager Electrical Engineering, Network Maintenance Division or
- ICON Electrical.

Contact

Electrical Distribution Unit
E: railelectricalsafety@transport.nsw.gov.au

Engineering Instruction
Electrical Distribution Unit

EI D 20-01

Work above Live Electrical Equipment

This Engineering Instruction includes urgent engineering information. Adherence to the information in this Instruction is **MANDATORY**.

Date in Force: 1 April 2020

Date of Review: 1 April 2021

Approved by:
Nadine Youssef
Associate Director
Electrical Distribution Unit

Authorised by:
Jonathon McKinnon
Engineering Technical
Publications Manager

Audience:

- All persons working or supervising or managing work on electrical equipment, including but not limited to:
  - Project teams – all disciplines
  - Maintenance personnel – all disciplines
  - Line managers – all disciplines
  - Project managers – all disciplines
  - Fleet Maintenance Centres
  - Station staff
  - Electrical workers
- SEQR

Main Points:

- Work near or above live exposed electrical equipment to be avoided.

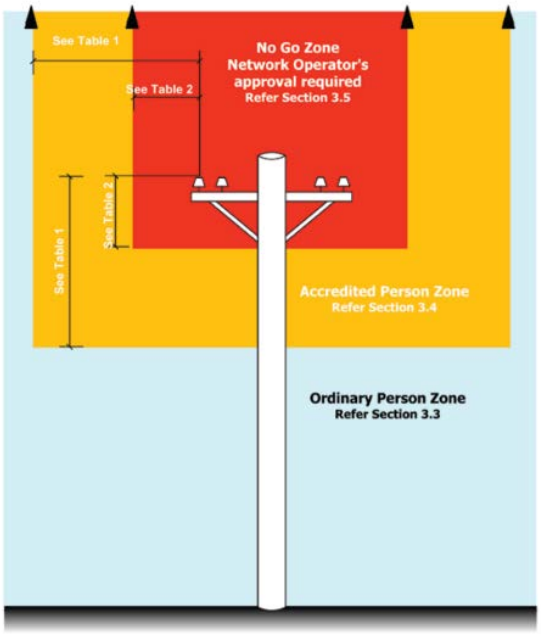
Primary Affected Document: **SMS-06-GD-0268 Working around electrical equipment**

Scope

All staff – including project teams, maintenance staff, project engineers and line managers - are required to observe Safe Work NSW *Managing Electrical Risks in the Workplace Code of Practice* when working **on or near** electrical equipment.

Background

Staff have interpreted section 152 of the Work Health & Safety Regulation 2017 as allowing Sydney Trains personnel to work on, above or near live exposed electrical equipment without adequate safety controls. This is contrary to the Code of Practice, and contrary to Sydney Trains *SMS-06-GD-0268 Working around electrical equipment*.



Action required

Personnel are reminded of the following mandatory obligations:

The primary safety control for working around electrical equipment is de-energisation, i.e. isolating the equipment, securing the point of isolation to prevent it being re-energised, applying earths and "testing for dead" before the work commences:

When working above;

High Voltage Electrical equipment

- the work is to be carried out under an appropriate Electrical Permit.

Low Voltage or 1500V DC equipment maintained by Sydney Trains

- the work is to be carried out under an appropriate Electrical Permit, or
- the work is to be carried out in accordance with an approved SWMS and the specific work is to be approved by an Authorised Officer (Mains or Substations), or
- A continuous rigid barrier is to be erected and the work is to be carried out in accordance with a SWMS approved by an Authorised Officer (Mains or Substations).

Note: Continuous rigid barriers shall be erected as temporary structures per SMS-06-GD-0268.

Low Voltage Equipment maintained by Other Network Operators

- the work is to be carried out under an appropriate Electrical Permit or
- If allowed by the Network Operator, work may be carried out in accordance with an approved SWMS and the specific work is to be approved by an Authorised Officer (Mains or Substations).

Note: Bare LV conductors (including other Network Operators assets) fitted with tiger tails are not to be treated as insulated.

If you are in any doubt about how to deal with electrical risks at your worksite **REQUEST ADVICE** from an Electrical Authorised Officer (Mains or Substations) with relevant experience.

Refer to RG D 78800 Personnel Certifications – Electrical Certification Status for a register of Electrical Authorised Officers (Mains or Substations).

Contact

Electrical Distribution Unit **E:** railelectricalsafety@transport.nsw.gov.au

Engineering Advice
Electrical Distribution Unit

EA D 20-04

Working between Rail and Earthed metallic items

This Engineering Advice is produced for information and guidance. Adherence to the information in this Advice is recommended but not mandatory.

Date in Force: 12 March 2020

Date of Review: 12 March 2021

Approved by:
Nadine Youssef
Associate Director
Electrical Distribution Unit

Authorised by:
Jonathan Mckinnon
Engineering Technical
Publications Manager

Audience:

- Sydney Trains
- Transport for NSW

Main Points:

- Requirement to confirm safe voltage between rail to earth or 1500V structures prior to contact.

Reference Document: **PR S 40027 Traction Return (1500V DC)**
SMS-06-GD-0268 Working around Electrical Equipment

Scope

This Engineering Advice sets out to clarify the requirements for situations when the work performed may involve simultaneous contact between rail and metallic infrastructure.

Background

A recent incident occurred at Richmond when a Major Works Infrastructure Worker received an electric shock when installing a train stop mounting plate at Richmond Station.

The Overhead Wiring for the terminal road was isolated and rail connected, however electric trains were still operating on the adjacent line.

As the rails are not connected to earth the rail voltage may rise due to other trains or other electrical issues between the worksite and the traction substation.

Action required

- Stop, if you cannot test the potential between the rail and the metallic infrastructure do not commence work.
- If work is required to continue it must be completed using an ASB or higher. Where a train is close to the worksite location there is an increase of DC voltage.

NOTE
It is safest to perform the work at night after the last train and before the first train.

- Test the electrical potential between the rail and the metallic object, e.g. train stop.

Should the test be unsafe to work on i.e. >50V DC stop work and contact the Territory Engineer for advice.

- Use insulated tools,
- Ensure you are wearing insulated rubber gloves prior to commencing work.

NOTE
These are only initial temporary controls to protect workers exposed to this risk. Further investigation is underway to implement a longer term solution.

Further more

- Metal structures connected to the local earth, such as:
  - galvanised steel troughs
  - fences
  - station platforms
  - buildings, bridges, handrails or barriers
  - metallic infrastructure in the rail corridor such as boom gates, pit covers, signalling equipment
  - tools powered from a GPO
  - metallic equipment installed on platforms or access paths
  - metallic scaffolds or elevated work platforms

  must not be connected to rail, rolling stock or 1500V OHW structures unless as except where the Authorised Engineering Organisation has submitted the design to Sydney Trains and received "No Objection" or equivalent from Sydney Trains.
- Painted or epoxy-coated metal objects bolted to or cast in concrete are not considered insulated and must be treated as connected to the local electrical earth unless proven otherwise by an electrical test.
- When working on Rail or any 1500V OHW structure or structures connected to rail only use electric or pneumatic power tools that are:
  - battery operated or
  - supplied from an isolating transformer, generator or inverter.

Contact

Electrical Distribution Unit
E: railelectricalsafety@transport.nsw.gov.au

Engineering Advice
Electrical Distribution Unit

EA D 20-01

Truss Bridge Containment Tunnel

This Engineering Advice is produced for information and guidance. Adherence to the information in this Advice is recommended but not mandatory.

Date in Force: 1 February 2020

Date of Review: 1 February 2021

Approved by:
Nadine Youssef
Associate Director
Electrical Distribution Unit

Authorised by:
Jonathon McKinnon
Engineering Technical
Publications Manager

Audience:

- Network Maintenance Division
- Engineering System Integrity
- Major Works Division
- TfNSW

Main Points:

- This EA endorses the use of the containment tunnel for refurbishment work on truss bridges.

Reference Document: **PR D 78700 (SMS-06-GD-0268) Working Around Electrical Equipment**

Scope

This Engineering Advice is to provide information on the use of a containment tunnel for refurbishment works on truss bridges.

Background

Steel truss bridges are being refurbished and painted as part of the MPM bridge painting program. As the existing bridges require the removal of the lead based paint, the environmental and safety requirements make it essential for the work to be undertaken within a fully sealed works containment area with effective control of all waste generated. As it is not feasible to undertake the work within available track possessions, Major Works have designed a containment tunnel to segregate the work area from trains and energised electrical equipment.

The containment tunnel has been designed to comply with bridge design requirements and the wind loads that are created by trains passing through the tunnel as set out in the “Cockle Creek Rail Bridge Works Tunnel Design Report”. The containment tunnel has been designed to comply with the Asset Standards Authority's *T HR EL 08012 ST Overhead Wiring Standards for Design and Construction* for clearance to OHW equipment and *ESC 215 Transit Space* for clearances to the kinetic envelope. The containment tunnel will be constructed with a steel frame supporting a durable, weatherproof structural plywood lining, the adjacent standing surfaces will comply with coverage and clearance envelope requirements of *T HR EL 08001 ST Safety Screens and Barriers for 1500 V OHW Equipment*.

The bridge capacity to support the containment tunnel and scaffold has been thoroughly reviewed and accepted by AEO bridge designers.

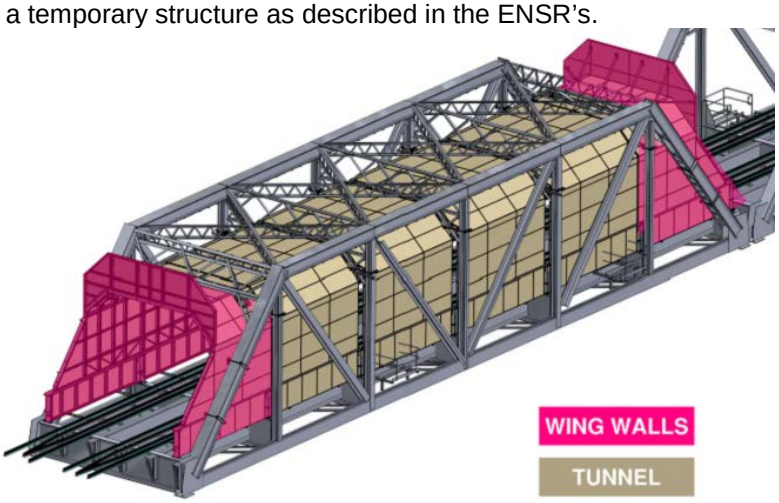
Once erected the containment tunnel provides a solid barrier so that most of the scaffold installation can be undertaken without encroaching on SADs, i.e. greater than 4.0m from OHW equipment. The remaining scaffold installation at either end of the tunnel will be undertaken during weekend track possession to ensure SAD requirements are not infringed during construction. At the completion of the scaffold construction (and prior to return of the Electrical Permit to Work), solid barriers will be installed to separate the work areas from operating trains and live electrical equipment.

All metallic members of the containment tunnel as well as the worksite scaffold will be effectively bonded to the bridge structure and the total structure will be protected by a spark gap bonded to rail to an approved E&B design.

Weekend track possessions with power outage will be utilised for installation, relocation and removal of the containment tunnel which is expected to be in place for approximately 12 months when it will be dismantled and moved to the next truss.

Summary

For electrical purposes EDU have accepted/endorsed the containment tunnel as a modification of the bridge as a substantial structure, which forms a solid and rigid barrier that is capable of withstanding any foreseeable forces. Located between the 1500V energised equipment and the worksite, and not a temporary structure as described in the ENSR’s.



Action required

As the containment tunnel is for a worksite, further requirements are as follows:

a. Construction that forms the tunnel:
   - Gaps in the tunnel construction between the worksite and energised equipment shall not exceed 3mm.
   - No exposed cut or drilled holes are permitted in the panels.
   - Warning signs shall be affixed to the safe side of the tunnel, warning of the presence of the electrical hazard on the other side of the tunnel and warning that the tunnel panels shall not be penetrated or removed.
   - A competent person with civil expertise shall inspect the containment tunnel after its erection and before its use, to certify that the temporary structure has been erected in compliance with the design drawings. A structure handover certificate is to be provided and kept at the site. (Refer to *SMS-06-GD-3066 Guide to Managing Construction Hazards* and *AS/NZS 4576 Guidelines for scaffolding* for inspection and recording requirements.)
   - The containment tunnel shall include perimeter edge protection to prevent workers, tools, material or objects from falling onto, or infringing the SADs of electrical equipment as specified in *PR D 78700 (SMS-06-GD-0268) Working around Electrical Equipment*.
   - These SADs shall be achieved as a taut string distance to the top and side extremities of the edge protection.

b. A competent person with civil expertise shall visually inspect the tunnel on a daily basis to ensure that the containment tunnel is in a satisfactory condition and remains impenetrable. Records of inspection shall be maintained. (Refer to SMS-06-GD-3066 and AS/NZS 4576 for additional inspection and recording requirements, e.g. inspection of scaffold by a competent person at intervals not exceeding 30 days or after repair or modification.)

c. The Earthing/Bonding arrangement shall be inspected as per the existing bridge spark gap inspection requirements.

d. Measures shall be put in place to restrict unauthorised access.

Contact

Electrical Distribution Unit
E: RailElectricalSafety@transport.nsw.gov.au

Engineering Instruction Electrical Distribution Unit	EI D 18-16
Approved by: Paul Poynton, A/Professional Head Electrical Engineering, Sydney Trains **Authorised by:** Jonathon McKinnon, Engineering Technical Publications Manager, Sydney Trains	Date in Force: 7 September 2018 Date Expires: 7 September 2019
This Engineering Instruction includes urgent engineering information. Adherence to the information in this Instruction is **MANDATORY**.	

Delegation of Approval to Excavate near buried Cables

Audience:	Main Points:
• Network Maintenance Division	• Approval of SWMS for working near cables

Primary Affected Document:
SMS-06-GD-0268 Working around Electrical Equipment

Scope

This Engineering Instruction sets out the detail to transfer the responsibility of the Obsolete District Maintenance Engineers Electrical.

Background

As described in **SMS-06-GD-0268**: Working Around Electrical Equipment, approval to excavate within 3 mtrs without an Electrical Permit or excavate by mobile plant 2.0 mtrs horizontally of the expected position of buried cables shall only be carried out with approval from the Professional Head Electrical Engineering or a Maintenance Engineer Electrical.

The base principle for this approval process is for a Senior Electrical Manager to review and accept the work process to mitigate the risk, SFAIRP, to:

- The work party
- The integrity of the network

Due to restructures within the Maintenance Division, reducing electrical management, ability to carry out this process, i.e. 7 DEE's to 4 MEE's to 1 Senior Manager Electrical Engineering, has resulted in the requirement to delegate the review and approval process to other suitably qualified persons.

Action required

An Electrically Authorised Person endorsed by the Senior Manager Electrical Engineering may review and accept;

1. Safe Work Methods for excavation and earth works that are required to, or might inadvertently come within 3 mtrs of electrical equipment, operated and maintained by Sydney Trains, without an electrical permit for:
   - Buried power cables, or
   - Cables in ducts, galvanised steel troughing (GST), ground line troughing (GLT), or
   - Cable pits
2. Give written approval to excavate by mobile plant within 2 mtrs horizontally of the expected position of buried cables without first exposing them.

Contact

Wayne Halls, System Safety Engineer EDU, RailElectricalSafety@transport.nsw.gov.au

Engineering Instruction

System Guide

Working around Electrical Equipment

Transport Sydney Trains

NSW GOVERNMENT

Version control

Version	Change from previous	Date	Comment
1.0	First release	12/09/06	Release of revised SMS
2.0	Amendments as required by release of the WorkCover Code of Practice 'Work near Overhead Power Lines'	27/11/07	Document reordered to reflect the risk management approach
2.1	• SADs for Authorised Persons for operating mobile cranes and plant clarified at Part 4.4 'Competence of persons'. • Figure 6 amended to be for 'Accredited Persons'. • Part 3 on 'electrical hazards' elaborated. • New Part 5.1.3 on 'clothing and personal items' added, followed by re-numbering of the subsequent parts.	21/12/07	In response to valid stakeholder's comment.
2.2	• Editorial change at 6.1.3. • Explicitly stipulating, at Part 16, that this document supersedes the previous Workplace Safety Manual A10-01-I062 document bearing the same title. • WorkCover Code of Practice 'Work Near Overhead Power Lines' added at Part 16. • Appendix A added for 'safe use of mobile plant' • Some diagrams changed • Section 13.3 'work on cables' changed. • 'Safe Approach Distance' defined in section 15.	9/3/09	• In response to valid stakeholder's comment. • Quality management requirement • This Code of Practice applies for working near overhead powerlines. • As discussed with and agreed by Safety Division. • In line with the WorkCover Code of Practice for Working Near Overhead Powerlines. • To incorporate requirements of ETN 08/09 & ETN 09/07 • Not good enough to define it in the 'Electrical Network Safety Rules', which is for the electrical discipline only.
2.3	Section 8.4.3 amended to allow the use of insulated staves. Editorial change to A.4.3.1.2, A.4.3.1.3, A.4.3.1.5 and Appendix 6 Correction to typographical errors Amended Section 12.2	21/01/10	In response to valid stakeholder's comment Incorporated requirements of ETN 09/11

Version	Change from previous	Date	Comment
3.0	• Section 1	09/11/11	Focus of the Guide has been changed from "making sure that minimum SAD's are not infringed" to "reducing the risks to ALARP" as sometimes work within minimum SAD's is permitted.
	• Section 3 & 11		New Note 2 to Table 1
	• Section 5.1 & 8.1		Editorialised to make clearer responsibility of Permit Holder & Workers
	• Section 5.2		Requirements for Safety Observer enhanced with some wording transferred from Appendix A.5, which is simplified with reference to Section 5.3.4. Inclusion of new requirement for use of a Safety Observer whenever work activities could damage electrical equipment of infrastructure. New Warning at end of section regarding work in tunnels.
	• Section 5.3 & 5.3.1		Old section 5.3 & 5.3.1 contained both General & Elimination instructions. New section 5.3.1 is now only General & section 5.3.2 is now only Elimination.
	• Section 5.3.4		Administration controls are only applicable as the sole control method for work in the vicinity and when elimination or separation controls are not practicable.
	• Section 5.3.2 & 5.3.3		Elimination & Separation controls shall be implemented in conjunction with the Administrative controls.
	• Section 5.3.5		Safety observer roles and responsibilities strengthened. Safety Observer duties from earlier version A5 now incorporated into this section.
	• Section 5.3.6		New section concerning ppe.
	• Section 5.4.1		New 1st & 2nd paragraph

Version	Change from previous	Date	Comment
3.0 cont.	• Section 5.4.3	09/11/11	Accredited Persons SAD's changed – broken into 2 groups, 'at track level' & 'above track level'
	• Section 5.4.3.3		Other non-electrical work now includes removing graffiti from trains and maintenance of ground mounted signal structures. Additional training requirements to be approved by the CEE. Electrical awareness briefing ≤ 12 months
	• Section 6.3.2		Section aligned to current SMS-06-GD-0378 Excavation and Earthworks.
	• Section 6.4.5 added for Signal maintenance work in the vicinity of registered Dead Leg Pennants.		To address the concern expressed by the Signal discipline.
	• Section 8		Retitled to "Working on *or near*.."
	• Section 8.1		Editorialised and technically cross-linked to others sections. New note. Personal responsibilities defined.
	• Section 8.2		New requirement to report incidents of work started without an Electrical Permit.
	• Section 8.4.3 added on the exclusion of routine maintenance of Signal Equipment.		New section to address the concern expressed by the Signal discipline. (This section is also linked to changes in sections 5.4.3 & 6.4.5.)
	• Section 8.4.5 added to cover other work using insulated tools outside the SAD's.		New section (largely sourced from original section 8.4.3) to address respective line managers' requests and to make provisions to enable such work to be carried out safely.
	• Section 8.4.6		Last paragraph from original section 8.1 now extracted and made into a new section. Now also includes work conducted under Annett style Key or Supplementary Lock system.

Version	Change from previous	Date	Comment
3.0 cont.	• Section 10 • Section 14 • Appendix A.4.3.1.5 • Appendix A.4.3.2.4 • Appendix A.4.3.2.4 & Chart 4 • Appendix A.5 • Appendix A.6 • Other minor editorial changes.	09/11/11	New 1st dot point concerning Administrative controls. Reference to new Waratah train set included and deletion of Authorised Officer (Mains) as an appropriate electrical safety supervisor from last dot point as they are not authorised to work live. Note added to item 1. Inclusion of new 1st & 2nd dash points for Third Option, i.e. Contact EOC. 'Level 5 Manager' replaced by 'RailCorp Level 5 Manager' Content of this section is now incorporated into section 5.2 & 5.3.5. Editorialised to more clearly align with WorkCover requirements which are used throughout the entire document. Fine-tuning & incorporating organisational changes (e.g. Regions no longer exist, ESO replaced by EOC).

3.1	• Sections 1 and 5.3.1	13/05/13	1st paragraph aligned with Work Health and Safety Act.
	• Section 2		Scope aligned with Work Health and Safety Act, new 2nd paragraph and Note.
	• Table 1		Title of table changed by inclusion of "exposed" before 'electrical equipment'.
	• Section 5.3.5		Inclusion of additional Safety Observer duty regarding excavation works near HV cables.
	• Section 5.4.3		Accredited Persons must have electrical awareness training and inclusion of new type of work, 'Work as a Mobile Plant Operator or Safety Observer'
	• Section 5.4.4		Non accredited Persons include RISI Persons whom can work at track or station platform level
	• Sections 5.4.3 and 5.4.4		Work using tools above or below shoulder height clarified
	• Section 6.1.4		"Conductive" removed from title and body of text, as all objects are to be deemed as conductive unless tagged otherwise and appropriate handling practices implemented
	• Section 6.1.5		New section to differentiate between section 6.1.4 "handling" and this section "working"
	• Section 6.2.2		Revised Warning.
	• Section 6.4.4		Inclusion of "or inverter" into Warning.
	• Section 6.4.5		Revised 'OHW reduced SAD to signal post' drawing - new note 7.
	• Section 8.1		New Note encouraging communication
	• Section 8.1		New paragraph concerning whom to contact to remove RailCorp and or another Electrical Network Operators electrical services and supporting Note.

3.1	• Section 8.3 • Section 8.4.6 • Section 9 • Section 12 • Section 13 • Section 13.1 • Section 13.4 • Section 13.6 • Section 14 • Section 15 • A.1 • A.4.3.2.4 • Annex 1 Chart 3 • Appendix B • Aligned to WHS • Global change	13/05/13	New last dot point re: SMS-06-GD-1588 New 2nd last dot point, Acceptance of work without a permit when in accordance with section 13.5. New Note and continuous barrier requirements now specified Section totally re-written Inclusion of "or in the vicinity of" in title New section Inclusion of conduit, tray and trough in last two dot points Section totally re-written Inclusion of Authorised Officer (Mains) into last sentence (as per previous version). Inclusion of additional definitions to support changes / improve clarity. New last sentence to update reference due to withdrawn sms Guide New Note before ‘First option’ and re-worded paragraph before this Note Removal of ‘double negative’ wording in Chart 3 New Appendix “Temporary Structures around Electrical Equipment”, Global change, “not practicable” replaced by “not reasonably practicable”. "Scaffolding" replaced by "scaffolding and temporary structures"
3.2	• General	16/07/18	Updated header and footer Updated metadata

{Remainder of page left intentionally blank.}

1. Introduction

This Guide describes the hazards associated with working around electrical equipment, and the procedures:

- to eliminate health and safety risks, so far as is reasonably practicable, and
- if it is not reasonably practicable to eliminate risks to health and safety, to minimise those risks so far as is reasonably practicable (SFAIRP)

when working on, near or in the vicinity of electrical equipment owned or maintained by RailCorp.

The requirements in this Guide vary according to:

- the proximity to the electrical equipment,
- the voltage level,
- the type of work being done,
- whether mobile plant is used to undertake the work, and
- the competency of the persons involved.

2. Scope

This Guide applies to all “persons conducting a business or undertaking” (PCBU) and all workers irrespective of their employer (the PCBU) or discipline, working around electrical equipment owned or maintained by RailCorp.

This Guide together with other SMS documentation provides electrical work instructions for those persons who are to work around electrical equipment owned or maintained by RailCorp. In addition, the guide SMS-06-EN-0550 Electrical Network Safety Rules (ENSR), being a subset of the SMS, provides additional electrical work instructions for those Authorised Persons who work on, near and in the vicinity of electrical equipment owned or maintained by RailCorp.

This Guide does **not** apply to:

- work near another electricity Network Operator’s electricity services, which is to be carried out in accordance with that Operator's safety instructions
- electrical equipment on rollingstock (except for roof-mounted exposed electrical equipment under overhead wiring).

For other exclusions, refer to Section 8.4 Exclusions.

{Remainder of page left intentionally blank.}

NOTE: Universal Safety Responsibilities

To support PCBU's and workers in complying with their duties, RailCorp employees and contractors share four Universal Safety Responsibilities which define the safety expectations of RailCorp. RailCorp established these responsibilities to achieve improved safety outcomes by requiring employees and contractors to:

- Avoid causing harm
- Avoid taking unjustifiable risks
- Follow the Safety Management System
- Be prepared to work safely.

(For details refer to SMS-02-SP-2062 Safety Responsibilities, Authorities and Accountabilities)

3. Summary of Safe Approach Distances (SADs)

For ease and quick reference, Table 1 (Minimum SADs to exposed electrical equipment for persons and tools they hold) and Table 2 (Minimum SADs for non-electrical work around insulated low voltage cables up to 1000V (including low voltage aerial bundled cables) and low voltage aerial lines are provided as follows as well as in Section 11 Safe Approach Distances (SADs).

Section 11 of this Guide should be referred to for more details on the application of SADs. In particular:

- Section 11.1 mandates an additional distance to that shown in the tables if inadvertent movement or mishandling of material could infringe on the minimum SAD.
- Section 11.2 mandates that work activities that might easily bring persons or equipment closer to the electrical hazard present additional risk and require increased SAD's and additional risk controls. Specific additional requirements are detailed for metal ladders, mobile plant, scaffolding and temporary structures.
- Section 11.3 details when reduced SADs may be applied.

{Remainder of page left intentionally blank.}

Table 1 Minimum SADs to exposed electrical equipment for persons and tools they hold

<table>
<tr><td></td><td colspan="3">Minimum SAD</td></tr>
<tr><td>AC - nominal voltage</td><td>Non-accredited Persons</td><td>Accredited Persons</td><td>Authorised Persons
(See Note 2)</td></tr>
<tr><td>Insulated low voltage aerial lines up to 1000V, including low voltage aerial bundled cables</td><td colspan="2">Refer to Table 2</td><td>0.5m</td></tr>
<tr><td>Low voltage - above 50V AC but not exceeding 1000V</td><td>3.0m</td><td>1.0m</td><td>0.5m
(See also Sect 11.3.2)</td></tr>
<tr><td>Above 1000V up to and including 11,000V</td><td>3.0m</td><td rowspan="2">1.2m</td><td>0.7m
(See also Sect 11.3.1)</td></tr>
<tr><td>Above 11,000V up to and including 33,000V</td><td>3.0m</td><td rowspan="2">1.0m</td></tr>
<tr><td>Above 33,000V up to and including 66,000V</td><td>3.0m</td><td>1.4m</td></tr>
<tr><td>Above 66,000V up to and including 132,000V</td><td>3.0m</td><td>1.8m</td><td>1.5m</td></tr>
<tr><td>Above 132,000V up to and including 220,000V</td><td rowspan="2">6.0m</td><td>2.4m</td><td rowspan="3">(See Note 3)</td></tr>
<tr><td>330,000V</td><td>3.7m</td></tr>
<tr><td>500,000V</td><td>8.0m</td><td>4.6m</td></tr>
<tr><td>DC - Nominal Voltage</td><td></td><td></td><td></td></tr>
<tr><td>Above 120V but not exceeding 600V</td><td rowspan="2">3.0m</td><td rowspan="2">1.0m
(See also Sect 14)</td><td>0.5m</td></tr>
<tr><td>Above 600V including 1500V</td><td>0.5m
(See also Sect 11.3.4)</td></tr>
</table>

NOTE 1 Refer to Section 5.4 for the competence levels of persons.

NOTE 2 Only persons holding authorisations specifically allowing work at the reduced distance to the equipment in question may work to these distances. In other cases, Authorised Persons must work only to the distances for Accredited Persons.

NOTE 3 These voltages are not found on the RailCorp Electrical Network. If these voltages are encountered around another network, the Network Operator concerned must be consulted as to the SAD.

NOTE 4 Refer to Sections 11.2.3 and 11.2.4 respectively for work using mobile plant, scaffolding and temporary structures.

Table 2 Minimum SADs for non-electrical work around insulated low voltage cables up to 1000 V (including low voltage aerial bundled cables) and low voltage aerial lines

Work activity	*Minimum SAD*	
	Non-accredited Persons	*Accredited Persons*
Mobile plant operation	Refer to Appendix A	
Handling non-conductive materials (timber, plywood, PVC, pipes and guttering etc)	1.5m	0.5m
Handling metal materials (roofing, guttering, pipes etc)	4.0m	
Driving or operating vehicle	0.6m	
Hand held tools	0.5m	
Scaffolding and temporary structures	Refer to Appendix B Temporary Structures around Electrical Equipment	

NOTE 1 Refer to Section 5.4 for the competence levels of persons.

4. Electrical hazards

4.1. Possible consequences of electrical incidents

Electrical incidents can result in:

- persons receiving an electric shock (possible cardiac arrest)
- persons burnt by hot gas
- persons receiving burns from electric current passing through the body (a much greater risk if High Voltage is involved)
- persons receiving radiation burns
- persons burnt by molten metal
- persons suffering flash injury to the eyes
- explosion.

In each case the result may be fatal, either directly or due to secondary events such as a subsequent fall.

Every situation must be treated as potentially dangerous and only proceed when it is known that it is safe to do so and that the required safety procedures have been followed.

In the majority of situations, it is impossible to determine whether electrical equipment is live by observing it. Any investigation or test carried out by an untrained person is more likely to increase their exposure to the electrical hazard. Under no circumstances should person's not specifically authorised attempt to investigate or test electrical equipment.

4.2. Electric shocks and the human body

The human body is a conductor of electricity, and severe injury or death results if a conducting path that allows electric current to pass through the body is formed.

A conducting path can be formed by:

- touching or making contact with the exposed live electrical equipment with any portion of the body, whether intentionally or inadvertently, or
- bringing any portion of the body close enough to the exposed live electrical equipment for an arc to occur between the equipment and the body, or
- bringing close or touching the exposed electrical equipment with tools or materials that are not insulated.

The danger of electric shock exists wherever a person could make contact between:

- live conductors, or
- a live conductor and earth, or
- 1500V dc overhead wiring and rail, or
- different overhead wiring sections, or
- overhead wiring and earth, or
- overhead wiring structures and rail (or vehicles on rail).

In the event that a person receives an electric shock it is essential that appropriate first aid is provided without delay. Even if there are no immediate signs of injury the requirements of SMS-06-SW-0269 Electric Shock Protocol must be complied with.

5. Control measures

5.1. General responsibilities

Line Managers are to make sure that:

- a risk assessment related to the tasks to be undertaken has been properly conducted and the appropriate control measures are implemented, and
- persons intending to work around electrical equipment are appropriately qualified where required by SMS-11-GD-0244 Personnel Certifications – Electrical Authorisations. See also Section 5.4 Competence of persons.

The person in charge of the work party must:

- determine if Electrical Permits are required, seeking advice from the electrical discipline if necessary. Refer to Section 8.1 for details about conditions that require Permits, and
- supervise the work party in accordance with this Guide.

If a Permit is required, the Permit Holder must supervise the work party in accordance with this Guide, and comply with their responsibilities as identified on the Electrical Permit.

If a Permit is required, workers must comply with their responsibilities as identified on the Electrical Permit.

Electrically Authorised Persons and Qualified Electricians are to assess the risks associated with any work that:

- brings the work party or plant close to electrical equipment, or
- might put the work party or plant operator in a position to inadvertently come within the SAD of electrical equipment.

5.2. Risk assessment and planning

Persons planning work around electrical equipment must ensure that the work is assessed and planned to enable the highest practicable level of risk control to be applied.

WARNING
If there is any uncertainty about the identification of any equipment, get advice from an appropriate electrically Authorised Person before nominating the equipment, from which removal of supply is requested.

The assessment must consider:

- the voltage present on the equipment. If the voltage is not known for certain, contact the Maintenance Engineer Electrical.
- the location of the electrical equipment and/or conductors that may be affected by the work.

The assessment must then consider the tasks to be undertaken and whether a person can intentionally or inadvertently come, within the relevant SADs of exposed electrical equipment (refer to Section 11), either directly or by means of tools, equipment, materials or other objects they may be using or carrying during the work.

Do **not** attempt to use a measuring tape, unapproved stave or other physical measuring device to directly measure the height of, or distance to conductors. (Refer to SMS-06-EN-0556 for equipment inspection, testing, care and maintenance instructions.) If the distance cannot be determined by sighting or measured with a non-contact measuring device, ask the Electrical Maintenance Engineer to arrange an Authorised Person to make the measurement.

NOTE
It is not sufficient to consider only the range or intended range of movement required to do the work.

The assessment MUST take account of the full extent of movement that the plant, equipment, tools or people can reach.

The assessment is to include the:

- nature of the work
- number of people involved in the work and their individual needs
- qualifications, competency, skill and experience of people doing the work
- set up and pack up process
- type and design envelope of machinery, equipment and tools to be used
- potential for inadvertent movement of equipment, persons and electrical equipment in the area
- prevailing or unexpected wind strength, direction and weather conditions
- presence of rail and vehicular traffic, pedestrians or livestock that could interfere with the work
- foreseeable abnormal conditions that may exist at the worksite
- need to provide a Safety Observer for the work and
- duration and number of occurrences / repetitions of the work.

A Safety Observer(s) must be appointed whenever:

- there is any risk of a person working within or potentially within the SAD directly or by means of tools, equipment, materials or other objects they may be using or carrying during the work, or
- the planned work activities could present an unacceptable risk of damage to electrical equipment and or infrastructure.

For work around electrical equipment not involving mobile plant, the need for a Safety Observer is to be assessed during work planning.

Refer to Appendix A for details regarding the mandatory requirements for the Safe Use of Mobile Plant around Electrical Equipment.

Generally, work around electrical equipment using mobile plant must be performed at greater SAD's than those described in Tables 1 and 2 of Section 11 accordingly additional planning and risk assessment is required. When a Safety Observer is used as a control with mobile plant used around electrical equipment, one Safety Observer must be appointed per item of mobile plant. If identified by the risk assessment processes of Appendix A.4.2, more than one safety observer may be appointed to observe the same item of mobile plant, equipment or load.

For details of Safety Observer(s) duties refer to Section 5.3.5.

In the case of track vehicles and rolling stock, if their activity is such that no part or section of these vehicles, other than pantographs, can move towards the overhead wiring then the need for a Safety Observer may be waived.

Where a RailCorp Safe Work Method Statement (SWMS) from the Safety Intranet is to be used, the Line Manager is to conduct and document the assessment in accordance with SMS-06-OP-2043 Managing Risk Using Safe Work Practices. This assessment includes:

- confirming that the RailCorp SWMS is current and fit-for-purpose
- using the Pre-work briefing process (refer to SMS-06-OP-2114 06.20 Pre-work briefings) to identify and document site specific hazards, risks and the Safety Observer requirements set out in Section 5.3.5
- having workers sign the Pre-work briefing form (SMS-06-FM-0163) to acknowledge the SWMS briefing or instruction
- attaching the completed Pre-work briefing form to the SWMS.

If a SWMS covering the work to be done is not available on the RailCorp Safety Intranet, the Line Manager is to conduct the assessment by:

- developing a SWMS in accordance with SMS-06-OP-2043 Managing Risk Using Safe Work Practices.
- preparing a Pre-work briefing that covers site specific risks and the requirements set out in Section 5.3.4.

Site specific risks are those risks that may only become apparent during an on site assessment and include, but are not limited to, the following conditions:

- weather conditions - effects of wind and temperature on the equipment and/or conductors, the amount of sag and sway that can be expected and the effects of wind gusts on a load being handled
- ground conditions - effects of moisture, contour etc. that may affect the movement of plant or cranes
- lighting conditions - low light levels or glare that may impede clear viewing of the conductors
- sighting distances and conditions - including visibility of the conductors and the ability to accurately determine distances and clearances.

Warning
When proposed work is situated in tunnels, additional risk assessment and planning activities may be required due to the installation of exposed electrical equipment mounted on tunnel walls, such as is the case in the CBD underground system.

5.3. Control of work process

5.3.1. General Principles

Work around electrical equipment exposes persons to health and safety risks that must be

- eliminated, so far as is reasonably practicable, or
- if it is not reasonably practicable to eliminate those risks, minimised so far as is reasonably practicable (SFAIRP).

Line Managers and persons planning the work are **not** to rely upon prior training and competency as the sole risk control measure.

Persons in charge of the work party must make sure that:

- the work process is adequately controlled so that all persons, equipment, plant tools or material do not come within the prescribed minimum SADs of exposed electrical equipment, and
- persons carrying out the work are warned to **not** allow any part of their body, clothes, tools or material they are using or carrying to come within the prescribed minimum SADs of exposed electrical equipment, and
- persons carrying out the work understand the work process controls that have been put in place, and that they must not pass over or under any work area or access markers, safety fences, demarcation tape or other special barriers placed in connection with the work.

Workers are to treat every situation as potentially dangerous and proceed only if:

- it is safe to do so, and
- the required safety procedures are followed.

All persons should consult an electrical discipline representative if there is any doubt about whether the electrical equipment is live or dead.

For specific controls applicable to:

- work around electrical equipment using mobile plant, refer to Appendix A,
- temporary structures or scaffolding works around electrical equipment, refer to Appendix B.

{Remainder of page left intentionally blank}

5.3.2. Elimination

The first consideration and the most effective control measure is to eliminate the risk by removing the supply and to work under an Electrical Permit. Refer Section Requirement for an Electrical Permit.

Another more costly and time-consuming elimination method is to re-route the electrical equipment from the work activity, either permanently or temporarily for the duration of the work.

Elimination controls shall be implemented in conjunction with the Administrative controls identified in Section 5.3.4.

5.3.3. Separation

Where it is not reasonably practicable to eliminate the risk, the next level of control is to separate the hazard. This can be achieved by:

- setting up equipment so that it or any load or work piece cannot encroach on the minimum SAD
- using alternative equipment that cannot encroach on the minimum SAD
- using hard (solid and rigid and capable of withstanding foreseeable forces) barriers and/or movement restriction devices, such as mechanical stops/constraints, interlocking devices or control devices, to prevent movement of plant, equipment or persons into the minimum SAD.

Only when the above separation controls are not reasonably practicable, may Line Managers use soft barriers (e.g. demarcation tape, bunting) to define non-entry areas only by using:

- rigid or tape barriers to mark off areas under overhead power lines
- high visibility bunting or similar to mark the limit of the SAD.

Separation controls shall be implemented in conjunction with the Administrative controls identified in the following section.

NOTE
The use of soft barriers such as demarcation tape and bunting is a lower order control which must be supplemented by additional control measures.

The system of work to prevent encroaching into the minimum SAD, including the use of a Safety Observer and communication methods, must be thoroughly assessed and rigidly enforced.

5.3.4. Administrative

Only when elimination or separation controls are not reasonably practicable and the work is not on or near exposed electrical equipment may administrative controls be used as the sole control measure.

Administrative controls to be used shall include, where appropriate:

- supervision to make sure that work is unhurried and methodical
- a work specific SWMS/SWI approved for the project and held on site
- a work specific SWMS/SWI that has been clearly explained to all work party members and rigorously followed
- practising the work method in an environment away from electrical hazards before undertaking work in the vicinity of electrical equipment.
- pre-work briefings conducted for all persons working in the area

- emergency planning (including fire fighting equipment and first aid kits on site)
- safety observer(s) used. (For details of Safety Observer duties refer Section 5.3.5.)

Before starting any work around electrical equipment, all persons involved in the work must:

- be instructed in the SWMS/SWI for the task being performed, as per SMS-06-OP-2043 Managing Risk Using Safe Work Practices, and
- participate in a pre-work brief covering the task to be performed.

Pre-work briefings for working around electrical equipment must, as a minimum, include:

- all live parts being clearly pointed out to all workers,
- advice about the voltage and SAD applicable to the work,
- a clear explanation of the reasons for the SAD,
- the controls to be used to make sure the SAD is not encroached,
- the duties of a Safety Observer and the method the observer will use to communicate with other workers, and
- the emergency procedures in place, including procedures in the event of contact with a live conductor.

NOTE

Line Managers and *Persons in charge* of the *work process must make* sure that *workers do* not *start work until they have received the required instruction* and *pre-work briefing. (Refer to* SMS-06-OP-2114 06.20 Pre-work briefings.)

5.3.5. Safety Observer's duties

The Safety Observer is specifically assigned the duty of observing the work around live overhead power lines, associated apparatus or other exposed electrical equipment and excavation works near HV cables.

Safety Observers must be able to fully focus their attention on the persons, plant, mobile plant, equipment or load and the SAD to the live aerial lines or equipment.

If the Safety Observer has to do something else the worker or plant, mobile plant or equipment operator must stop work until the observer returns to their position, or is replaced.

Safety Observers must **not** carry out any other work while tasks or work activities which could present a risk of the SAD being encroached, such as plant or load movement, are being undertaken. For example the Safety Observer must not be used to monitor or guide the placement of a component. A separate person must be utilised to perform such a task.

Safety observers must:

a) be attired in personal protective equipment appropriate to the situation,

b) not have any known temporary or permanent disabilities that would adversely affect their role and performance,

c) only be used to observe those work functions for which they have been certified to carry out,

d) in the case of observing mobile plant, be verified as competent on site in accordance with Appendix A.6 of this Guide, and

e) not be located in the workbasket of an EWP while observing the work being undertaken from that workbasket, unless the work is 'electrical work' and is being performed from a rail mounted EWP.

Safety Observers are to:

- act as a Safety Observer for one work activity at a time only
- be given authority to suspend the work activity at any time
- warn personnel or the crane or plant operator to make sure minimum SADs are being maintained
- warn of any other unsafe conditions
- continually monitor the tasks or work activities that could present a risk of the minimum SAD being encroached by persons directly or by means of tools, equipment, materials or other objects they may be using or carrying during the work
- continually monitor the tasks or work activities that could present an unacceptable risk of damage to electrical equipment and or infrastructure
- be positioned at a suitable location to effectively observe the movement of plant with respect to the overhead power line, overhead wiring, associated apparatus or other exposed electrical equipment representing the risk
- be able to communicate immediately and effectively with plant and equipment operators and other personnel as required
- make sure that workers stay outside the specified minimum SAD, unless they are performing a rescue in accordance with approved procedures or are doing a specific task that is described in the SWMS - such as a dogman holding a non-conductive tag line attached to a load suspended from a crane.

5.3.6. Personal Protective Equipment

Persons working on, near or in the vicinity of exposed electrical equipment must wear clothing, footwear and other personal protective equipment as per SMS-06-EN-0552 General Requirements for Electrical Work and SMS-06-SW-0538 PPE for Electrical Work.

Protective clothing worn by persons shall be appropriate for the purpose, fit correctly, cover the full body (including the arms and legs) and be in good condition.

5.4. Competence of persons

5.4.1. Overview

Persons working around RailCorp electrical equipment shall not have any known temporary or permanent disabilities that would adversely affect their role and performance.

Not addressed in this Guide are other RailCorp competencies, qualifications or safe working requirements, including but not limited to the WorkCover general construction induction training requirements.

Three levels of competence apply to persons required for working around RailCorp electrical equipment:

- Authorised Persons
- Accredited Persons
- Non-accredited Persons.

The level of competence determines the type of work the person may do and the minimum SAD (refer to Section Safe Approach Distances (SADs)) that applies to the work.

5.4.2. Authorised Persons

Persons who perform electrical work on, near and in the vicinity of equipment that forms part of the RailCorp Electrical Network are specifically authorised to perform this work. The

certifications required by Authorised RailCorp personnel are identified in SMS-11-GD-0244 Personnel Certifications - Electrical Authorisations.

Authorised Persons:

- must work in accordance with their authorisation and the relevant Electrical Network Safety Rules (refer SMS-06-EN-0550)
- where requested and in accordance with their authorisation, must provide advice to others working around electrical equipment
- may, in accordance with their authorisation, issue Electrical Permits
- may operate mobile plant at the relevant SADs specified in Appendix A, provided they are verified as competent on site in accordance with Appendix A.6 of this Guide
- may work as a Safety Observer for mobile plant in accordance with the requirements of Appendix A Safe Use of Mobile Plant around Electrical Equipment.

NOTE
The requirements for Authorised Persons performing work around electrical equipment are different from those for unauthorised persons performing non-electrical work in the vicinity of electrical equipment

5.4.3. Accredited Persons

Accredited Persons are those persons performing non-electrical work at or above track level in the vicinity of live electrical equipment, have completed the Rail Industry Safety Induction (RISI) course and have received additional Electrical Awareness training and demonstrated competence to perform such non-electrical work in the vicinity of live electrical equipment safely.

Non-electrical work at station platform, track level or above track level, in the vicinity of live electrical equipment includes using tools but is not limited to:

- Work using ladders.
- Work from scaffolding or temporary structures.
- Work on a station platform or at track level above shoulder height.
- Work on part of a train such as window cleaning or removing graffiti , or the use of insulated survey staves or insulated telescopic height measuring sticks in accordance with Section 8.4.5 Other work undertaken by Accredited Persons with appropriate training of this Guide.
- Work on a ground mounted signal structure in accordance with Section Routine maintenance of Signal Equipment of this Guide.
- Work as a Mobil Plant Operator or Safety Observer. This work requires specific personal competency requirements as set out in Appendix A.6.

For all non-electrical work in the vicinity of live electrical equipment the required SWMS/SWI for the work must address the issue of **additional training**, which shall include Electrical Awareness, required over and above the completion of the RISI course, as determined by a risk assessment for the particular circumstance (refer Section 5.2 and 10), in order to be accredited to perform this work in the vicinity of live electrical equipment.

A minimum set of training objectives for the Electrical Awareness training would include:

- the electrical safety contents of the RISI course,
- identification, awareness and risk control methodologies with respect to the particular electrical safety hazards associated with the proposed work function, location and site conditions,
- identification and application of the prescribed SAD boundary,

- identification of mandated personal protective equipment particular to the proposed work function, (refer Section 5.3.6 of this Guide),
- the methodology of preventing the person from intentionally or inadvertently coming, within the relevant SADs of exposed electrical equipment, either directly or by means of tools, equipment, materials or other objects they may be using or carrying during the work,
- the methodology of addressing any relevant electrical hazards identified in Section 6 of this Guide,
- identification of the local electrically Authorised Person whom can provide advice if required and is available when the work activities are to be undertaken,
- identification of potential electric shock conducting paths relevant to the proposed work function and the consequences of electric shock on the human body, (refer Section 4 of this Guide),
- response methodology to an electric shock incident, (refer Section 4 of this Guide),
- dissemination of an established, effective and efficient communication protocol to support the proposed work function and incident response.

The SWMS/SWI and the additional training course must be approved by the Chief Engineer Electrical before the training and hence the work can proceed. The person who is to do the work shall have attended an Electrical Awareness briefing session within the last 12 months.

For all such non electrical work in the vicinity of live electrical equipment, the persons performing this work and the tools, equipment, materials or other objects they may be using or carrying during the work must remain outside the Accredited Persons Minimum Safe Approach Distances. Refer to Section Normal SADs for Persons and Tools Held by Persons, Table 1 of this Guide.

5.4.4. Non-accredited Persons

Non-accredited persons are those persons who have not received training in, or demonstrated competency in, the specific hazards and risks associated with working around electrical equipment at station platform or track level. Non-accredited persons include those persons who have completed the RISI course and no other electrical awareness training or electrical courses.

Persons performing non-electrical work in the vicinity of live electrical equipment must have completed the RISI course.

Non-electrical work at station platform or track level, in the vicinity of live electrical equipment includes but is not limited to:

- Walking on track
- Walking on station platforms
- Walking between cars on a train
- Using hand held tools at or below shoulder height on a station platform or at track level.

For all such non electrical work in the vicinity of live electrical equipment at station platform or track level, the persons performing this work and the tools, equipment, materials or other objects they may be using or carrying during the work must remain outside the Non-accredited Persons Minimum Safe Approach Distances (SADs). Refer to Section Normal SADs for Persons and Tools Held by Persons, Table 1 of this Guide.

6. Particular electrical hazards

6.1. Work activities and tools

6.1.1. Hazardous materials, tools and equipment

Unless there is definite knowledge to the contrary, treat **all** materials including liquids, gases, metal, tree branches, clothing, wet ropes, and flames as conductors of electricity.

Unless there is definite knowledge that the item concerned is suitable, approved and maintained in accordance with the SMS and manufacturers' requirements, for use at the voltage concerned, treat all tools and equipment as capable of conducting electricity.

Long objects, particularly metal objects, can be a hazard if not handled with care or kept away from exposed live electrical equipment. Such objects include but are not limited to:

- brooms
- ladders
- long tools
- scaffolding or temporary structures
- lengths of metallic pipe, conduit and reinforcing bars
- portable radio equipment with long or telescopic aerials
- metallic guttering, metal roof or wall sheeting
- rope, hose and wire
- tree branches, particularly when wet.

Take care to make sure that long objects are neither placed nor used in positions where they are likely to fall onto, come in contact with, or be blown across, exposed live equipment.

6.1.2. Metallic tapes

Warning
When working around electrical equipment, use only non-conductive tapes and sticks that have been electrically tested, approved and branded.

Steel tapes, metal reinforced linen tapes and long steel rules can be very dangerous as they do conduct electricity and are **not** to be used:

- when taking measurements near live exposed electrical equipment, or
- when there is any likelihood that the metal tape/rule might bridge between metal objects that might be at different potentials, for example:
  - between overhead wiring structures and rail (or vehicles on rail)
  - between structures and fencing or metallic troughing.

  More examples are listed in Section 4.2 Electric shocks and the human body.

Refer to instruction D2013/8087 Inspection and Testing of Insulated Sticks, Tools and Equipment used for work On, Near or In the Vicinity of Exposed 1500 V OHW or Equipment for the inspection and test requirements of non-conductive measuring tapes to be used around electrical equipment.

6.1.3. Clothing and Personal Items

Jewellery or other items such as metallic watches, bracelets, rings, neck chains, or body piercings, exposed zips or spectacle frames can be hazardous. Such items may be caught on protruding objects or rotating machinery. Metallic items also conduct electricity and will therefore increase the severity of accidental contact with live electrical equipment as they make good contact with the human body.

Loose clothing and long hair must be properly secured when working near or around rotating machinery to avoid being trapped by the moving parts or air suction produced.

6.1.4. Handling objects over 1m in length in the vicinity of electrical equipment

Long objects, especially conductive objects such as lengths of guttering, roof sheeting and scaffolding tubes present special risks and must be handled carefully in the vicinity of electrical equipment.

In normal circumstances the minimum SADs in Table 1 may be applied safely when two people carry below shoulder height, any long object from opposite ends and control of movement can be absolutely maintained for the duration of the task. (Refer to Figure 1.)

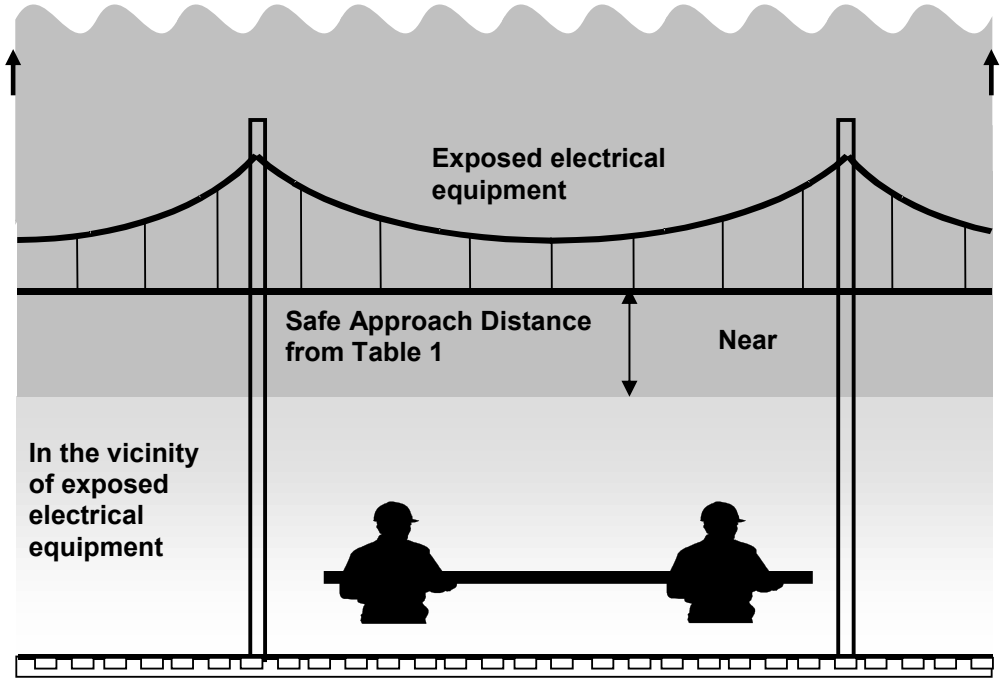


Figure 1 Handling objects over 1 metre in length in the vicinity of electrical equipment (two people)

NOTE

*For work **above** exposed electrical equipment, refer to Section 9 Work above exposed electrical equipment.*

In the case where one person handles an object longer than 1m an additional distance equal to half the length of the object is to be added to the SADs in Table 1. For example, if the SAD was 1.5m and the object was 6m long then at least 3m is to be added to give a SAD of 4.5m. (Refer Figure 2.)

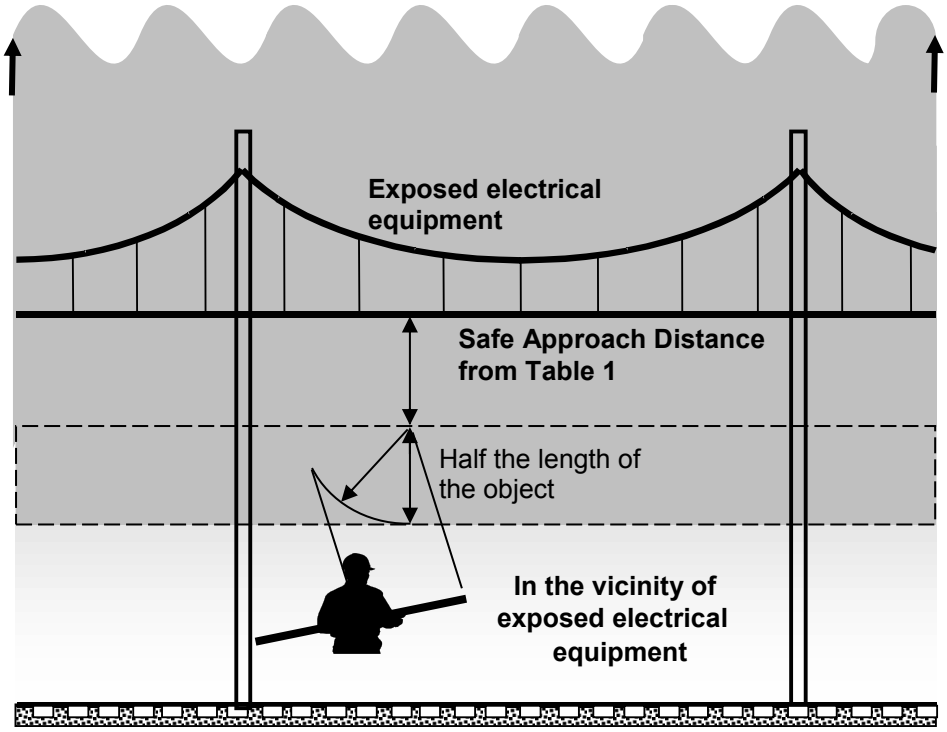


Figure 2 Handling objects over 1 metre in length in the vicinity of electrical equipment (one person)

NOTE

*For work **above** exposed electrical equipment, refer to Section 9 Work above exposed electrical equipment*

In all cases, the Line Manger is to:

- assess the site or weather conditions that might reduce the control of the object while working in the vicinity of electrical equipment, and
- have the supply removed from the electrical equipment or implement adequate additional protection or controls.

6.1.5. Working with objects over 1m in length in the vicinity of electrical equipment

Refer to Section Work in the vicinity of electrical equipment of this Guide.

6.1.6. Flames in the vicinity of electrical equipment

Flame is a good conductor of electricity and care is to be exercised when using flame-producing items near electrical equipment. Under certain circumstances, open flare torches and welding torches can throw a long stream of flame.

Flames in the vicinity of live exposed equipment can cause an arc to form along the path of the flame if a tongue of flame or vapour makes contact with the exposed equipment.

6.1.7. Work using cranes, vehicles and plant

Take particular care when using cranes, vehicles or plant fitted with elevating units or tipping trays and items such as extendable lighting masts in the vicinity of electrical equipment.

When looking up at conductors it is often difficult to judge the minimum SADs. Where possible, view the situation from several angles to make sure that the required minimum Safe Approach Distance is not infringed.

Further, Line Managers are to note the magnification of movement that occurs with tall items of equipment on relatively narrow bases. Any movement due to uneven ground, subsidence, or similar may be magnified several times in the resultant movement at the top of the item. For more information regarding these hazards refer to Appendix A.

Such plant and equipment include but are not limited to:

- cranes, elevating work platforms
- mobile temporary structures/scaffolding and scaffold tubes carried by hand.

NOTE
There are specific requirements for the safe use of mobile plant in the vicinity of electrical equipment. Refer to Appendix A.

6.1.8. Activities altering ground level under aerial conductors

The following activities carried out under or in the vicinity of aerial conductors might result in the statutory clearances of aerial conductors from ground not being maintained and must be avoided:

- building stockpiles
- stacking material
- filling up ground
- earthworks using machinery, especially for those that will result in raised ground level
- placing containers or erecting portable buildings.

It is possible that the work itself does not infringe the required minimum SADs for persons and tools, for mobile plant, or for work using or erecting scaffolding or temporary structures during the course of work. However, if conductor clearances from ground and structures are reduced on completion of such work it is possible that these may no longer meet the minimum statutory requirements. This could result in a major safety hazard for people working under the aerial line in the future.

{Remainder of page left intentionally blank}

6.2. Emergency situations

6.2.1. Fallen wires

WARNING
All persons are to protect themselves and others from the danger of making contact with or approaching fallen aerial conductors or objects that are in contact with the fallen conductors.

*Treat all such wires and objects as **live**. Do **not** relax this obligation until the required Electrical Permit has been issued.*

Although a contact or catenary wire might have fallen to the rails and caused a short circuit, this does not mean that the 1500V supply has been isolated and made safe. On the contrary, the supply may be switched onto the overhead wiring at intervals.

Supply will be removed from the damaged and adjacent sections to reduce the electrical danger at the site only once the Electrical Operating Centre has been told about the fallen overhead wiring. Do **not** consider the area safe until an Electrical Permit has been received.

Take care when approaching a derailment or collision as vehicles might be in contact with overhead wiring. Separation of the vehicle from the rails could cause the vehicle to be live at 1500V.

6.2.2. Fire fighting in the vicinity of electrical equipment

WARNING
*Persons unfamiliar with the hazards involved must **not** fight fires in electrical substations, sectioning huts, transformer rooms, cable tunnels, pole tops, signalling locations and other places containing high voltage.*

Immediately report smoke and fires of this nature to the Electrical Operating Centre (EOC) on Telephone No. (02) 9379 4911and get to a safe place; then keep others away and wait until relieved. EOC will call the relevant Fire Brigade.

Electrical testing has confirmed that fires associated with live 1500V electrical equipment can be extinguished using hand-held extinguishers and fire hoses when all the following conditions are complied with:

- fire extinguishers are marked "*Suitable for use on electrical fires*". The extinguisher's nozzle is **not** to be used closer than 1.5m to live 1500V equipment.
- fire hoses may be used. However, the nozzle or branch of the hose is **not** to be used any closer than 3m to the live 1500V equipment.
- fresh water is to be used. Brackish or salt water may be used only after the electrical supply has been removed.

If a major fire occurs in a vehicle in an electrified area, arrange with the Electrical Operating Centre for supply to be removed from the 1500V overhead wiring so that fallen live wires do not create additional hazards.

In case of fire in the vicinity of 1500V equipment along the railway lines, take care to prevent persons contacting the equipment, either by falling material or through water that might eject from broken pipes or hoses.

6.3. Concealed cables

6.3.1. Concealed cables in building and structures

Line Mangers are to consider the presence of concealed cables in buildings and structures before starting work such as cutting or drilling.

Where it is not possible to positively determine that there are no cables in the way before work commences, the Line Manager is to seek the advice from the Maintenance Engineer Electrical. The Maintenance Engineer Electrical may require specific procedures to be followed. Work is not to start until the situation has been investigated and advice has been received.

6.3.2. Underground cables and buried services

WARNING
Underground cables and other services are installed by RailCorp and by other authorities or organisations. Confirm the locations of all services before work involving digging, excavating, boring, piling, installing fence posts, or driving electrodes is begun.

All excavation and earthworks carried out on RailCorp property or within 5 metres of RailCorp's services shall be carried out in accordance with the Guide SMS-06-GD-2066 Managing Construction Hazards and Section Excavation and earth works near or in the vicinity of cables" of this Guide.

Underground services exist within the rail corridor, adjoining rail property, public streets, public property, and within private property. The presence of power poles and aerial conductors should not be taken as an indication that there are no buried services in the area. Prior to the commencement of any excavation work or earthwork, an underground services search **must** be undertaken.

The Line Manager is to make sure all service searches are initiated. The person in charge of the work is to make sure that work does not begin until the services search has been completed and the Line Manager in charge of the work approves of the commencement of the work.

A Detailed Service search (DSS) identifies all services, including those above and below ground and those owned by other organisations (eg Ausgrid). An Internal Service Search (ISS) identifies RailCorp's services only.

When requesting service searches allow a minimum of:

- 16 weeks for a DSS
- 6 weeks for an ISS.

For excavation work in the Rail Corridor, a SMS-06-FM-0384 Services Search Request form is to be completed and faxed/emailed to the District Services Search Coordinator, Asset Management Group. For advice and information, contact the Underground Asset Manager.

To locate external (i.e. non-RailCorp) underground services outside or within the Rail Corridor, contact Dial Before You Dig (DBYD) by phone on 1100 or www.dialbeforeyoudig.com.au.

To locate RailCorp underground services outside the Rail Corridor, contact Dial Before You Dig (DBYD) by phone on 1100 or www.dialbeforeyoudig.com.au.

6.4. Traction system

6.4.1. Interfering with negative connections to rail

If the negative cables connecting a substation or sectioning hut to the track or to the track bonding equipment are broken or disconnected, equipment in the substation or sectioning hut could cause the cable voltage to rise to a dangerous level. Similarly, separating a section of rail

to which these negative cables are connected from the rest of the track could cause the separated rail to become live at a dangerous voltage.

Report broken or disconnected cables to the Electrical Operating Centre on telephone No. (02) 9379 4911.

Line Managers are to coordinate any work requiring disconnection of negative cables, such as re-railing, with the relevant Electrical Engineer. Appropriate bridging connections are to be made when negative cables are connected or disconnected, or the 1500V supply is to be removed and the persons involved signed on to the appropriate Electrical Permit.

6.4.2. Disconnecting or removing sections of rail

When removing or disconnecting sections of rail, make allowance for traction return current. This current may be the result of electric traffic on an adjacent track or may be current returning to a nearby substation from more distant electric traffic on the same track.

When a traction rail or traction bonds are disconnected in a section of electrified track beyond which there is no substation (e.g. Port Kembla North to Port Kembla), there is a danger that overhead wiring equipment or equipment on a stationary train might cause the rail ends to become live at a dangerous voltage. For advice regarding this issue, contact the relevant District electrical and signalling representatives.

If it is necessary to remove the 1500V supply to make the work safe, an Electrical Permit is to be issued to make sure that supply is not restored until the rails or traction bonds are reconnected.

6.4.3. Working around portable rail-connecting equipment

WARNING
Do **not** interfere with or remove the connection to rail of portable rail-connecting equipment without the proper authority.

A person breaking the connection of portable rail connection equipment to rail could inadvertently become part of the 1500V circuit, potentially exposing themselves to an electrical hazard and could also render the rail connection ineffective in protecting other workers.

Therefore, all persons are to make sure that the connection to rail of portable rail connecting equipment is not damaged or disconnected. Contact the Electrical Operating Centre (EOC) immediately if accidental damage or disconnection occurs. The EOC will make arrangements with electrical staff if it is necessary for a portable rail connection to be relocated for work to proceed.

{Remainder of page left intentionally blank}

6.4.4. 1500 Volt DC Overhead Wiring structures or Equipment

WARNING

When working on near 1500 Volt DC OHW structures or equipment, only use electric power tools that are:

- battery operated, or
- supplied from an isolating transformer, generator or inverter.

This applies to all electric power tools and equipment to be used in the rail corridor, substation and section hut, including work on:

- overhead wiring structures
- rail, and
- rail connected equipment, (including trains standing on the rails).

There is a possibility that overhead wiring structures may rise to an electrical potential above earth. The risk of persons receiving an electric shock when standing beside an overhead wiring structure and touching the structure, or when standing on the rail, is low but not impossible.

Contact the relevant Maintenance Engineer Electrical to arrange testing that the structures are not live (refer SMS-06-EN-0571 Overhead Wiring Structure to Rail Voltage Test), if there is a risk of persons touching overhead wiring structures at the same time as touching steel troughing, metal fences, rolling stock or standing on the rail.

6.4.5. Signal maintenance work in the vicinity of Registered Dead Leg Pennants

6.4.5.1 Overview

Maintenance of signal equipment in the vicinity of electrical equipment must be carried out in accordance with the requirements of this Guide.

However, at some locations signal equipment has been installed such that normal routine maintenance of the signal equipment, such as cleaning lenses and replacement of lighting globes, would place the person completing the task to be within the Safe Approach Distance (SAD) prescribed in Section 11.1 of this Guide – see Table 1 for 1500 Volt DC overhead wiring (OHW) and equipment. As per section 5.3.1 of this Guide, the electric shock risk would normally be eliminated by removing supply and working under an Electrical Permit, unfortunately this is not always practicable.

In some cases, the 1500 Volt OHW in the vicinity would be a 'Dead Leg' section of wire or part of the regulated weight tension system. To reduce the risk of electric shock during signal maintenance at such locations, the engineering and administrative controls specified below, when implemented, in conjunction with appropriate safe working practices, would permit safe signal maintenance at such locations.

*Note: The engineering and administrative controls outlined below are intended for **existing** ground-mounted signal configurations ONLY. New signal installations are to be such that the minimum SAD's are not infringed.*

6.4.5.2 Engineering Controls

Signal equipment/structures located such that normal routine maintenance would require encroachment of the SAD to the 1500 Volt OHW and equipment shall be permanently and legibly tagged with a suitable warning "Refer to SMS-06-SW-0754 "SWMS – Maintain Signals" before accessing this structure". (This shall be managed by the Signals discipline.)

Any OHW or equipment within the SAD to the signal equipment/structure shall have installed a 1500 Volt termination insulator at least 2m from the work zone of the signal

equipment/structure. Hereafter the OHW from the termination insulator to the anchor mast is referred to as the "Dead Leg" section. (This shall be managed by the Electrical discipline.)

The "Dead Leg" in the immediate vicinity of the signal equipment/structures is covered with non-conductive, heavy duty, UV stabilised material having a visually distinctive colour. The material shall cover the "Dead Leg" within the work zone and extend at least 1.5m from the perimeter of the signal equipment/structure work zone towards the 1500 Volt termination insulator and towards the mast. The material shall be permanently attached to the pennant wire to ensure that its position is maintained. (This shall be managed by the Electrical discipline.)

The above requirements are illustrated in Drawing No. EL0172344 on Page 29.

Note: The material to be utilised is not selected for its electrical properties and as such cannot be relied upon to provide a reliable electrical insulation barrier. Accordingly the warning sign and advice to staff to take extra care when working at the reduced SAD is required, e.g. no intentional contact is to be made with the "Dead Leg".

The normal termination insulator of the wire is removed or bridged across such that the wire is now electrically connected to the mast. (This shall be managed by the Electrical discipline.)

The mast is bonded to the traction rail via a spark gap. (This shall be managed by the Electrical discipline.)

6.4.5.3 Administrative Controls

The locations of signal equipment/structure, such that normal routine maintenance would require encroachment of the SAD to the 1500 Volt overhead wires and equipment shall be identified and entered into a hazardous location register ("the register") on a District by District basis, by the Manager Signal Maintenance. The register should be sent to the District Maintenance Electrical Engineer, who shall nominate an Authorised Officer (Mains) to review the register and the particular signal location and confirm the action required.

Note: The reduced SAD is applied to the OHW in the immediate vicinity ONLY of the 'registered' signal structure; this OHW is normally directly above or just to one side of the signal structure and is not applied to any other OHW and/or associated equipment.

The register shall identify which signal structure has had the engineering controls indicated above implemented and which has not. This assessment shall be made by the nominated Authorised Officer (Mains) who shall advise the relevant District Signal Maintenance Engineer for recording in the register.

The signal structures having the implemented engineering controls, other than the bonding of the mast via a spark gap, shall be included on and maintained as per the Signal Technical Maintenance Plan – Field Equipment Signals.

The signal structures having the mast bonded to the traction rail via a spark gap shall be included on and maintained as per the Electrical Technical Maintenance Plan – Structure Bonding.

The register shall identify which ground mounted signal structures have the engineering controls implemented and maintained.

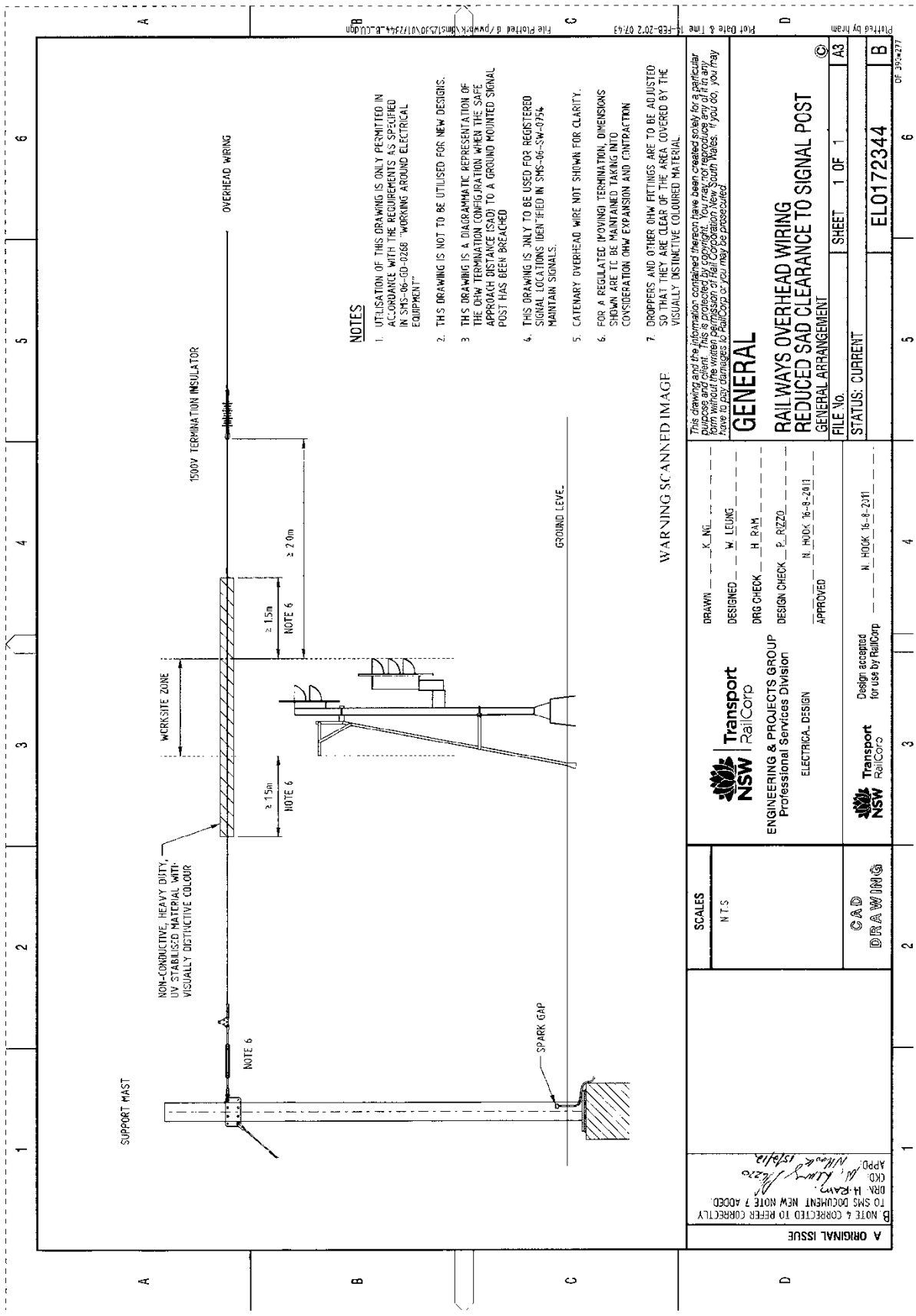
6.4.5.4 Signal maintenance at these locations

Signal structures recorded in the Register can be maintained on the condition that:

- persons are working in accordance with an approved site specific SWMS (Note: SMS-06-SW-0754 "SWMS – Maintain Signals" that shall be reviewed in consideration of the site specific location and Sections 5.2, 5.3, 5.4, 6.1, and 10 of this Guide, and
- the site specific SWMS shall require, amongst other things, persons:
  - having been accredited as per Section 5.4.3 Accredited Persons,
  - to verify the engineering controls are still intact, e.g. visual inspection to ensure the non-conductive material covering the "Dead Leg" is intact and inspection of the spark gap rail connection to ensure continuity to traction rail prior to commencing work,

- not to utilise portable metal or metal reinforced ladders or plant to access the signal,
- to contain themselves and the tools they may hold totally within the worksite zone boundaries as indicated on Drawing No. EL0172344 on Page 29, and
- to take extra care when working at the reduced SAD, e.g. no intentional contact is to be made with the “Dead Leg”.

{Remainder of page left intentionally blank}



7. Proximity to electrical equipment

7.1. Options for work around electrical equipment

Work carried out around electrical equipment will generally be undertaken under one, or a combination of, the following arrangements:

- the electrical equipment is made safe and the work party is signed onto an Electrical Permit; refer to SMS-06-SW-0267 Working in Accordance with an Electrical Permit
- the electrical equipment remains alive (in service), and other controls are put in place to make sure that the minimum SADs are not infringed
- the work is such that persons, plant and materials are at all times outside the minimum SADs
- the work is carried out by appropriately Authorised Persons using approved live working techniques. (Note: RailCorp does NOT work on live HV equipment.)

7.2. Exceptions and Exclusions

Special minimum SADs apply for some types of work and when using some types of equipment. Increased minimum SADs apply for some plant and equipment. Refer to Section 8.3 "Additional safety requirements" for a listing of relevant instructions.

Exceptions and exclusions apply for certain types of work. Refer to Section 8.4 "Exclusions" for a listing of exceptions and exclusions.

7.3. Work on, near and in the vicinity

Different requirements apply to work “on”, “near”, “in the vicinity of” exposed electrical equipment, and are defined below:

Work on (exposed electrical equipment)	Work that requires contact with the normally live parts of the electrical equipment, either directly or indirectly For details refer to Section 8 Working on or near electrical equipment.
Work near (exposed electrical equipment)	Work within or potentially within the SAD. Note: The work near distance varies with the equipment voltage and competence of the people performing the work. For details refer to Section 8 Working on or near electrical equipment.
Work in the vicinity of (exposed electrical equipment)	Work at a distance greater than the SAD but still close enough that the presence of the electrical hazard is to be considered in the planning of the work. For details refer to Section 10 Working in the vicinity of electrical equipment.

NOTE
There is no single specified outer boundary of the area that is “in the vicinity of” as the boundary varies according to each situation and the work method, materials and tools to be used.

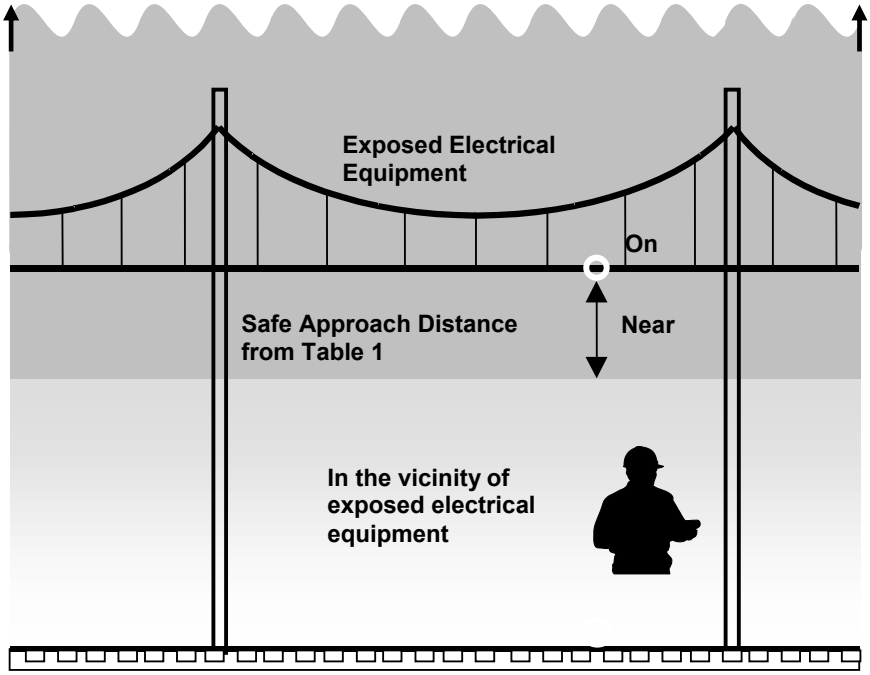
The following diagrams are provided to assist in understanding of the distinction between “on”, “near”, and “in the vicinity of” exposed electrical equipment. While the diagrams use the example of the 1500V overhead wiring the same principles apply to High Voltage and Low Voltage equipment.

NOTE
All *F*igures shown are intended as guides only. They are **not** to be used as a substitute for proper job planning.

Figure 3 Working around exposed electrical equipment (looking across the tracks)

For work **Near** exposed electrical equipment refer to Section 8 "Working on or near electrical equipment"

For work **In the vicinity of** exposed electrical equipment refer to Section 10 "Work in the vicinity of electrical equipment"



NOTE

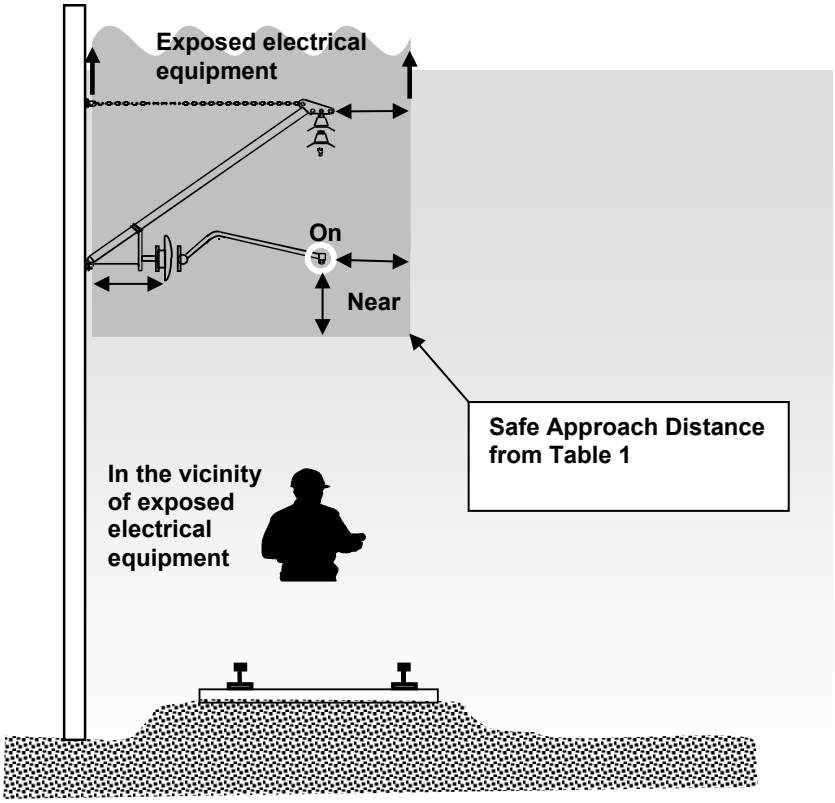
*For work **above** exposed electrical equipment, refer to Section 9 Work above exposed electrical equipment*

{Remainder of page left intentionally blank}

Figure 4 Working around exposed electrical equipment (looking along the tracks)

For work **Near** exposed electrical equipment refer to Section 8 "Working on or near electrical equipment"

For work **In the vicinity of** exposed electrical equipment refer to Section 10 "Work in the vicinity of electrical equipment"



NOTE

*For work **above** exposed electrical equipment, refer to Section 9 Work above exposed electrical equipment*

{Remainder of page left intentionally blank}

8. Working on or near electrical equipment

8.1. Requirement for an Electrical Permit

When working on or near electrical equipment, supply is to be removed, the equipment made safe and the person signed onto an Electrical Permit when:

- the person will be required to work on or near exposed electrical equipment, or
- it is foreseeable that the person will be required to or might inadvertently come within the SADs (refer to Section 11, Table 1) of exposed electrical equipment, either directly or through tools, equipment, materials or other conducting objects, or
- the work is to be carried out in a high voltage enclosure. A high voltage enclosure is an enclosed (typically fenced) area containing exposed high voltage conductors, access to which is not prevented by suitable screening or barriers or by design to be beyond a person's normal reach.

An Electrical Permit is the primary safety document for work on or near electrical equipment.

Exceptions and exclusions apply for certain types of work. Refer to Section 8.4 "Exclusions" for a listing of exceptions and exclusions.

The person in charge of the work party must complete and submit a SMS-06-FM-0484 Request for Electrical Permit to Work form if supply is to be removed , the equipment made safe and for an Electrical Permit to Work to be issued, for work to be carried out on or near any of the following:

- 1500V DC overhead wiring or cables,
- High Voltage (HV) aerial lines or cables, or
- Low Voltage (LV) aerial lines.

NOTE

Completion and submission of a Request for Electrical Permit form (SMS-06-FM-0484) does not guarantee that your request will be accepted.

Accordingly, the person in charge of the work party should contact the Maintenance Engineer Electrical to discuss if the request is likely to be accepted and importantly if not accepted what alternative risk mitigation strategies should be put in place. It should be noted that the most appropriate risk mitigation strategy may be that the work does not commence which means the Maintenance Engineer Electrical should be contacted as early as possible in the planning process to avoid likelihood of any work being rejected.

Furthermore, should the proposed programme of works require multiple instances and locations which will require removal of supply to conduct work(s) under an Electrical Permit the person in charge of the work party should contact the Maintenance Engineer Electrical to discuss how the number of outages (removal of supply) may be reduced to an absolute minimum.

NOTE

An Authorised person is permitted to issue an Electrical Permit in accordance with their authorisation without completing and submitting a SMS-06-FM-0484 Request for Electrical Permit to Work form.

In relation to other 1500V DC, HV or LV equipment, such as equipment in or associated with a RailCorp substation the person in charge of the work party should seek advice from the electrical discipline representative who will organise the appropriate Electrical Permit.

The work must then be conducted in accordance with SMS-06-SW-0267 Working in Accordance with an Electrical Permit.

In relation to the electrical services of another Electrical Network Operator, the following applies:

a) If the work to be performed requires both RailCorp electrical services and another Electrical Network Operator's electrical services to be isolated and made safe for the work, then the Electrical Discipline will organise the appropriate Electrical Permit(s) for this work.

b) If the work to be performed requires only another Electrical Network Operator's electrical services to be isolated and made safe for the work, then the person in charge of the work party should seek advice from that Electrical Network Operator's representative in relation to arranging for an Electrical Permit from that Electrical Network Operator to allow the work to proceed.

NOTE
Only appropriately authorised RailCorp Electrical Discipline staff are permitted to hold an Operating Agreement issued by another Electrical Network Operator for work being performed by RailCorp in the vicinity of that Electrical Network Operator's electrical services.

RailCorp staff are not permitted to hold Electrical Permits issued by another Electrical Network Operator. Such a Permit must be held by an authorised representative of that Electrical Network Operator.

WARNINGS
Consider the neutrals of HV windings of transformers disconnected from the earthing system as high voltage equipment.

Treat floating sections of overhead wiring as live.

Work must not be started until:

- the Permit Holder has been issued the Electrical Permit
- all persons in the work party have been instructed on the conditions of the Electrical Permit
- all persons in the work party have signed onto the Electrical Permit.

Persons performing work near isolated equipment in accordance with an appropriate Electrical Permit need not be an electrically Authorised or Accredited Person as per Section 5.4.2 or 5.4.3 respectively.

Responsibilities of the Permit Holder are detailed on the rear of the Permit, and include such activities as to ensure that the work process is adequately controlled so that persons do not work beyond the limits of the Electrically Safe Work Area. Further responsibilities are detailed in SMS-06-SW-0267 Working in Accordance with an Electrical Permit.

Workers must comply with their responsibilities as identified on the Electrical Permit.

The person in charge of the work party must assist the Permit Holder and work party members comply with their respective responsibilities as identified on the Electrical Permit.

8.2. Procedure if work is started without an Electrical Permit

If it is discovered that work for which an Electrical Permit should have been obtained has been started without the required Electrical Permit being issued, the following procedure must be followed:

- Halt the activity being undertaken immediately and move all persons outside the applicable minimum Safe Approach Distance.

- Review the arrangements for the supervision of the work party as appropriate.
- If the work is to continue or if required to pack up equipment, remove electrical supply and issue the required Electrical Permit.
- Report the incident to RailCorp's Safety Incident Hotline 1800 772 779, the Electrical Operating Centre (02) 9379 4911 and the person in charge of the WHVI/Authority.

Subsequent actions are to address investigating the circumstances in which the work was commenced, the competence of the persons involved, and the dissemination of any general lessons that should be learned.

8.3. Additional safety requirements

Additional requirements and special SADs or instructions apply to the work as set out in the following sections or documents:

- for work above exposed electrical equipment in accordance with Section 9 "Work above exposed electrical equipment" of this Guide
- for work using metal ladders, refer to SMS-06-SW-0264 Portable Ladders, Stepladders and Step Platforms
- for work using mobile plant refer to Appendix A of this Guide
- for work using temporary structures such as scaffolding refer to Appendix B of this Guide
- for work conducted under a Substation Access Permit, the Electrically Safe Work Area shall be defined and demarcation tape and temporary warning signs applied where required (refer SMS-06-EN-0583 Substation Access Permit section 8)
- for 1500V OHW stringing work in the vicinity of existing exposed electrical equipment, refer to SMS-06-GD-1588 Guide for the Stringing of 1500V OHW Conductors in the Vicinity of Existing Electrical Equipment.

8.4. Exclusions

8.4.1. 1500V traction return system

Work on or near the 1500V traction return (negative) system is excluded from the scope of this Guide. Generally it is not necessary to maintain a SAD from this equipment. However, it is important that connections are not broken and that the equipment is not damaged. See Section 6.4 of this Guide for more detail about the particular hazards.

Work on the 1500V traction return system is undertaken by electrical or signalling discipline personnel. The instructions to be followed by electrical discipline personnel are set out in instructions SMS-06-EN-0568 Work on 1500V Negative Equipment outside Substations and SMS-06-EN-0569 Work on 1500V Negative Equipment inside Substations.

8.4.2. Lamp replacement

Replacing general service lighting globes and tubes is not considered to be work near low voltage electrical equipment.

8.4.3. Routine maintenance of Signal Equipment in the vicinity of Registered Dead Leg Pennants

Replacing lighting globes, cleaning lenses, inspecting electrical connections, wiring and operation of lamps ONLY of signalling equipment is not considered to be working near 1500 Volt Overhead Wiring, if such work is carried out in accordance with Section 6.4.5 of this Guide.

8.4.4. Work that does not bring the operator within the relevant electrical SADs

For the purpose of this Guide, the following activities, when carried out by Authorised Persons and provided the work does not bring the operator within the relevant electrical SADs, are not considered to be work near electrical equipment:

- operation of switches and link switches
- use of specially insulated apparatus
- application and removal of earths
- application and removal of rail connections
- work on disconnected equipment within a substation
- work on disconnected low voltage equipment.

8.4.5. Other work undertaken by Accredited Persons with appropriate training

For the purpose of this Guide, the following activities, when carried out by Accredited Persons with appropriate training and periodic re-certification to ensure continued competency are not considered to be work near electrical equipment:

- the use of using insulated survey staves to measure 1500V OHW conductor heights from track level, or
- the use of insulated telescopic height measuring sticks to measure RailCorp High Voltage aerial line conductor heights above ground level, or
- the use of non-conductive cleaning poles to clean train windows or removal of graffiti

provided all of the following requirements are met:

i) the person who is to do the work has attended an approved Electrical Awareness briefing session within the last 12 months,

ii) the work does not bring the persons within the relevant Accredited Persons electrical SAD's,

iii) appropriate work-related training in accordance with Section 5.4.3.3 has been provided to such Accredited Persons,

iv) the use of insulated staves or height measuring sticks is in compliance with SMS-06-EN-0556 Insulated Sticks, Tools and Equipment used for work On, Near or In the Vicinity of Exposed Electrical Equipment – Inspection Testing Care and Maintenance,

v) the cleaning poles used for train window cleaning and/or graffiti removal, or insulated survey staves to measure 1500V OHW conductors from track level have been inspected and tested in accordance with SMS-06-SW-0275 Inspection and Testing of Insulated Sticks, Tools and Equipment used for work On, Near or In the vicinity of Exposed 1500V OHW or equipment,

vi) the work is to be carried out in accordance with the approved SWMS/SWI which specifically addresses the issue of additional training required over and above the completion of the RISI course, as determined by a risk assessment for the particular circumstances under which the work is carried out, and

vii) the SWMS/SWI and the additional training course must be approved by the Chief Engineer Electrical before the training and hence the work can proceed.

8.4.6. Electrical Permit may not be necessary

An Electrical Permit may not be necessary if the work is:

- carried out under live conditions by persons trained and authorised to work on live equipment in accordance with the relevant instructions, namely SMS-06-EN-0587 Work on Live 1500V Overhead Wiring or SMS-06-EN-0590 Work on Live Low Voltage Equipment,

NOTE
RailCorp does NOT work on live HV equipment.

- on Low Voltage equipment and electrical discipline personnel carry out the work in accordance with SMS-06-EN-0575 Work on Low Voltage Distribution System or SMS-06-SW-0276 Work on Low Voltage Installations, and the relevant instruction states that a Permit is not required for the particular situation, or
- for the construction of a new HV or LV aerial line or new traction overhead wiring and the work is carried out in accordance with Section 12 of this Guide, or
- carried out on an abandoned cable in accordance with Section 13.4 of this Guide, or
- carried out in accordance with Section 13.5 of this Guide, or
- carried out totally within a dedicated work site at a Maintenance Centre where electrical isolation is effected by utilisation of an Annett style Key Token System or Supplementary Lock System (refer SMS-06-SW-1578) and the work is separated from the electrical hazard by hard (solid and rigid and capable of withstanding foreseeable forces) barriers.

9. Work above exposed electrical equipment

In general, when working above exposed electrical equipment there is a risk of persons or material encroaching the SAD due to falling materials, or plant or equipment being manoeuvred or lowered.

NOTE
RailCorp does NOT allow work or permit temporary structure work or the use of temporary structures above live exposed HV aerial lines or equipment.

When work is above live exposed Low Voltage or 1500V DC overhead wiring or electrical equipment:

- the work is to be carried out under an appropriate Electrical Permit, or
- the work is to be carried out in accordance with an approved SWMS and the specific work is to be approved by an Authorised Officer (Mains or Substations), or
- a continuous rigid barrier is to be erected and the work is to be carried out in accordance with a SWMS.

  All of the conditions specified in Appendix B Temporary Structures around Electrical Equipment, Section B.5.3.4 Erection and Use of Continuous Rigid Barriers on Temporary Structures of this Guide shall be met for the erection and use of the continuous rigid barrier.

  If a continuous rigid barrier is used, the SWMS are to be approved by an Authorised Officer (Mains or Substations) who understands sufficient detail of the work process for which the continuous rigid barrier is required and to assess the documented work process for its adequacy to prevent infringement of the relevant SADs.

Particular requirements apply to work above exposed electrical equipment using mobile plant. Refer to Appendix A.

Particular requirements also apply to temporary structures, scaffolding work and the use of temporary structures and scaffolds above exposed electrical equipment. Refer to Appendix B.

10. Work in the vicinity of electrical equipment

An Electrical Permit may not be required for work in the vicinity of electrical equipment if the risk assessment shows that persons performing the work will **not** be required to, or **cannot**, either directly or through tools, plant, equipment, material or other conducting objects, come inadvertently within the relevant minimum SAD defined in Section 11 and Appendix A.

The person planning the work must make sure that risk control measures are developed and communicated in accordance with Section 5. These controls must be directed toward ensuring that persons, material or plant cannot infringe the relevant minimum SADs.

The person in charge of the work party remains responsible for the electrical safety of the staff working under their control. The person in charge of the work party is to make sure that:

- administrative controls as per Section 5.3.4 of this Guide are established and implemented
- the work process is adequately controlled so that persons, equipment, plant tools or material do **not** come within the prescribed minimum SADs of exposed electrical equipment
- persons carrying out the work are warned to **not** allow any part of their body, clothes, tools or material they use or carry to come within the minimum SADs of exposed electrical equipment
- persons carrying out the work understand the work process controls put in place and that they are **not** to pass over or under any work area or access markers, safety fences, demarcation tape or other special barriers placed in connection with the work.

{Remainder of page left intentionally blank}

11. Safe Approach Distances (SADs)

11.1. Normal SADs for Persons and Tools Held by Persons

Line Managers and Employees are **not** to assume that it is always safe to work up to minimum SADs listed in Table 1 and Table 2. Add an additional distance to that shown in the tables if inadvertent movement or mishandling of material could infringe on the minimum SAD.

Line Managers and Employees are to treat high voltage and 1500V DC cables that do not have an earthed metallic sheath or screen as exposed electrical equipment. Refer to Section 13 for further details of work near cables.

Table 1 Minimum SADs to exposed electrical equipment for persons and tools they hold

	Minimum SAD		
AC - nominal voltage	***Non-accredited Persons***	***Accredited Persons***	***Authorised Persons (See Note 2)***
Insulated low voltage aerial lines up to 1000V, including low voltage aerial bundled cables	Refer to Table 2		0.5m
Low voltage - above 50V AC but not exceeding 1000V	3.0m	1.0m	0.5m (See also Sect 11.3.2)
Above 1000V up to and including 11,000V	3.0m	1.2m	0.7m (See also Sect 11.3.1)
Above 11,000V up to and including 33,000V	3.0m		1.0m
Above 33,000V up to and including 66,000V	3.0m	1.4m	
Above 66,000V up to and including 132,000V	3.0m	1.8m	1.5m
Above 132,000V up to and including 220,000V	6.0m	2.4m	(See Note 3)
330,000V		3.7m	
500,000V	8.0m	4.6m	
DC - Nominal Voltage			
Above 120V but not exceeding 600V	3.0m	1.0m (See also Sect 14)	0.5m
Above 600V including 1500V			0.5m (See also Sect 11.3.4)

NOTE 1 Refer to Section 5.4 for the competence levels of persons.

NOTE 2 Only persons holding authorisations specifically allowing work at the reduced distance to the equipment in question may work to these distances. In other cases Authorised Persons must work only to the distances for Accredited Persons.

NOTE 3 These voltages are not found on the RailCorp Electrical Network. If these voltages are encountered around another network, the Network Operator concerned must be consulted as to the SAD.

NOTE 4 Refer to Sections 11.2.3 and 11.2.4 respectively for work using mobile plant, scaffolding and temporary structures.

Table 2 Minimum SADs for non-electrical work around insulated low voltage cables up to 1000 V (including low voltage aerial bundled cables) and low voltage aerial lines

<table>
<tr><th rowspan="2">Work activity</th><th colspan="2">Minimum SAD</th></tr>
<tr><th>Non-accredited Persons</th><th>Accredited Persons</th></tr>
<tr><td>Mobile plant operation</td><td colspan="2">Refer to Appendix A</td></tr>
<tr><td>Handling non-conductive materials (timber, plywood, PVC, pipes and guttering etc)</td><td>1.5m</td><td rowspan="2">0.5m</td></tr>
<tr><td>Handling metal materials (roofing, guttering, pipes etc)</td><td>4.0m</td></tr>
<tr><td>Driving or operating vehicle</td><td colspan="2">0.6m</td></tr>
<tr><td>Hand held tools</td><td colspan="2">0.5m</td></tr>
<tr><td>Scaffolding and temporary structures</td><td colspan="2">Refer to Appendix B Temporary Structures around Electrical Equipment</td></tr>
</table>

NOTE 1 Refer to Section 5.4 for the competence levels of persons.

{Remainder of page left intentionally blank}

11.2. Increased SADs

11.2.1. General

Work activities that might easily bring persons or equipment closer to the electrical hazard present additional risks and require increased SADs and additional risk controls. These are set out in separate Safe Work Instructions or guides. Line Managers planning or controlling work around electrical equipment which involves these activities are to make sure that the requirements of the guides are followed.

11.2.2. Portable metal ladders

Metal or metal reinforced portable ladders, stepladders or step platforms are not to be used for work that is:

- on or near low voltage aerial conductors, or
- within 6 metres of 1500V DC overhead conductors or equipment ,or
- within 6 metres of high voltage (greater than 1000V AC) aerial conductors or equipment

For further guidance on the use of ladders refer to SMS-06-SW-0264 Portable Ladders, Stepladders and Step Platforms.

11.2.3. Mobile plant

Specific requirements relating to crane and plant operator competence, risk elimination/ control measures and SADs apply for work using cranes and plant around electrical equipment. Refer to Appendix A for further information.

11.2.4. Temporary structures such as scaffolding

Specific requirements relating to certification, risk elimination and control measures and SADs apply for temporary structure work and work using temporary structures around electrical equipment. The requirements vary according to the structures location, and whether the structure is metallic or non-conductive. Refer to Appendix B for further information.

11.3. Reduced SADs

11.3.1. Testing and earthing

Testing and earthing procedures on some 2kV and 11kV equipment might bring the operator within the specified 0.7m SAD.

Only Authorised Persons trained in testing and earthing procedures may undertake this work. The work is to be done in accordance with written instructions.

11.3.2. Work on low voltage equipment by Authorised Persons or Qualified Electricians

Electrical discipline personnel, i.e. RailCorp Authorised Persons (Low Voltage) or Qualified Electricians as set out in SMS-11-GD-0244 Personnel Certifications – Electrical Authorisations, may carry out work on low voltage equipment in accordance with SMS-06-EN-0575 Work on Low Voltage Distribution System or SMS-06-SW-0276 Work on Low Voltage Installations at a distance of less than 0.5m after the associated risks are identified and the risks of contact with live parts controlled.

NOTE
The minimum SADs for non-electrical work around insulated low voltage aerial lines are set out in Table 2.

11.3.3. Substation busbars (voltages not exceeding 66kV)

A person who is not appropriately authorised, e.g. an Accredited Person or an Authorised for Entry person, may approach substation busbars to a minimum distance of 1m for the purpose of passing under the busbar provided an Authorised Person (Substations) who is specifically authorised to supervise work within substations:

- provides the person on-site instruction about the dangers and precautions, and
- accompanies that person at the site, and
- provides direct/constant supervision of that person.

11.3.4. 1500V cables

Unscreened 1500V cable

Treat 1500V unscreened insulated cable as exposed 1500V equipment.

Authorised Persons may approach an unscreened insulated 1500V cable to a distance of not less than 50mm, on condition that:

- the reduced SAD is applied to the normally insulated cable only, and not applied to exposed conductor or conductive components connected to the conductor, and
- extra care is taken when working at the reduced SAD.

Screened 1500V cable

Persons may touch a screened 1500V cable provided it is visually inspected and found to be in good condition.

11.3.5. Jacking rolling stock

Reduced clearances are permitted where rolling stock is to be jacked under or adjacent to live 1500V overhead wiring provided the work is carried out in accordance with Section 14 of this Guide.

11.3.6. Authorised persons in training

Persons training to become Authorised Persons may come closer than the SADs specified under Accredited Persons of Table 1 provided:

- the person is assessed as competent to carry out the work under supervision, and
- the SADs under "Authorised Persons" of Table 1 are maintained, and
- the work is under the direct/constant supervision by a person suitably authorised to perform the work.

NOTE
The person supervising the work is responsible for the safety of the person in training.

11.4. Examples of SADs

The following diagrams are to be used for guidance only. Assess each situation individually.

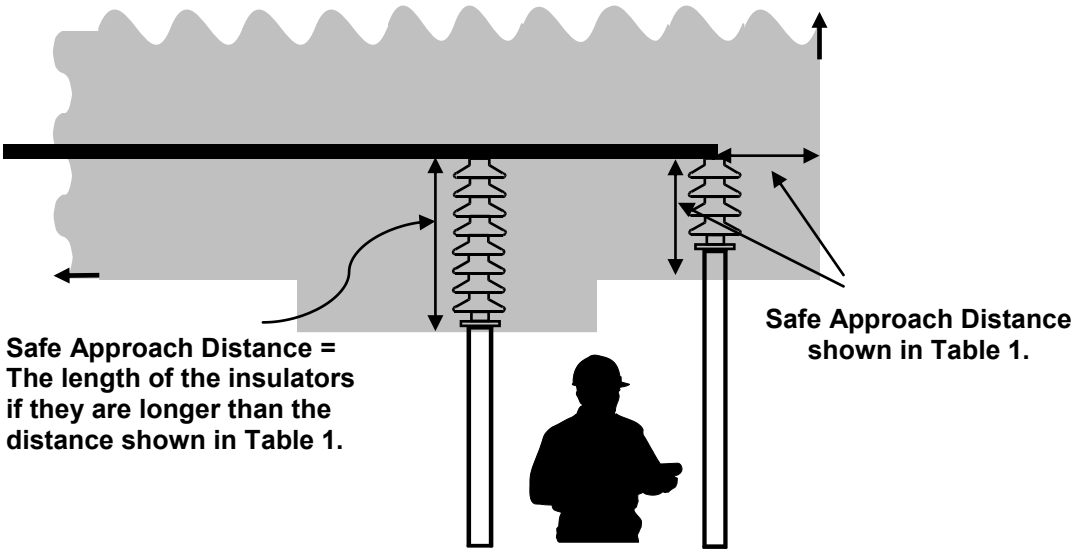


Figure 5 Exposed busbars in substations

WARNING
Unless signed on to a relevant Electrical Permit, persons and any objects they carry are not to enter the shaded area shown in the diagrams.

NOTE

*For work **above** exposed electrical equipment, refer to Section 9 Work above exposed electrical equipment.*

{Remainder of page left intentionally blank}

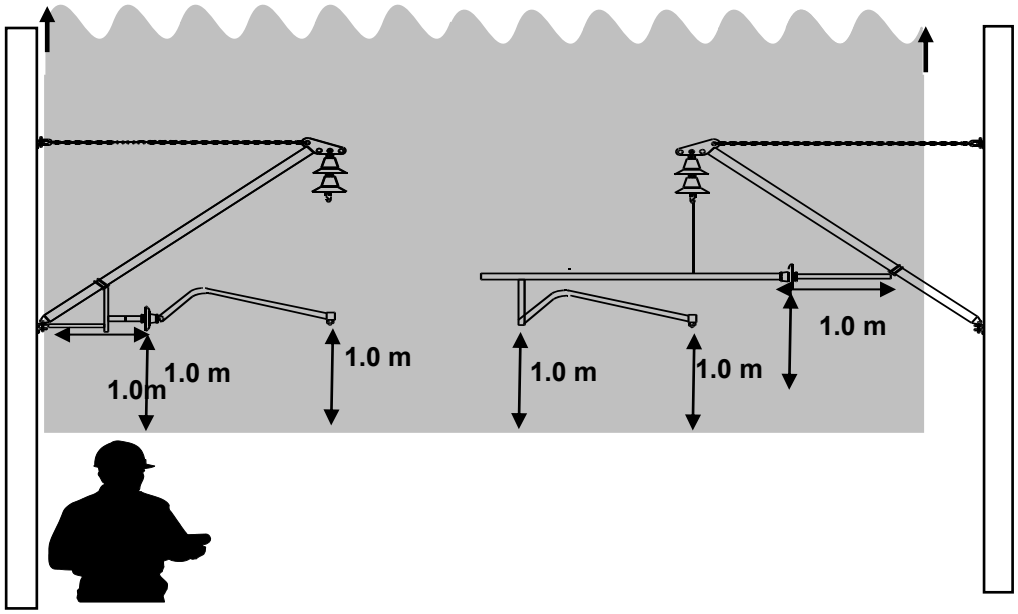


Figure 6 SADs to OHW equipment – Accredited Persons

WARNING
Persons other than Authorised Persons, who have not signed on to an Electrical Permit are not to enter the shaded area either directly or through any object.

NOTE

*For work **above** exposed electrical equipment, refer to Section 9 Work above exposed electrical equipment.*

{Remainder of page left intentionally blank}

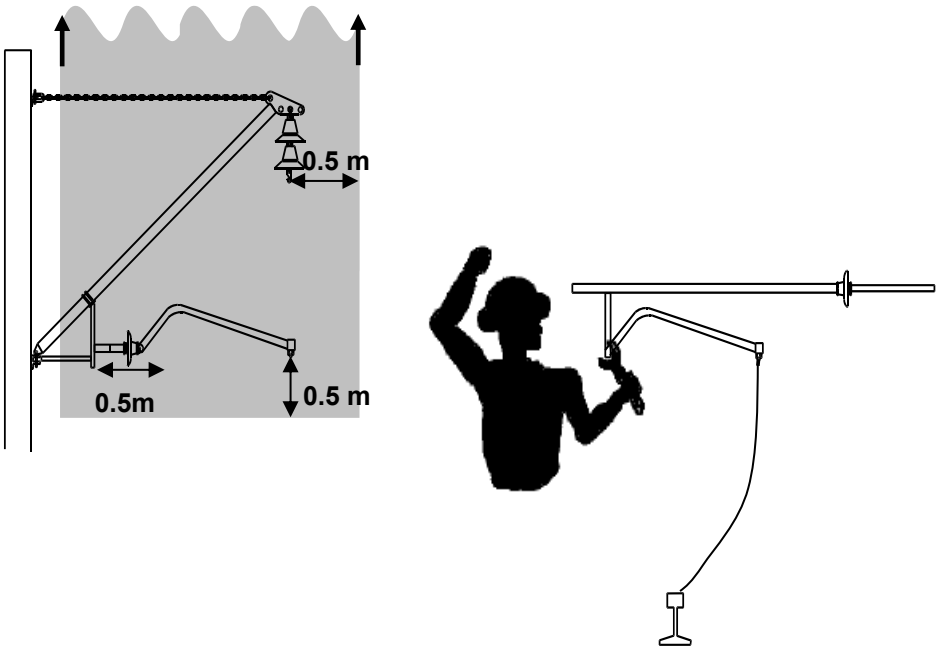


Figure 7 Work on OHW equipment by Authorised Persons (Case 1)

NOTE 1
*Authorised Persons working on structures or rail connected equipment near live 1500V equipment are **not** to enter the shaded area either directly or through any conducting object.*

NOTE

*For work **above** exposed electrical equipment, refer to Section 9 Work above exposed electrical equipment*

{Remainder of page left intentionally blank}

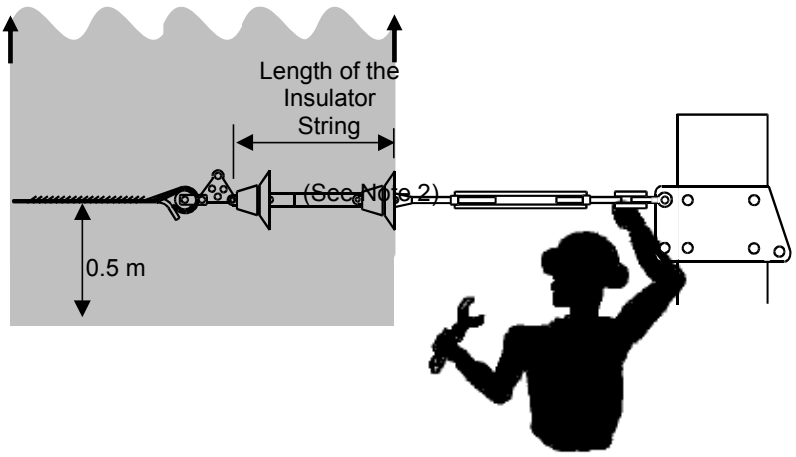


Figure 8 Work on OHW equipment by Authorised Persons (Case 2)

NOTE 1
*Authorised Persons working on structures or rail connected equipment near live 1500V equipment are **not** to enter the shaded area either directly or through any conducting object.*

NOTE 2
The SAD for an Authorised Person is as shown in Table 1 or the length of the insulator string if it is longer.

NOTE
*For work **above** exposed electrical equipment, refer to Section 9 Work above exposed electrical equipment*

12. Construction of new aerial lines

12.1. New HV and LV aerial lines

New HV and LV aerial lines include:

- New HV/LV conductors and associated hardware erected on new pole lines, or
- New additional HV/LV conductors and associated hardware.

Construction of new HV/LV aerial lines includes all activities involving the erection of the new HV/LV aerial line up to the initial energisation of the new HV/LV aerial line.

Before commencement of stringing conductors, the Project Engineer in charge of the work must obtain approval from RailCorp's Chief Engineer Electrical as to an agreed staging plan to include the new HV aerial line on RailCorp's Electrical Operating Diagrams.

The requirements of RailCorp Standard EP 95 00 00 12 SI 'Advertising of New Work' must be complied with.

Also, the requirements of instruction SMS-06-EN-0552 General Requirements for Electrical Work section 14 'Precautions when leaving work unfinished' must be complied with.

All new HV/LV aerial lines under construction are to be treated as live unless an Electrical Permit to Work has been issued for those new HV/LV aerial lines in accordance with instruction

SMS-06-EN-0598 Electrical Permit to Work. Only those persons who have signed onto an Electrical Permit to Work issued for the construction of the new HV/LV aerial line concerned may come within the SAD's of the HV/LV lines being erected.

It is often the case that the new HV/LV aerial line erection is being carried out around existing live exposed electrical equipment. Activities such as stringing new conductor around existing live exposed electrical equipment presents additional risks to those which are encountered when performing normal maintenance work around this electrical equipment. Such additional risks must be considered when determining whether required SAD's can be maintained to that existing electrical equipment and whether or not the stringing work can proceed without obtaining an Electrical Permit for the existing electrical equipment.

12.2. New 1500V overhead wiring (OHW)

New 1500V OHW means new 1500V conductors and associated hardware (excluding OHW support structures) erected on previously un-electrified existing track or new track.

Construction of new 1500V OHW includes all activities involving the erection of the new 1500V OHW up to the initial energisation of the new 1500V OHW.

Before commencement of stringing conductors, the Project Engineer in charge of the work must obtain approval from RailCorp's Chief Engineer Electrical as to an agreed staging plan to include the new 1500V OHW on RailCorp's Electrical Operating Diagrams.

The requirements of RailCorp Standard EP 95 00 00 12 SI 'Advertising of New Work' must be complied with.

Also, the requirements of instruction SMS-06-EN-0552 General Requirements for Electrical Work section 14 'Precautions when leaving work unfinished' must be complied with.

All new 1500V OHW under construction is to be treated as live unless an Electrical Permit to Work has been issued for that OHW in accordance with instruction SMS-06-EN-0598 'Electrical Permit to Work'. Only those persons who have signed onto an Electrical Permit to Work issued for the construction of the new OHW concerned may come within the SAD's of the OHW being erected.

It is often the case that the new 1500V OHW erection is being carried out around existing live exposed electrical equipment. Activities such as stringing new conductor around existing live exposed electrical equipment presents additional risks to those which are encountered when performing normal maintenance work around this electrical equipment. Such additional risks must be considered when determining whether required SAD's can be maintained to that existing electrical equipment and whether or not the stringing work can proceed without obtaining an Electrical Permit for the existing electrical equipment. See system guide SMS-06-GD-1588 'Guide for the Stringing of 1500V OHW Conductors in the Vicinity of Existing Electrical Equipment'.

{Remainder of page left intentionally blank}

13. Work on, near or in the vicinity of cables

13.1. General

To locate underground cables and buried services refer to Section Underground cables and buried services of this Guide.

13.2. Approach to high voltage or 1500V cables

For the purpose of approach by persons, tools, materials or plant, workers must treat cables that do not have an earthed metallic sheath or screen as exposed equipment and apply the relevant minimum SADs.

Where an earthed metallic sheath or screen exists but its condition is doubtful or suspect, treat the cable as exposed equipment.

NOTE
As detailed in Section 11.3.4 1500V cables of this Guide, a reduced SAD may apply to 1500V cables.

When an earthed metallic sheath or screen exists and is exposed, take precautions where necessary to avoid danger from induced voltage and transferred earth potential before approaching the cable.

13.3. Handling high voltage or 1500V cables

When it is necessary to move or bend a high voltage or 1500V cable, the persons handling the cable are to be signed onto an appropriate Electrical Permit before handling the cable.

NOTE
If the cable is to be flexed significantly an insulation resistance test is to be carried out before the cable is moved and again before returning the cable to service to make sure of the continued integrity of the cable.

13.4. Work on cables

Persons are **not** to begin work on any cable until:

- the cable has been positively identified at the worksite, and
- the person has signed onto the appropriate Electrical Permit.

A Low Voltage Access Permit is not required for work on low voltage cables when the work is being carried out by a Qualified Electrician or an Authorised Person.

See section 9 of the SMS-11-GD-0244 Personnel Certifications – Electrical Authorisations document for details of who is permitted to carry out cable jointing and termination work on RailCorp's high voltage and 1500V DC cables.

At cable work sites, there is a danger of induced voltages and transferred earth potentials from adjacent cable or substation faults. Persons are:

- to work on one conductor or sheath only at a time, and
- **not** to bridge themselves between conductors or sheath and earth.

When it is necessary to cut through the cable protection cover to allow further excavation or other work to proceed, the following precautions are to be undertaken:

- Even if an Electrical Permit has been issued for working on the de-energised cable, all other live cables in the same trench, conduit, tray or trough should also, where reasonably practicable, be de-energised.
- Suitable equipment (eg non-penetrating manual cutting equipment) should be used to minimise the risk of cutting blades contacting cables protected by a cable protection cover, such as a cable cover, conduit tray or trough.

13.5. Work on abandoned cables

When it is necessary to carry out work on abandoned electrical cables or near the exposed cores of abandoned electrical cables, Line Managers are to make sure that:

- the cable is identified by its former identifier and designated as abandoned e.g. FORMER IS 12 (ABANDONED), and
- the cable is proved dead by spiking screened or metallic sheathed cables or testing unscreened cables with a non-contact device, and
- unless the cable is visually and continuously traced from end to end, an appropriate Electrical Permit endorsed ABANDONED is issued.

WARNING
Take care when tracing cables to include tee-offs that branch from the cable.

13.6. Excavation and earth works near or in the vicinity of cables

Where excavation or earth works will be required to, or might inadvertently come within 3 metres to RailCorp:

- buried power cables, or
- cables in ducts, galvanised steel troughing (GST), ground line troughing (GLT), or
- cable pits,

the Maintenance Engineer Electrical shall be contacted. The Maintenance Engineer Electrical or nominated representative shall determine the appropriate risk mitigation strategy to be implemented, refer to Section 5.3 of this Guide. An Electrical Permit may not be required if the work is:

a) to be carried out in accordance with an approved SWMS accepted by the Chief Engineer Electrical or a Maintenance Engineer Electrical, and

b) carried out under the supervision of a Safety Observer whom shall be verified as competent on site in accordance with Appendix A.6 of this Guide and fulfil their duties as per Section 5.3.5 of this Guide.

NOTE
Excavation by mobile plant shall not be carried out within 2.0 m horizontally of the expected position of buried cables without first exposing all the buried cables by careful hand-excavation. In cases where ground conditions make hand excavation impracticable, a mechanical excavation method may be used subject to the written approval and conditions of the Chief Engineer Electrical or a Maintenance Engineer Electrical.

In addition to any risk mitigation strategies required to be implemented, excavation and earth works near or in the vicinity of electrical cables shall be carried out in accordance with SMS-06-GD-2066 Managing Construction Hazards, in particular section 2.4.

14. Jacking rolling stock

Jacking of a vehicle on or adjacent to an electrified track is to be carried out in accordance with the following instructions. Any person not signed onto an Electrical Permit to Work for the section/subsection concerned is to treat the overhead wiring as live.

A vehicle may be jacked under or adjacent to live 1500V overhead wiring provided that each of the following three conditions is satisfied:

- the Electrical Operating Centre is advised:
  - before work commences, and
  - at the completion of the work
- if the vehicle is:
  - an electric locomotive, both pantographs are lowered and the associated air supply isolated, or
  - an electric multiple unit (EMU) motor car or trailer, the associated pantograph is lowered and the associated air supply isolated, or
  - a Tangara, Millennium or Outer Suburban car, both pantographs on the 4 car set are lowered and the associated air supplies isolated, or
  - a Waratah, all pantographs on the 8 car set are lowered and the associated air supplies isolated.
- no part of the vehicle is, or may come, closer than 1m to the OHW except if one bogie of the vehicle remains on the rails, the vertical distance below the contact may be reduced to 300mm, provided that the rails are not separated from the traction current return path to a substation. This distance may be further reduced to 150mm if an Authorised Traction Live Line Worker or Authorised Officer (Mains) supervises the electrical safety aspects.

15. Definitions

Term	***Means***
Authorised Person	Has the same meaning as set out in SMS-11-GD-0244 Personnel Certifications - Electrical Authorisations
Line Manager	Is a RailCorp employee who has management responsibility, or In the case of a non RailCorp employee, a “person conducting a business or undertaking” (PCBU)
Overhead wiring structure	Any structure that supports or registers a catenary and/or contact wire, or supports ancillary equipment such as a field switch or surge arrester. These structures can include masts, portals, wood poles, overline bridges, embankments and tunnels.
Person / Worker	Has the same meaning as ‘worker’ as defined in the Work Health and Safety Act
Person conducting a business or undertaking (PCBU)	Has the same meaning as defined in the Work Health and Safety Act
Person in charge of the work party	The person who is present at the work location and directly monitors and controls the work being performed

Term	*Means*
Persons planning work	The person with responsibility for developing the work methods to be used for work around electrical equipment. The person planning the work is not necessarily present at the work location whilst the work is performed
Qualified Electrician	Has the same meaning as set out in SMS-11-GD-0244 Personnel Certifications - Electrical Authorisations
RailCorp Level 5 Manager	Is the employee **directly** associated with the work who has currency of knowledge about the project, people, processes, tasks, hazards and work site conditions.
Reasonably practicable	Has the same meaning as defined in the Work Health and Safety Act. Note Safe Work Australia provide an interpretive guideline to the meaning of 'reasonably practicable'
Safe Approach Distance (SAD)	The minimum separation, in air, from an exposed conductor or exposed electrical equipment that shall be maintained by a person, or any object held by or in contact with that person (other than insulated objects designed for contact with live conductors), or any mobile plant operated or controlled by that person.

16. References

- AS/NZS 4836:2011 Safe working on or near low-voltage electrical installations and equipment
- Drawing No. EL0172344 Railways Overhead Wiring Reduced SAD Clearance to Signal Post
- Electricity (Consumer Safety) Regulation 2006
- Electricity Supply (Safety and Network Management) Regulation 2008
- EP 95 00 00 12 SI Advertising of New Work
- ISSC14 – Guide to electrical workers' safety equipment – October 2010
- Safe Work Australia Managing Electrical Risks in the Workplace Code of Practice July 2012
- SMS-02-SP-2062 Safety Responsibilities, Authorities and Accountabilities
- SMS-05-TP-1508 Local Safety Records Register
- SMS-06-EN-0550 Electrical Network Safety Rules
- SMS-06-EN-0551 Definitions and Conventions for Electrical Safety
- SMS-06-EN-0552 General Requirements for Electrical Work.
- SMS-06-EN-0556 Insulated Sticks, Tools and Equipment used for work On, Near or In the Vicinity of Exposed Electrical Equipment – Inspection, Testing, Care and Maintenance
- SMS-06-EN-0563 Earthing of High Voltage Equipment using portable earthing equipment
- SMS-06-EN-0571 Overhead Wiring Structure to Rail Voltage Test
- SMS-06-EN-0575 Work On Low Voltage Distribution System
- SMS-06-EN-0583 Substation Access Permit

- SMS-06-EN-0598 Electrical Permit to Work
- SMS-06-FM-0163 Pre-work Briefing
- SMS-06-FM-0384 Services Search Request
- SMS-06-FM-0484 Request for Electrical Permit to Work
- SMS-06-GD-1588 Guide for the Stringing of 1500V OHW Conductors in the Vicinity of Existing Electrical Equipment
- SMS-06-GD-2066 Managing Construction Hazards
- SMS-06-OP-2043 Managing Risk Using Safe Work Practices
- SMS-06-OP-2114 06.20 Pre-work briefings
- SMS-06-SW-0264 Portable Ladders, Stepladders and Step Platforms
- SMS-06-SW-0267 Working in Accordance with an Electrical Permit
- SMS-06-SW-0269 Electric Shock Protocol
- SMS-06-SW-0271 Rescue from Live Low Voltage
- SMS-06-SW-0275 Inspection and Testing of Insulated Sticks, Tools and Equipment used for work On, Near or In the Vicinity of Exposed 1500 V OHW or Equipment
- SMS-06-SW-0276 Work on Low Voltage Installations
- SMS-06-SW-1578 Isolating 1500V DC OH using an Annett Key or Supplementary Lock systems
- SMS-11-GD-0244 Personnel Certifications – Electrical Authorisations
- WorkCover Code of Practice Work Near Overhead Power Lines issued in 2006
- Work Health and Safety Act 2011 No 10
- Work Health and Safety Regulation 2011 No 674

Appendix A Safe Use of Mobile Plant around Electrical Equipment

A.1 Purpose

To provide information about the hazards, controls and the additional safety requirements to be complied with specifically associated with the use of mobile plant for work around electrical equipment owned or maintained by RailCorp up to and including 132,000V AC and 1500V DC.

Generally, work around electrical equipment using mobile plant must be performed at greater SADs than those described in Tables 1 and 2 of Section 11. This Appendix includes the SADs relevant to mobile plant. For information regarding excavation and earth works near or in the vicinity of cables refer to Section 13.5 of this Guide.

A.2 Scope

This Appendix is applicable to all persons working with mobile plant, including motor vehicles, around RailCorp owned or maintained electrical equipment.

While this Appendix is aimed primarily at mobile plant such as cranes, elevating work platforms (EWP), excavators, drilling rigs, Hi-rail vehicles, rail-only mobile plant, forklift trucks, tip trucks and concrete pumps, it can be applied to other portable or moveable equipment such as lighting towers, generators and compressors.

This Appendix does not apply:

- to work using mobile plant around electrical equipment owned or maintained by another Electricity Network Operator. This work must be carried out in accordance with that Electricity Network Operator's safety management system. However, if the work requires that Network Operator to remove supply to its electrical equipment for the work to proceed and the work is being performed on RailCorp property, then RailCorp's Electrical Operating Centre (EOC) is to be advised of the planned work to allow the EOC to make appropriate arrangements should the isolation affect supply to RailCorp operations.
- to mobile plant operating on a public road if the design envelope is not greater than the transit envelope and is in any case not greater than 4.6 metres in height (e.g. a side loading waste collection vehicle collecting waste bins from the side of a public road under an aerial line owned or maintained by RailCorp).
- when the mobile plant is correctly stowed for travelling on a public road and the design envelope is not greater than the transit envelope and is in any case not greater than 4.6 metres in height.
- to 'rail only' mobile plant which operates within the rolling stock gauge or has a design envelope capable of infringing rolling stock gauge only at track level.
- to rolling stock which is addressed in other operational and engineering standards.
- to portable ladders, stepladders, scaffolds, scaffolding components, temporary structures and temporary structure components which are addressed in SMS-06-SW-0264 "Portable Ladders, Stepladders and Step Platforms" SWI and Appendix B Temporary Structures around Electrical Equipment of this Guide.

A.3 Definitions

Design Envelope	the space encapsulating all possible movements of the mobile plant under maximum unrestricted reach, including:– • any load attached to the mobile plant, or • any person including tools and equipment occupying the basket of an EWP.
Transit Envelope	the area encompassing the normal height and width of mobile plant when travelling to or from a worksite
Tiger Tails	pipe type cable covers used as a warning to visually indicate the position of low voltage aerial conductors and are not to be regarded as providing sufficient protection against electrical hazards

A.4 Planning for the work using mobile plant

Prior to any work using mobile plant around aerial lines or electrical equipment being performed (including mobile plant in transit), planning for this work must be carried out by the person requiring this work to be performed.

This planning must be done in consultation with the persons who will actually be doing the work and must include:–

An identification of the foreseeable hazards involved in performing work around the aerial line or electrical equipment (see A.4.1), and

An assessment of the risks (see A.4.2), and

Understanding and planning to implement the relevant requirements necessary to eliminate or control the risks (see A.4.3).

A.4.1 Identification of foreseeable hazards

Live aerial lines and associated electrical apparatus are a potential hazard posing a substantial risk of death or serious injury to persons performing work using mobile plant.

An aerial line and associated electrical equipment owned or maintained by RailCorp must be treated as **live** by a person unless that person has signed onto an Electrical Permit covering that aerial line and covering the work being performed by that person during the time for which that Electrical Permit is current.

Contact or near contact between:

EITHER

the mobile plant, or

the load being carried by the mobile plant, or

persons using the mobile plant

AND a live aerial line can result in:

- electrical shock and electrocution
- a rain of molten metal
- fire
- explosion
- swift, unpredictable aerial line conductor whip-lash

- Loss of electrical power supply to the rail network, which may have major implications for rail safety

It is important to remember that these risks can arise not only through direct contact with the aerial line but also by arcing from close approach to the aerial line.

A.4.2 Assessment of the risks

A.4.2.1 Risk factors to be considered

Risk factors which must be considered include, but are not limited to the following:–

a) the voltage of the aerial line and/or the associated equipment.

If the aerial line includes multiple feeders erected on the same pole route, then the voltage of each of the individual feeders must be considered in order to determine the risk.

If the voltage of the aerial line and associated equipment is not known and cannot be definitely determined, then the Maintenance Engineer Electrical concerned is to be contacted to obtain accurate information. (See A.4.2.2)

b) the height of the conductors and horizontal distance to the conductors

When looking up at conductors it is often difficult to judge the approach distances. This is particularly the case where higher voltages are involved and the approach distances are large. Where possible the situation is to be viewed from several angles to make sure that the required distance is not infringed.

Warning
Do not attempt to directly measure the height or horizontal position of aerial lines with a measuring tape, stave or other physical measuring device. If the distance cannot be determined by sighting or measured with a non contact measuring device, contact the Maintenance Engineer Electrical concerned to arrange an Authorised Person to perform the measurement.

Aerial conductors are made of metal and are therefore subject to expansion and contraction when heated and cooled. This can be a direct result of high ambient air temperature and / or heating caused by load current passing through the conductors. Regardless of the cause, any expansion will result in gravity causing the power lines to sag downwards. Wind can also cause the power lines to swing from side to side. For this reason the Safe Approach Distances must be increased either vertically or horizontally by the amount of conductor sag or swing possible at the point of work. Refer to Figure A 1.

{Remainder of page left intentionally blank}

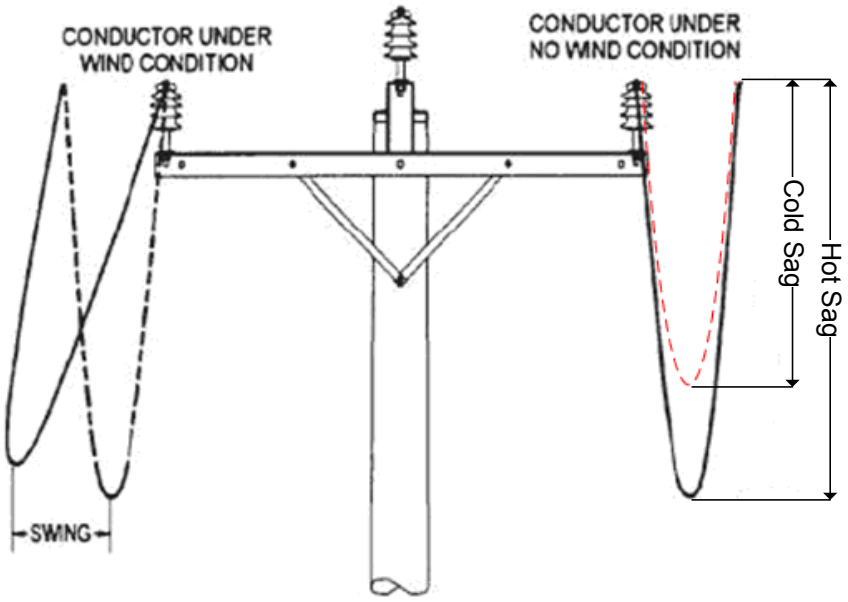


Figure A 1 – Illustration of aerial lines 'sag or swing'

Attention is also drawn to the magnification of movement that occurs with tall items of equipment on relatively narrow bases. Any movement due to uneven ground, subsidence or the like may be magnified several times in the resultant movement at the top of the item.

c) the extent and dimensions of the design envelope of the mobile plant and the load being carried.

Particular care is to be taken to accurately assess the extent and dimensions of the design envelope of the mobile plant fitted with elevating units or tipping trays and items such as extendable lighting masts.
Refer to Figure A 2.

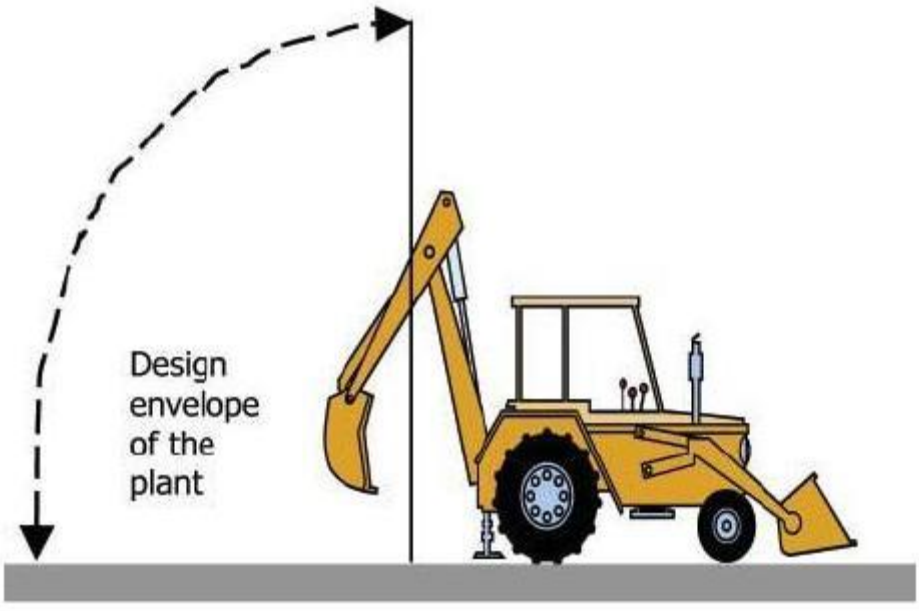


Figure A 2 – Illustration of design envelope of mobile plant

In the case of Elevated Work Platforms, the design envelope must include the extent and dimensions of persons working from the platform and include tools and equipment being used by these persons.

Selecting mobile plant with a design envelope that results in the mobile plant being unable to infringe applicable Safe Approach Distances significantly reduces the risks associated with working around electrical equipment.

d) the tasks to be undertaken using the mobile plant (including the setting up and packing up process). In the case of Elevated work platforms, this also includes a consideration of the tools and equipment to be used from the platform.

e) the qualifications, competency, skill and experience of the people doing the work.

f) the number of people involved in the work

g) prevailing or unexpected wind strength and direction which may impact on the distance between the mobile plant and the aerial line

h) rail and vehicular traffic, pedestrians or livestock that could interfere with the work

i) foreseeable conditions that may exist at the worksite, including but not limited to

- weather conditions – the effects of wind gusts on the load
- ground conditions – effects of rain, moisture and contour which may affect the movement of mobile plant or may cause unintended movement by ground subsidence
- lighting conditions – low light levels, glare or mist which may impede clear viewing of the mobile plant operation

j) the duration of the work around electrical equipment involving the mobile plant. People involved with tasks that are to be carried out over protracted periods of time may initially be alert to risks and vigilant to ensure appropriate controls are applied. However, these same people can become complacent as time passes and work is successfully progressing.

k) the Safe Approach Distances (SAD) is the minimum distance required to be maintained during the mobile plant work

In determining the required SAD, you need to consider the closest distance which:

- any part of the mobile plant, or
- any load being moved, including the slings, chains and other lifting gear, or
- any persons working from the platform of an elevated work platform together with tools and equipment being used by these persons, or
- any hand control lines and equipment or other material utilised in conjunction with the mobile plant,

may come to the electrical equipment or aerial line and associated apparatus.

The Safe Approach Distances specified in this Appendix are as detailed in Tables A, B, C and D and associated Diagrams A, B, C and D. These are the minimum distances to be maintained. Additional clearance is to be added to these distances to allow for the risk factors relevant to the work such as conductor movement due to the effects of wind and temperature or inadvertent movement of material which would infringe on the Safe Approach Distances.

Table A – General minimum Safe Approach Distances for mobile plant work unless the work is performed under an Electrical Permit.

Nominal phase to phase a.c. voltage (volts)	Safe Approach Distance (m)
Not exceeding 132,000	3
Nominal overhead wiring to rail d.c. voltage (volts)	**Safe Approach Distance (m)**
1500	3

Diagram A – to be used in conjunction with Table A

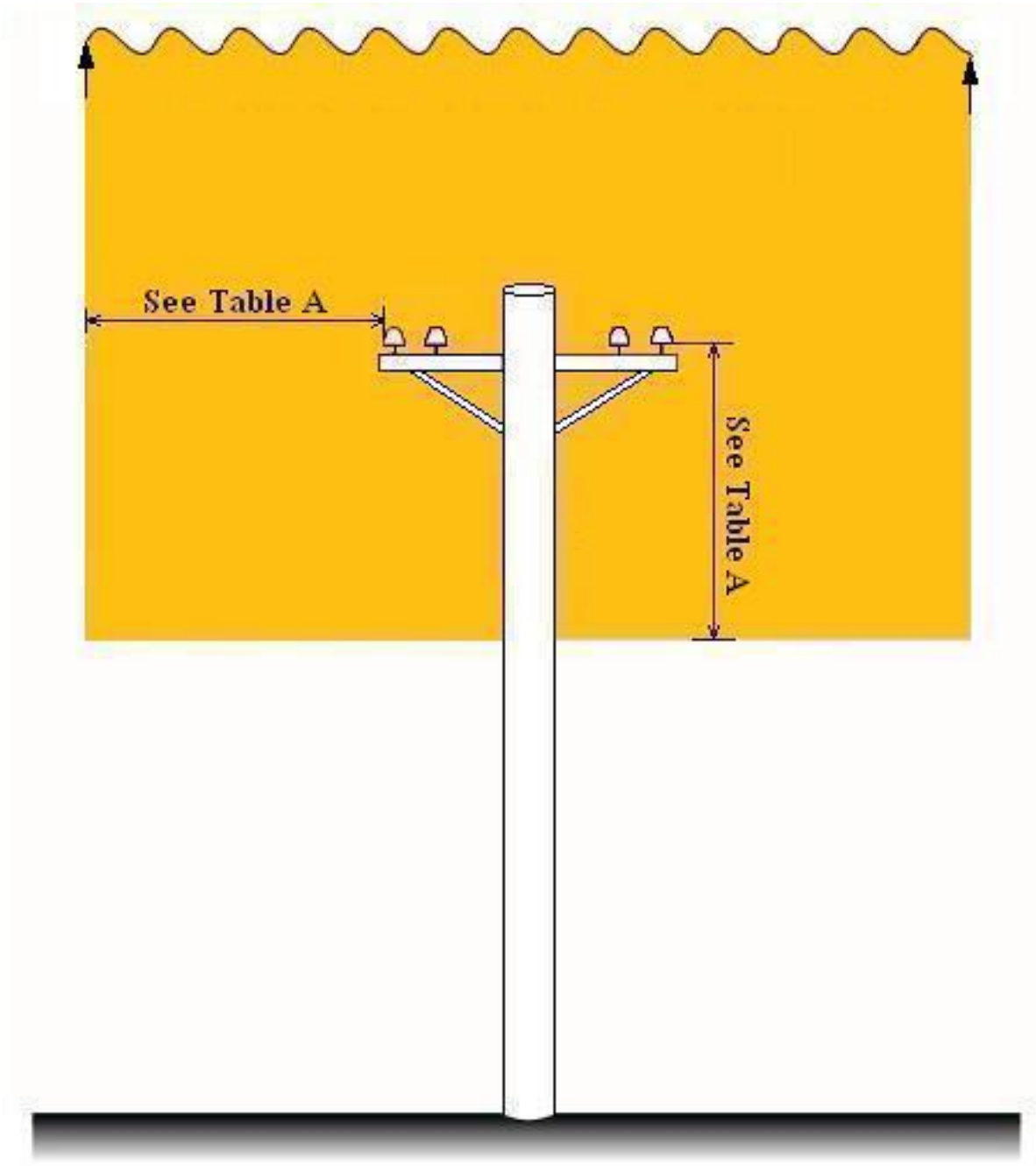


Table B – Special minimum Safe Approach Distances for mobile plant work used under appropriate special controls as specified in this Guide - unless the work is performed under an Electrical Permit.

Nominal phase to phase a.c. voltage (volts)	Safe Approach Distance (m)
Low voltage aerial conductors up to 1000	1.0
Above 1000 up to and including 33,000	1.2
Above 33,000 up to and including 66,000	1.4
Above 66,000 up to and including 132,000	1.8
Nominal overhead wiring to rail d.c. voltage (volts)	**Safe Approach Distance (m)**
1500	1.0

Diagram B – to be used in conjunction with Table B

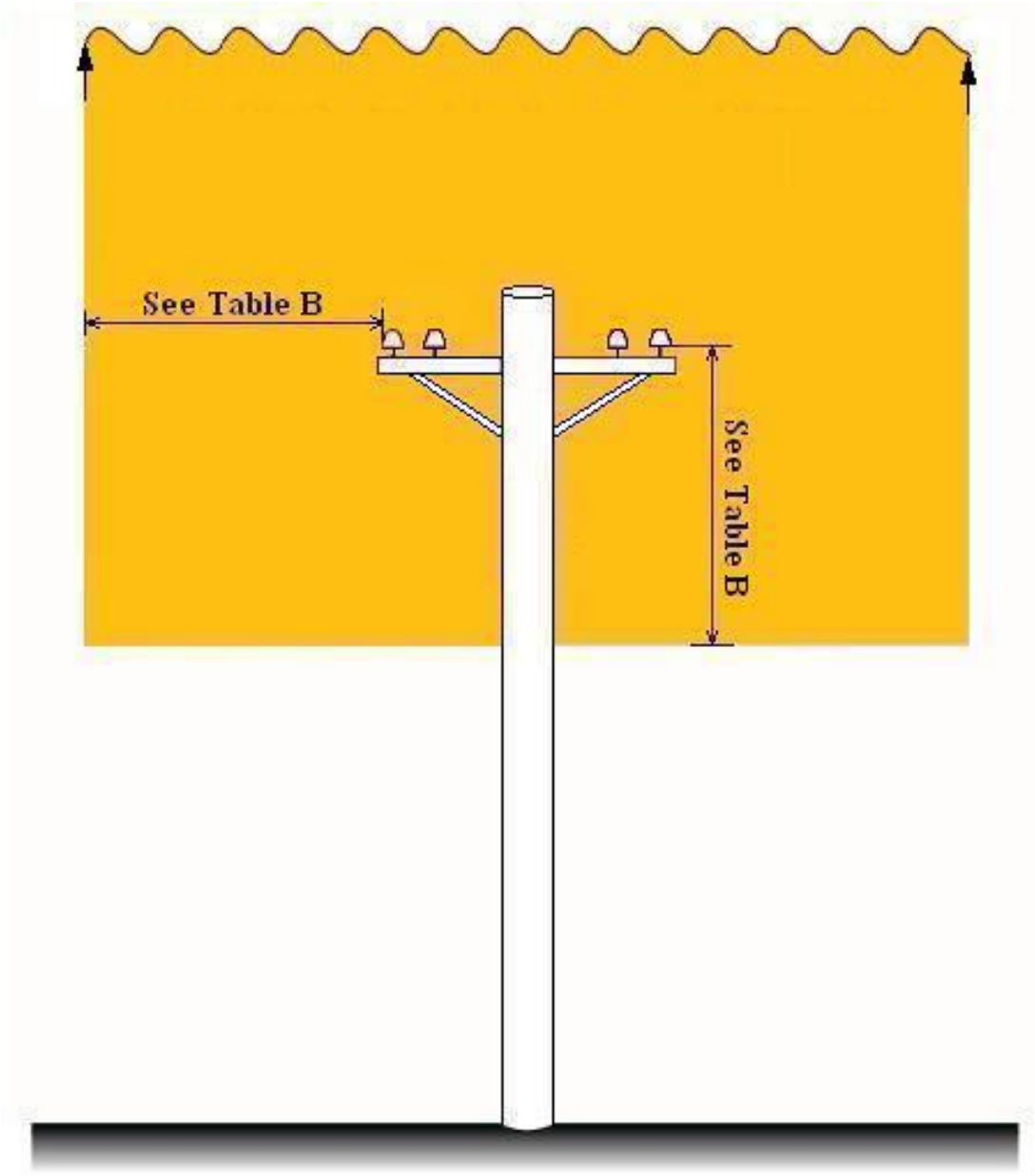
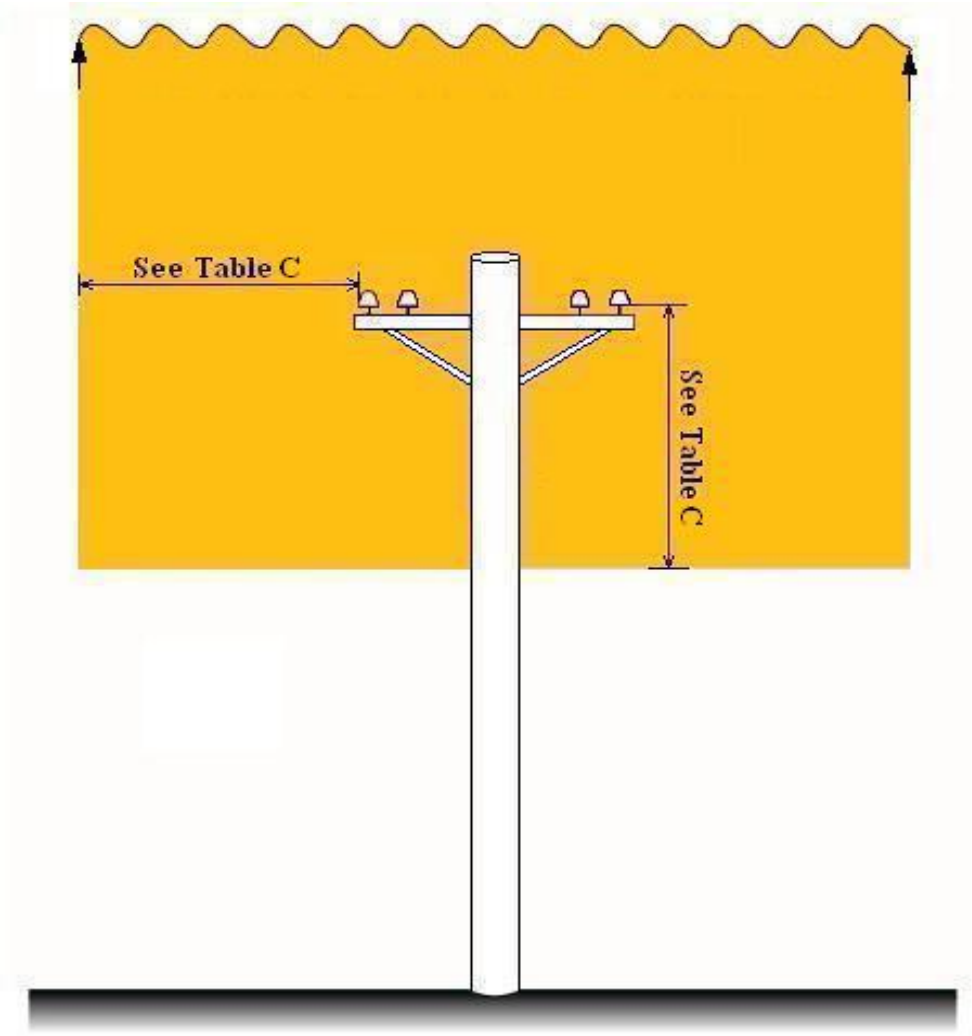


Table C – Special minimum Safe Approach Distances for mobile plant work used under appropriate controls as specified in this Guide unless the work is performed under an Electrical Permit. – Maintenance or construction of the Electrical System Only – (see *Note 1 below)

Nominal phase to phase a.c. voltage (volts)	**Safe Approach Distance (m)**
Up to 1000	0.5
Above 1000 but not exceeding 33000	1.2
Above 33000 but not exceeding 66000	1.4
Above 66000 but not exceeding 132000	1.5
Nominal overhead wiring to rail d.c. voltage (volts)	**Safe Approach Distance (m)**
1500	0.7

Diagram C – to be used in conjunction with Table C



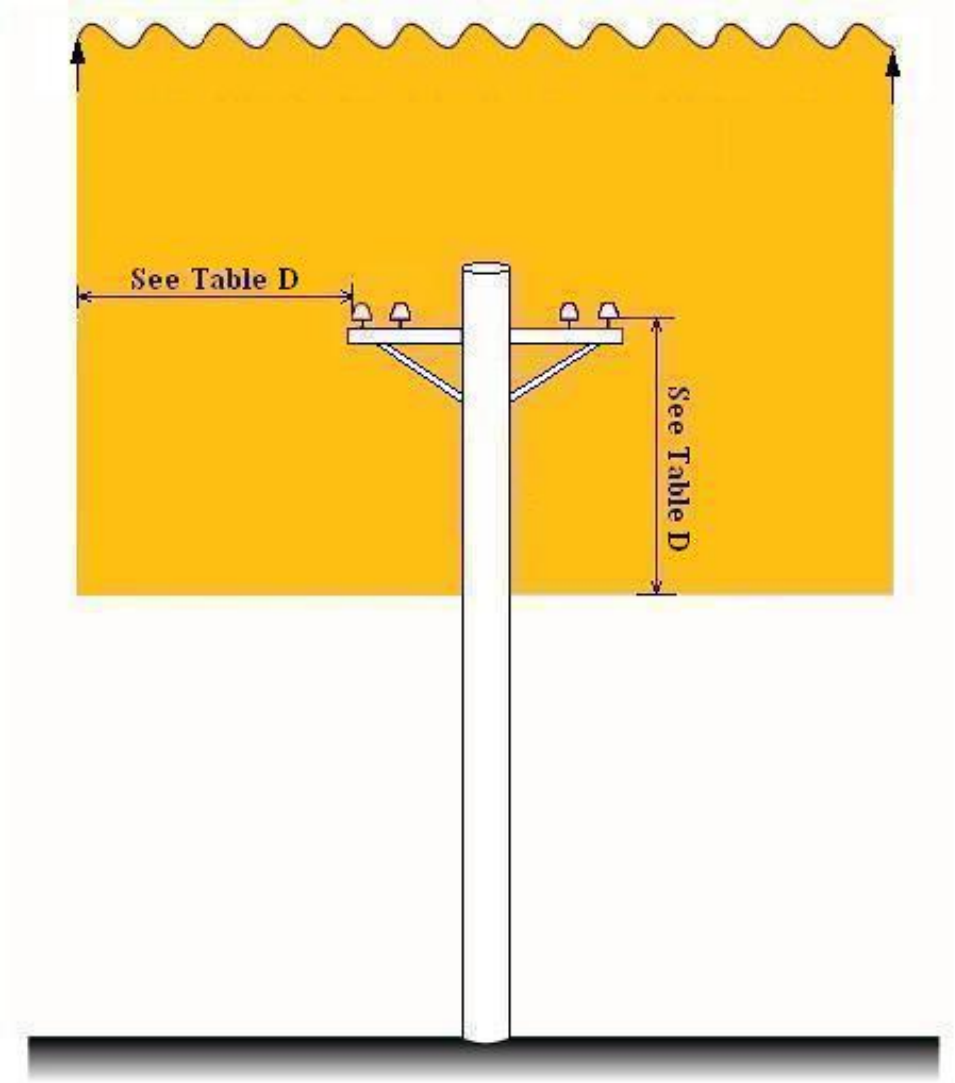
NOTE 1
Earthing of aerial lines using an EWP must be carried out in accordance with *SMS-06-EN-0563 'Earthing of High Voltage Equipment using portable earthing equipment'*. Compliance with *SMS-06-EN-0563* determines the Safe Approach Distance of the EWP in this instance.

Table D – Minimum Safe Approach Distances for Vehicles in Transit

Nominal phase to phase a.c. voltage (volts)	**Safe Approach Distance (m)**
Up to 1000	0.6
Above 1000 but not exceeding 33000	0.9
Above 33000 but not exceeding 132000	2.1
Nominal overhead wiring to rail d.c. voltage (volts)	**Safe Approach Distance (m)**
1500	0.9

NOTE
*T*he above SADs are based on the design or transit envelope of the vehicle not allowing any part of the vehicle such as load, exhaust pipes, radio aerials, to infringe these SADs. Refer to *SMS-06-GD-2066 Managing Construction Hazards*. Where a worker has to stand on or gain access to the top of the vehicle, the SADs of Tables A, B and C apply

Diagram D – to be used in conjunction with Table D



A.4.2.2 Requesting information from the Maintenance Engineer Electrical

Where the planning risk assessment identifies that the Maintenance Engineer Electrical must be requested to provide information such as, but not limited to the voltage, height, or horizontal safety clearances to an aerial line, this request must be made in writing.

Where such a request for information is made, no work must commence until a written response has been received from the Maintenance Engineer Electrical concerned.

Upon receiving a written request for information, the Maintenance Engineer Electrical must ensure that an Authorised Person inspects the proposed work location with the

person requesting the information, and understands the work that is being planned.

The Maintenance Engineer Electrical must then respond to the request in writing, providing all of the requested information and other advice considered relevant to the proposed work. This written advice must remind the requestor that the requirements of this Appendix must be complied with.

A.4.3 Requirements to eliminate or control the risks

The requirements to eliminate or control the risks vary depending on whether the work to be carried out is electrical work (see A.4.3.1) or non-electrical work (see A.4.3.2). Mandatory requirements to comply with for both electrical and non-electrical work are listed in A.4.3.3. Supplementary requirements to control the risks that should be considered for both electrical and non-electrical work are listed in A.4.3.4.

A.4.3.1 Specific requirements for maintenance or construction work on RailCorp's Electrical System (Electrical Work)

The erection, modification and dismantling of 1500 V OHW support structures is not considered to be maintenance or construction work on RailCorp's electrical system.

In addition to A.4.3.3, the following requirements apply:–

A.4.3.1.1. Electrical work that will be required to, or might inadvertently, infringe the SADs of Table C / Diagram C to an aerial line

Where the planning risk assessment concerning the use of the mobile plant reveals that the electrical work is required to, or might inadvertently, infringe the Safe Approach Distances of Table C / Diagram C to an aerial line, the first consideration must be to eliminate the risk by arranging for an Electrical Permit to be issued covering the aerial line whilst work which may infringe the Table C / Diagram C Safe Approach Distance is being undertaken.

When an Electrical Permit to Work is to be put in place SMS-06-FM-0484 Request for Electrical Permit to Work must be completed and submitted. The work must then be conducted in accordance with SMS-06-SW-0267 Working in Accordance with an Electrical Permit.

Warning
Where isolation is used, work must not commence until the Electrical Permit is issued to the person in charge of the work, all persons have been briefed on the conditions of the Electrical Permit and have signed onto the Electrical Permit

Where an Electrical Permit is not reasonably practicable to obtain (see Annex 1), the risk assessment must indicate the reasons why an Electrical Permit is not reasonably practicable to obtain and the approval of the Chief Engineer Electrical must be obtained before the work can proceed unless the electrical equipment is low voltage. In this case, the work must be carried out in accordance with document SMS-06-EN-0590 Work on Live Low Voltage Equipment.

A.4.3.1.2. Electrical work that will be required to, or might inadvertently, infringe the SADs of Table B / Diagram B to an aerial line

Where the planning risk assessment concerning the use of the mobile plant reveals that the electrical work is required to, or might inadvertently, infringe the Safe Approach Distances of Table B / Diagram B then ***the first consideration must be to eliminate the risk by arranging for an Electrical Permit to be issued covering the aerial line whilst the work which infringes the Table B / Diagram B Safe Approach Distance is being undertaken.***

When an Electrical Permit to Work is to be put in place, the SMS-06-FM-0484 Request for Electrical Permit to Work form must be completed and submitted. The work must then be conducted in accordance with SMS-06-SW-0267 Working in Accordance with an Electrical Permit.

Warning :–
Where isolation is used, work must not commence until the Electrical Permit is issued to the person in charge of the work, all persons have been briefed on the conditions of the Electrical Permit and have signed onto the Electrical Permit

Where an Electrical Permit is not reasonably practicable to obtain (see Annex 2), the risk assessment must indicate the reasons why an Electrical Permit is not reasonably practicable to obtain and the following must be planned to be arranged for the work to proceed :–

- a job specific SWMS is to be prepared and approved by an Authorised Officer (Mains). This Authorised Officer (Mains) must be certified to perform all functions of an Authorised Officer (Mains) with the exception of the following 4 specified functions:-
  - approve an Advice of Alteration to Electrical System Operating Diagrams
  - approve a Special 1500V work instruction
  - hold a WHVI for a Test Electrical Permit to Work
  - hold a 1500V Authority" for a Test Electrical Permit to Work

- the mobile plant is to be operated by a person who is qualified to operate the mobile plant concerned and

  either,

  – has in the previous 12 months successfully completed an RTO approved course in 'Safe Electrical Approach for Cranes and Plant' training, or

  – is an Authorised Person Mains, Authorised Officer (Mains or Substations) or Authorised Operator

- a Safety Observer who:

  either

  – is qualified to operate the mobile plant concerned or holds a crane chasers certificate or a dogmans certificate, and

  – is certified in resuscitation and releasing and rescuing a person from live electrical apparatus, and

  – is an Authorised Person (Mains), Authorised Officer (Mains or Substations) or Authorised Operator

  or

  has in previous 12 months successfully completed an RTO approved course in 'Safe Electrical Approach for Cranes and Plant' training,

  is used for the work.
  Note: If a person who meets the above requirements is not available, then it is permissible to use multiple persons who collectively meet these requirements and in combination are to perform the role of Safety Observer.
- prior to the work commencing each day, the Electrical Operating Centre is to be advised of the work
- at the completion of work each day, the Electrical Operating Centre is to be advised of the completion of the work.
- where the aerial line concerned is low voltage, then tiger tails must be fitted to the low voltage aerial conductors by an Authorised Person (Mains) to extend a minimum of five metres beyond the extremities of where the mobile plant will be operating. These tiger tails :–
  – are not to be regarded as providing protection against electrical hazards
  – are only to be considered as an improved visual indication to all persons involved in the mobile plant work of the presence of the low voltage aerial mains
  – are to be inspected by an Authorised Person (Mains) each day prior to the commencement of the work by the mobile plant
  – are to be corrected immediately it is detected that the tiger tails have moved or been damaged.

{Remainder of page left intentionally blank}

A.4.3.1.3. Electrical work that will be required to, or might inadvertently, infringe the Safe Approach Distances of Table A Diagram A to an aerial line

Where the planning risk assessment concerning the use of the mobile plant reveals that the work will be required to, or might inadvertently, infringe the Safe Approach Distances of Table A / Diagram A to an aerial line the work must be planned to be performed with the following minimum controls in place :–

- the mobile plant must be operated by a person who is qualified to operate the mobile plant concerned and

  either

  – has in the previous 12 months, successfully completed an RTO approved course in 'Safe Electrical Approach for Cranes and Plant' training, or

  – is an Authorised Person (Mains), Authorised Officer (Mains or Substations), Authorised Operator, Contract OHW Worker or Contract Aerial Line (HV & LV) Worker.

- a Safety Observer who:

  either

  – is authorised to operate the mobile plant concerned or holds a crane chasers certificate or a dogmans certificate, and

  – is certified in resuscitation and releasing and rescuing a person from live electrical apparatus, and

  – is an Authorised Person (Mains), Authorised Officer (Mains or Substations), Authorised Operator, Contract OHW Worker or Contract Aerial Line (HV & LV) Worker.

  or

  has in previous 12 months successfully completed an RTO approved course in 'Safe Electrical Approach for Cranes and Plant' training,

  is used for the work.

  Note: If a person who meets the above requirements is not available, then it is permissible to use multiple persons who collectively meet these requirements and in combination are to perform the role of Safety Observer.

- prior to the work commencing each day, the Electrical Operating Centre is to be advised of the work, and

- at the completion of work each day, the Electrical Operating Centre is to be advised of the completion of the work, and

- where the aerial line concerned is low voltage, then tiger tails must be fitted to the low voltage aerial conductors by an Authorised Person (Mains) to extend a minimum of five metres beyond the extremities of where the mobile plant will be operating. These tiger tails:–

  – are not to be regarded as providing protection against electrical hazards

  – are only to be considered as an improved visual indication to all persons involved in the mobile plant work of the presence of the low voltage aerial mains

  – are to be inspected by an Authorised Person (Mains) each day prior to the commencement of the work by the mobile plant

  – are to be corrected immediately it is detected that the tiger tails have moved or been damaged.

A.4.3.1.4. Live Line Work

Work carried out using Live Line Techniques with mobile plant is presently limited to low voltage and must be carried out in accordance with Document SMS-06-EN-0590 'Work on Live Low Voltage Equipment'.

A.4.3.1.5. Work to be performed inside a Substation

All work being performed by mobile plant inside a Substation is considered to be Electrical Work and the following conditions apply :-

1. Where mobile plant is to be used to perform work inside a Substation, irrespective of whether or not the mobile plant is located inside the Substation boundary fence, then a Substation Access Permit (SAP) must be issued in accordance with instruction SMS-06-EN-0583 Substation Access Permit.

   Note: In some circumstances, this SAP may be issued without isolation of any equipment, i.e. nil switching is recorded at item (4) and N/A is recorded at item (5) on the issued SAP.

2. The Substation Access Permit must define the area inside the Substation where the mobile plant and work party must be confined to the Electrically Safe Work Area.

3. Where the chassis of the mobile plant is stationary during the work this chassis must be effectively earthed to the Substation earth mat.

4. If the mobile plant, when operating within the Electrically Safe Work Area, is required to infringe the safe approach distances of Table A / diagram A of exposed equipment inside that substation, then:-

   EITHER

   the exposed equipment concerned must be isolated, proved dead and earthed, and identified as such at item (5) on the SAP, prior to the issue of the SAP,

   and

   the mobile plant must be operated by a person qualified to operate the mobile plant concerned in accordance with Appendix A.6,

   and

   a Safety Observer shall be utilised who:

   either
   - is qualified to operate the mobile plant concerned in accordance with Appendix A.6 or holds a WorkCover Authority of NSW high risk work licence in dogging, and
   - is certified in resuscitation and releasing and rescuing a person from live electrical apparatus, and
   - is an Authorised Person (Mains), Authorised Officer (Mains or Substations) or Authorised Operator,

   or

   has in the previous 12 months successfully completed an RTO approved course in 'Safe Electrical Approach for Cranes and Plant' training,

   is used for the work.

Note: If a person who meets the above safety observer requirements is not available, then it is permissible to use multiple persons who collectively meet these requirements and in combination are to perform the role of Safety Observer.

OR

written approval must be obtained from the Chief Engineer Electrical for the work to proceed.

A.4.3.2 Specific requirements for work not in connection with the maintenance and construction of RailCorp's electrical system (non-electrical work)

In addition to A.4.3.3, the following requirements apply:–

A.4.3.2.1. Work being performed in the vicinity of RailCorp Substations

Where the mobile plant is performing work in the vicinity of a RailCorp Substation and the mobile plant is capable of infringing the Safe Approach Distances of Table A / Diagram A of exposed electrical equipment located inside the Substation, then:–

EITHER

a Substation Access Permit must be arranged in accordance with instruction SMS-06-EN-0583 Substation Access Permit to cover the isolation and earthing of this exposed electrical equipment whilst the work which is capable of infringing the Table A / Diagram A Safe Approach Distance is being undertaken. This Electrical Permit can be arranged by contacting the Maintenance Engineer Electrical concerned.

OR

arrange for the use of mobile plant fitted with a movement restriction devices, such as mechanical constraints, or programmable zonal limiting devices which, when activated, are capable of limiting the hoisting, slewing and luffing movements of the mobile plant so as not to infringe the SADs of Table A / Diagram A,

and

arrange for the use of both a mobile plant operator and a safety observer who have both, in the previous 12 months, successfully completed an RTO approved course in 'Safe Electrical Approach for Cranes and Plant' training,

and

arrange for a job specific SWMS covering the work using the restricted mobile plant. This SWMS must require that both the mobile plant operator and safety observer are to ensure that, before work commences on each shift, the movement restriction device is activated and correctly operating to limit the mobile plant from infringing the SADs of Table A / Diagram A.

OR

arrange for the installation of hard barriers, such as jersey curbing, which are capable of withstanding foreseeable forces involved in preventing the mobile plant from occupying a position where the SADs of Table A / Diagram A can be infringed,

and

arrange for the use of both a mobile plant operator and a safety observer who have both, in the previous 12 months, successfully completed an RTO approved course in 'Safe Electrical Approach for Cranes and Plant' training,

and

arrange for a job specific SWMS covering the work using the mobile plant and hard barriers. This SWMS must require that both the mobile plant operator and safety observer are to ensure that, before work commences on each shift, the hard barriers are correctly positioned to limit the mobile plant from infringing the SADs of Table A / Diagram A.

A.4.3.2.2. Work involving mobile plant with a design envelope that is not capable of infringing the SADs of Table A / Diagram A of an aerial line

Where the design envelope of the mobile plant that is planned to be used is not capable of infringing the SADs of Table A / Diagram A of an aerial line, irrespective of where the mobile plant is positioned at the worksite, then :–

the specific item of mobile plant concerned must be uniquely identified on the SWMS and pre-work briefing documents for the work so that it is clear to all concerned that the work must not be performed by any other item of mobile plant,

and

prior to the commencement of work each shift, the person in charge of the work must ensure that the mobile plant item identified on the SWMS and pre-work brief is the actual mobile plant item to be used for the work.

A.4.3.2.3. Work involving mobile plant with a design envelope that is not capable of infringing the SADs of Table B / Diagram B of an aerial line

Where the design envelope of the mobile plant that is planned to be used around an aerial line is not capable of infringing the SADs of Table B / Diagram B of the aerial line, irrespective of where the mobile plant is positioned at the worksite, then the work can be planned to be performed with the following controls implemented as a minimum in connection with the use of the mobile plant around the aerial line:–

the specific item of mobile plant concerned must be uniquely identified on the SWMS and pre-work briefing documents for the work so that it is clear to all concerned that the work must not be performed by any other item of mobile plant

and

the mobile plant must be operated by a person who has, in the previous 12 months, successfully completed an RTO approved course in 'Safe Electrical Approach for Cranes and Plant' training

and

a Safety Observer who has, in the previous 12 months, successfully completed an RTO approved course in 'Safe Electrical Approach for Cranes and Plant' training must be used for the work

and

prior to the commencement of work each shift, both the mobile plant operator and the safety observer must ensure that the unique mobile plant item identified on the SWMS and pre-work brief is the actual mobile plant item to be used for the work

and

prior to the work commencing each day, the Electrical Operating Centre are to be advised of the work

and

at the completion of work each day, the Electrical Operating Centre is to be advised of the completion of the work.

A.4.3.2.4. Work involving mobile plant with a design envelope capable of infringing the SADs of Table B / Diagram B of an aerial line

Where the design envelope of the mobile plant that is planned to be used is capable of infringing the SADs of Table B / Diagram B, then **the first consideration must be to eliminate the risk by :–**

either

planning and arranging for the aerial line to be removed from the worksite for the period that the work which may infringe the Table B / Diagram B Safe Approach Distance will be undertaken.

or

arranging for an Electrical Permit to be issued covering the aerial line whilst the work which may infringe the Table B / Diagram B Safe Approach Distance is to be undertaken.

When an Electrical Permit is to be put in place, the SMS-06-FM-0484 Request for Electrical Permit to Work form must be completed and submitted. The work must then be conducted in accordance with SMS-06-SW-0267 Working in Accordance with an Electrical Permit.

Warning
Where an Electrical Permit is used, work must not commence until the Electrical Permit is issued to the person in charge of the work, all persons (including the mobile plant operator) have been briefed on the conditions of the Electrical Permit and have signed onto the Electrical Permit.

Where either of the above methods of risk elimination is not reasonably practicable (see Annex 1), the planning risk assessment must indicate why and the responsible RailCorp Level 5 Manager may or may not approve the work to proceed. However, work can only proceed if the Line Manger can demonstrate to the RailCorp Level 5 Manager:

- via their documented risk assessment why it is not reasonably practicable to obtain a Permit, and
- that they have established and shall implement a level of risk control on the basis of one of the following 3 options, in order of preference:–

NOTE
If and when needed, the responsible RailCorp Level 5 Manager is to consult the relevant *Maintenance Engineer Electrical on any electrical technical matters prior to approving work to proceed. Records in accordance with SMS requirements (refer SMS-05-TP-1508 Local Safety Records Register) of any advice sought should be kept by the RailCorp Level 5 Manager.*

First option

arrange for the use of mobile plant fitted with a movement restriction device, such as a mechanical constraint, or programmable zonal limiting device which, when activated, is capable of limiting the hoisting, slewing and luffing movements of the mobile plant so as not to infringe the SADs of Table B / Diagram B,

and

arrange for the use of both a mobile plant operator and a safety observer who have both, in the previous 12 months, successfully completed an RTO approved course in 'Safe Electrical Approach for Cranes and Plant' training,

and

arrange for a job specific SWMS covering the work using the restricted mobile plant. This SWMS must require that both the mobile plant operator and safety observer are to ensure that, before work commences on each shift, the movement restriction device is activated and correctly operating to limit the mobile plant from infringing the SADs of Table B / Diagram B,

and

where the aerial line concerned is low voltage, then arrange for tiger tails to be fitted to the low voltage aerial conductors by an Authorised Person (Mains) to extend a minimum of five metres beyond the extremities of where the mobile plant will be operating. These tiger tails:–

- are not to be regarded as providing protection against electrical hazards
- are only to be considered as an improved visual indication to all persons involved in the mobile plant work of the presence of the low voltage aerial mains
- are to be inspected by an Authorised Person (Mains) each day prior to the commencement of the work by the mobile plant
- are to be corrected immediately it is detected that the tiger tails have moved or been damaged,

and

prior to the work commencing each day, arrange for the Electrical Operating Centre to be advised of the work,

and

at the completion of work each day, arrange for the Electrical Operating Centre to be advised of the completion of the work

OR

Second option

arrange for the installation of hard barriers, such as jersey curbing, which are capable of withstanding foreseeable forces involved in preventing the mobile plant from occupying a position where the SADs of Table B / Diagram B can be infringed,

and

arrange for the use of both a mobile plant operator and a safety observer who have both, in the previous 12 months, successfully completed an RTO approved course in 'Safe Electrical Approach for Cranes and Plant' training,

and

arrange for a job specific SWMS covering the work using the mobile plant and hard barriers. This SWMS must require that both the mobile plant operator and safety observer are to ensure that, before work commences on each shift, the hard barriers are correctly positioned to limit the mobile plant from infringing the SADs of Table B / Diagram B,

and

where the aerial line concerned is low voltage, then arrange for tiger tails to be fitted to the low voltage aerial conductors by an Authorised Person (Mains) to extend a minimum of five metres beyond the extremities of where the mobile plant will be operating. These tiger tails:–

- are not to be regarded as providing protection against electrical hazards
- are only to be considered as an improved visual indication to all persons involved in the mobile plant work of the presence of the low voltage aerial mains
- are to be inspected by an Authorised Person (Mains) each day prior to the commencement of the work by the mobile plant.
- are to be corrected immediately it is detected that the tiger tails have moved or been damaged,

and

prior to the work commencing each day, arrange for the Electrical Operating Centre to be advised of the work,

and

at the completion of work each day, arrange for the Electrical Operating Centre to be advised of the completion of the work

OR

Third option

arrange for a job specific SWMS covering the work using the mobile plant to be approved by the Maintenance Engineer Electrical concerned. This SWMS must include the following controls as a minimum:–

- prior to the work commencing each day, arrange for the Electrical Operating Centre to be advised of the work, and
- at the completion of work each day, arrange for the Electrical Operating Centre to be advised of the completion of the work, and,
- the installation of soft barriers that will warn the competent operator and the safety observer that the mobile plant:–

EITHER

is about to enter an area where the mobile plant is capable of infringing the SADs of Table B / Diagram B,

OR

is about to actually infringe the SADs of Table B / Diagram B.

Such soft barriers include :–

- ground level rigid or tape barriers,

or

- high visibility bunting hung below the aerial line conductors by authorised electrical staff (see section A.4.3.3.4 for further details of this bunting),

and

- the use of both a mobile plant operator and a safety observer who have, in the previous 12 months, successfully completed an RTO approved course in ‘Safe Electrical Approach for Cranes and Plant’ training.
- In this case, both the mobile plant operator and safety observer must ensure that, before work commences on each shift, the required soft barriers and other controls specified by the job specific SWMS are in place,

and

- the inhibiting of auto-reclose on high voltage aerial lines where it is possible for the Electrical Operating Centre to remotely inhibit auto-reclose,

and

- where practical, the earthing and bonding of the chassis of the mobile plant,

and

  - where the aerial line concerned is low voltage, then the Maintenance Engineer Electrical must arrange for tiger tails (cable covers) to be fitted to the low voltage aerial conductors by an Authorised Person (Mains) to extend a minimum of five metres beyond the extremities of where the mobile plant will be operating. These tiger tails :–

- are not to be regarded as providing protection against electrical hazards
- are only to be considered as an improved visual indication to all persons involved in the mobile plant work of the presence of the low voltage aerial mains
- are to be inspected by both the mobile plant operator and the safety observer each day prior to the commencement of the work by the mobile plant.
- are to be reported back to the Maintenance Engineer Electrical concerned by the workers involved in the use of the mobile plant immediately it is detected that the tiger tails have moved or been damaged. No work must commence using the mobile plant until the tiger tails have been replaced or located in the correct position by an Authorised Person (Mains).
- must be thoroughly inspected every 6 months by an Authorised Person (Mains) should the worksite require the tiger tails to remain in service at the location for periods of long duration.

A.4.3.3 Requirements related to all work around RailCorp's electrical system using mobile plant.

A.4.3.3.1. Safe Work Method Statements

All work performed around RailCorp's electrical system using mobile plant must be carried out in accordance with SWMS developed in accordance with SMS-06-OP-2043 Managing Risk Using Safe Work Practices. (See Section 5 of the main text of this document for further information on the controlling of hazards associated with working around electrical equipment).

A.4.3.3.2. Safe Approach Distances for mobile plant in transit

Mobile plant stowed for transit which is driven under aerial lines is subject to the Safe Approach Distances as set out in Table D where an Electrical Permit has not been issued for the aerial line.

These Safe Approach Distances must be maintained to all extremities of the transit envelope of the mobile plant including such items as exhaust pipes and radio aerials.

Where a worker has to stand on top of or gain access to the top of the mobile plant, the approach distances in Tables A, B and C apply.

A.4.3.3.3. Minimising unexpected movement of the mobile plant

Consideration must always be given to the use of the following controls to minimise the risk of unexpected movement of the mobile plant:–

- preparation of the ground or surface and maximum deployment of outriggers.
- additional supports or packing to increase the stability of the mobile plant.
- adjustment or servicing of the mobile plant, to minimise surge or backlash.

A.4.3.3.4. Providing marking barriers to define areas that the mobile plant should not enter

Whenever work is being performed around an aerial line without an Electrical Permit, consideration must be given to the provision of marking barriers to define areas that the mobile plant should not enter such as by :–

- using rigid or tape barriers to mark off areas under aerial lines,
- arranging for the Maintenance Engineer Electrical concerned to mark the limit of the Safe Approach Distance with high visibility 'bunting' or similar. Refer to Figure A 3 below.

Figure A 3 – Illustration of a visual tape bunting fitted under overhead power lines.

{Remainder of page left intentionally blank}

A.4.3.3.5. Controls for workers in contact with the mobile plant and ground or other earthed situation when using mobile plant around an aerial line not covered by an Electrical Permit

A) Operators

Where mobile plant is required to, or might inadvertently, infringe the Safe Approach Distances of Table A / Diagram A of an aerial line not covered by a Electrical Permit, operators are permitted to operate this mobile plant whilst standing on the ground only if one of the following controls, in order of preference, is implemented whilst the mobile plant is, or might inadvertently, infringe the Safe Approach Distances of Table A / Diagram A :–

EITHER

the operator uses wireless remote control to operate the mobile plant and does not touch any part of the mobile plant or its load,

OR

the operator stands on an equipotential conductive mat which is electrically connected to all metalwork associated with the mobile plant controls,

OR

in the case of low voltage aerial lines, the operator stands on a rubber insulating mat 900mm x 900mm x 6mm thick that is clean and dry,

OR

in the case of low voltage aerial lines, the operator wears low voltage insulating gloves.

B) Other workers making contact with the mobile plant

Other workers must not touch any part of the mobile plant and the ground, or other earthed situation while the mobile plant is, or might inadvertently, infringe the Safe Approach Distances of Table A / Diagram A of an aerial line not covered by a Electrical Permit. However, work such as:–

positioning or removing lifting gear from the mobile plant hook,

or

adjusting outriggers, jacks, packing, chocks or similar,

may be carried out provided the following minimum controls are employed:–

- the mobile plant and load are stationary, and
- control of the load by non-conductive tail ropes that have been inspected for no damage, moisture-free and cleanliness prior to use is carried out.

NOTE
Authorised Electrical staff working from the bucket of an EWP in accordance with Clauses A.4.3.1.2 or A.4.3.1.3 may make simultaneous contact between the bucket and the overhead wiring support structure provided the requirements of SMS-06-EN-0571 Overhead Wiring Structure to Rail Voltage Test are complied with.

C) Other workers making contact with the load being manoeuvred

Other workers must not touch any part of the load being manoeuvred by the mobile plant and the ground or other earthed situation while the mobile plant is, or might inadvertently, infringe the Safe Approach Distances of Table A / Diagram A of an aerial line not covered by a Electrical Permit, unless the following minimum controls are employed:–

a synthetic fibre sling is used to connect the lifting hook of the mobile plant to the load slings,

and

a job specific SWMS has been prepared covering the work requiring contact to be made with the load. This SWMS must include the requirement that, before each individual lifting operation is commenced, both the Safety Observer and the mobile plant Operator are to ensure that the synthetic fibre sling has been installed

A.4.3.3.6. Notices to be fixed to Mobile Plant

Mobile plant working around electrical equipment must be fitted with one of the two following notices as per Figure A 4 and Figure A 5 below. The notice must be displayed at each set of controls and must be readily visible to the operator. 'Rail only' mobile plant which operates within the rolling stock gauge or which has a design envelope that is only capable of infringing rolling stock gauge at track level is exempt from this requirement.

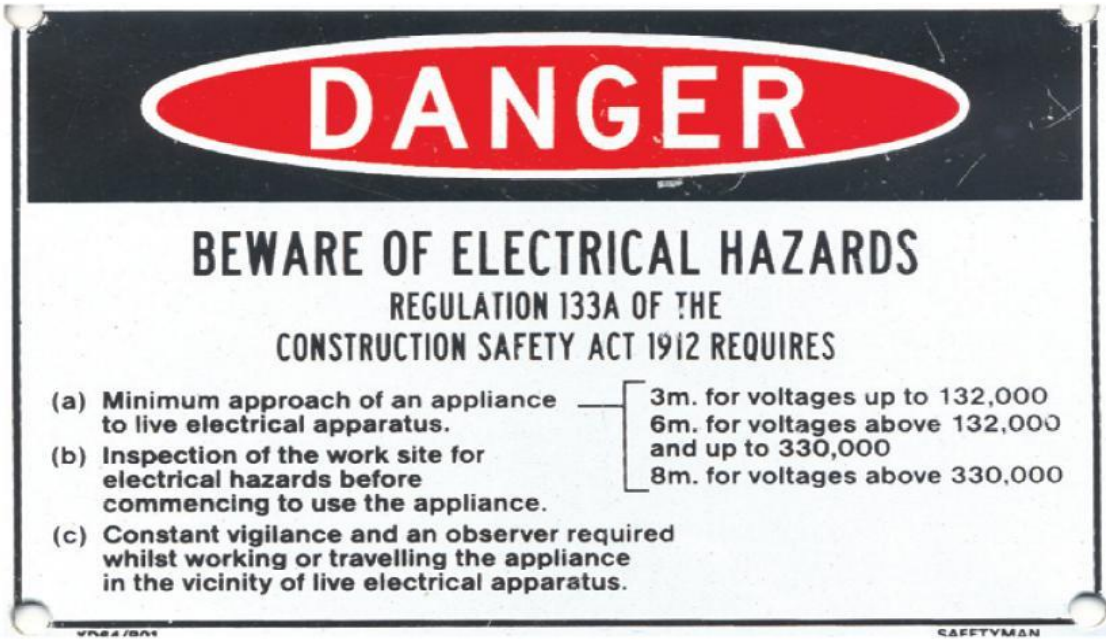


Figure A 4 – Notice that may remain fitted to mobile plant commissioned before 1 September 2001 (i.e. existing notice as at the date of introduction of the OHS Regulation 2001) – Dimensions 150mm wide, 100mm high.

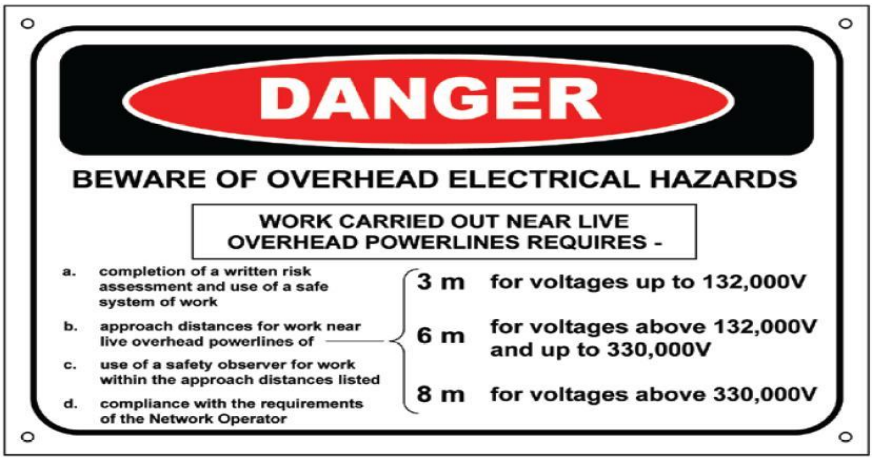


Figure A 5 – Alternative notice or label for mobile plant commissioned after 1 September 2001 – Dimensions 150mm wide, 100mm high.

A.4.3.4 Supplementary Controls that should be considered when operating mobile plant around aerial lines

Consideration should be given to the use of the following controls in support of the mandatory controls previously described:–

- Fitting warning devices to the mobile plant that alerts the operator when the mobile plant has entered high voltage overhead power line zones.
- Using warning signs attached to supports at or near ground level warning workers of the location of overhead power lines and / or defined work areas. Refer to Figure A 5 below.
- Using mobile plant that has been fitted with devices that restrict the speed of mobile plant operations such as slewing, luffing and hoisting can be performed.

Figure A 5 – Overhead power lines warning sign

{Remainder of page left intentionally blank}

A.5 Appointment and Duties of Safety Observer's

Refer to Sections 5.2 and 5.3.5 of this Guide in relation to the appointment and duties of Safety Observer's.

A.6 On site verification of competence of mobile plant operators and safety observers

Where required, this Guide stipulates that Mobile Plant Operators (who must also hold a WorkCover Authority of NSW high risk work licence or equivalent) and Safety Observers must have, in the previous 12 months, successfully completed a Registered Training Organisation (RTO) approved course in Safe Electrical Approach for Cranes and Plant' training, which includes a satisfactory on the job skills assessment. These persons must be in possession, at the worksite, of statements of attainment or written certification of the course while ever performing the work for which the competence is required.

A.7 Emergency procedure in the event of an incident involving mobile plant working around electrical equipment

In the event of an incident involving mobile plant working around electrical equipment, the Electrical Operating Centre is to be contacted as soon as possible after the incident on Telephone No. (02) 9379 4911.

The WorkCover Code of Practice 2006 Work Near Overhead Power Lines includes an emergency procedure following contact with live overhead power lines. This emergency procedure is included in this Guide at Annex 3.

A.8 References to Appendix A

- WorkCover Code of Practice for Work Near Overhead Power Lines 2006
- AS 2294 Earth-moving machinery – Protective Structures (all parts)
- AS 1636 Tractors – Roll-over protective structures (all parts)
- ISSC 32 Guide for Network Operators to provide Information to the Construction Industry for the use of Cable Covers – December 2007
- SMS-06-OP-2043 Managing Risks Using Safe Work Practices
- SMS-18-SP-2078 Safety Action Management
- SMS-06-OP-2046 Energy Lock-Out/Tag-Out
- SMS-06-OP-2029 Manage Risks in Construction Projects
- SMS-06-OP-2035 Manage Risks with Plant and Equipment
- SMS-06-GD-2112 Guide to Plant Risk Assessment
- http://sms.railcorp.nsw.gov.au/Shared Documents/SMS-06-GD-0282 Scaffolding.pdfSMS-06-SW-0264 Portable Ladders, Stepladders and Step Platforms

Annex 1 Using mobile plant around electrical equipment Flowchart.

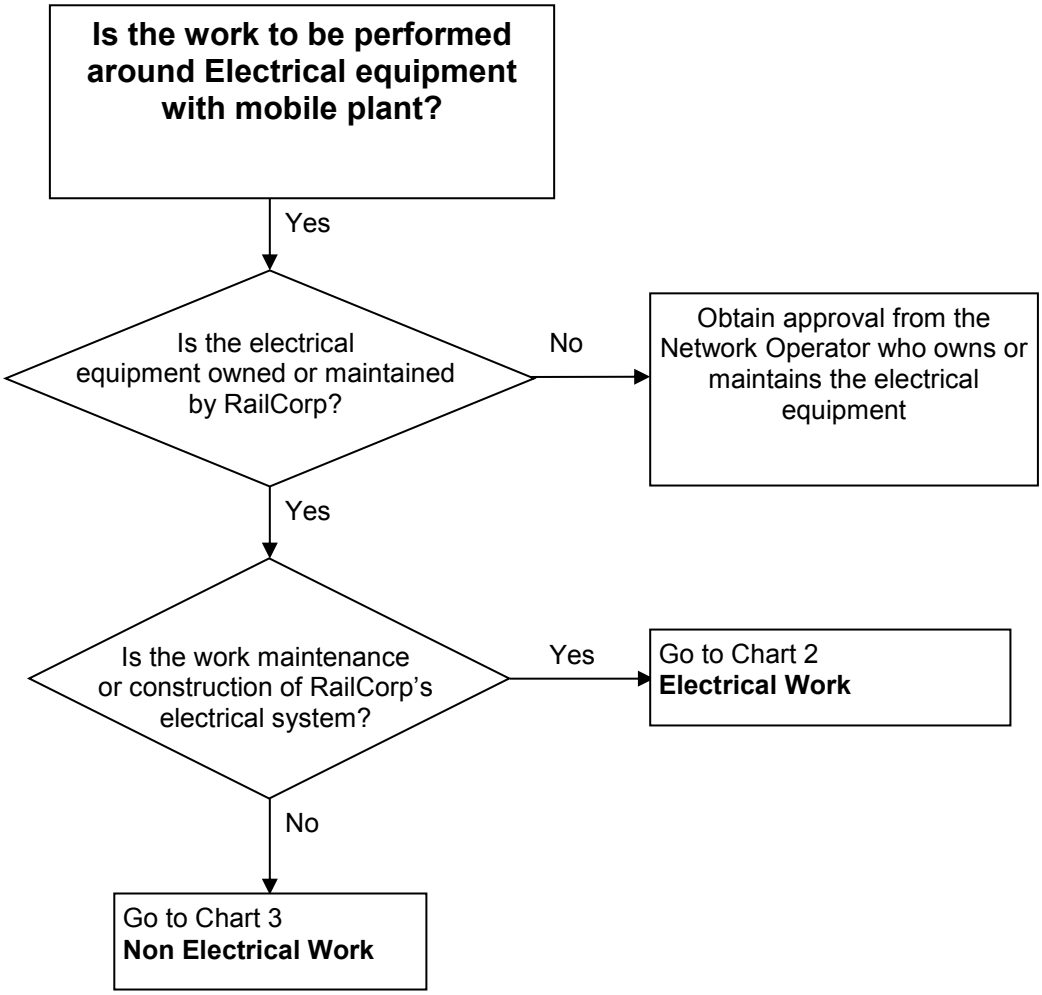


Chart 1

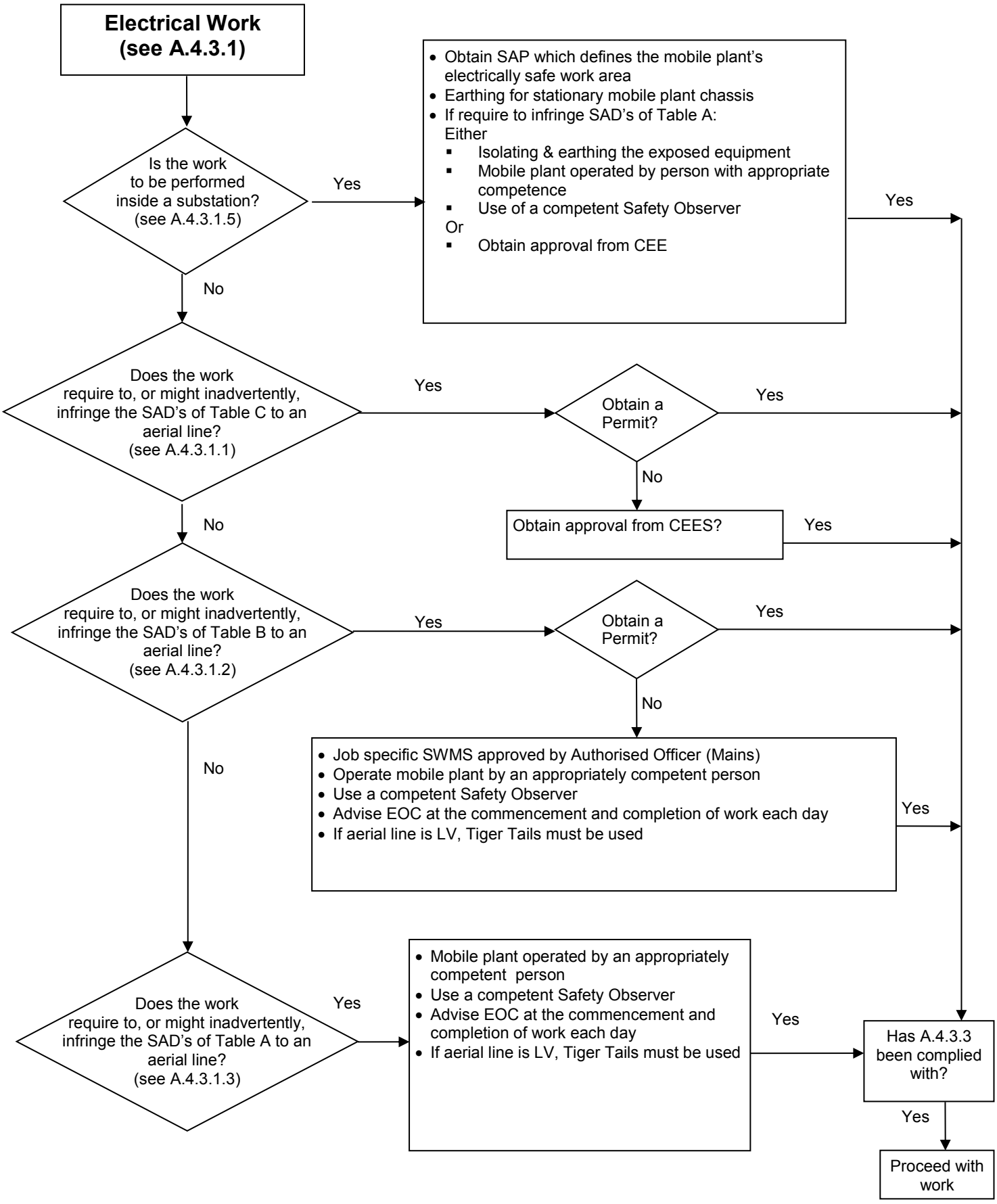


Chart 2

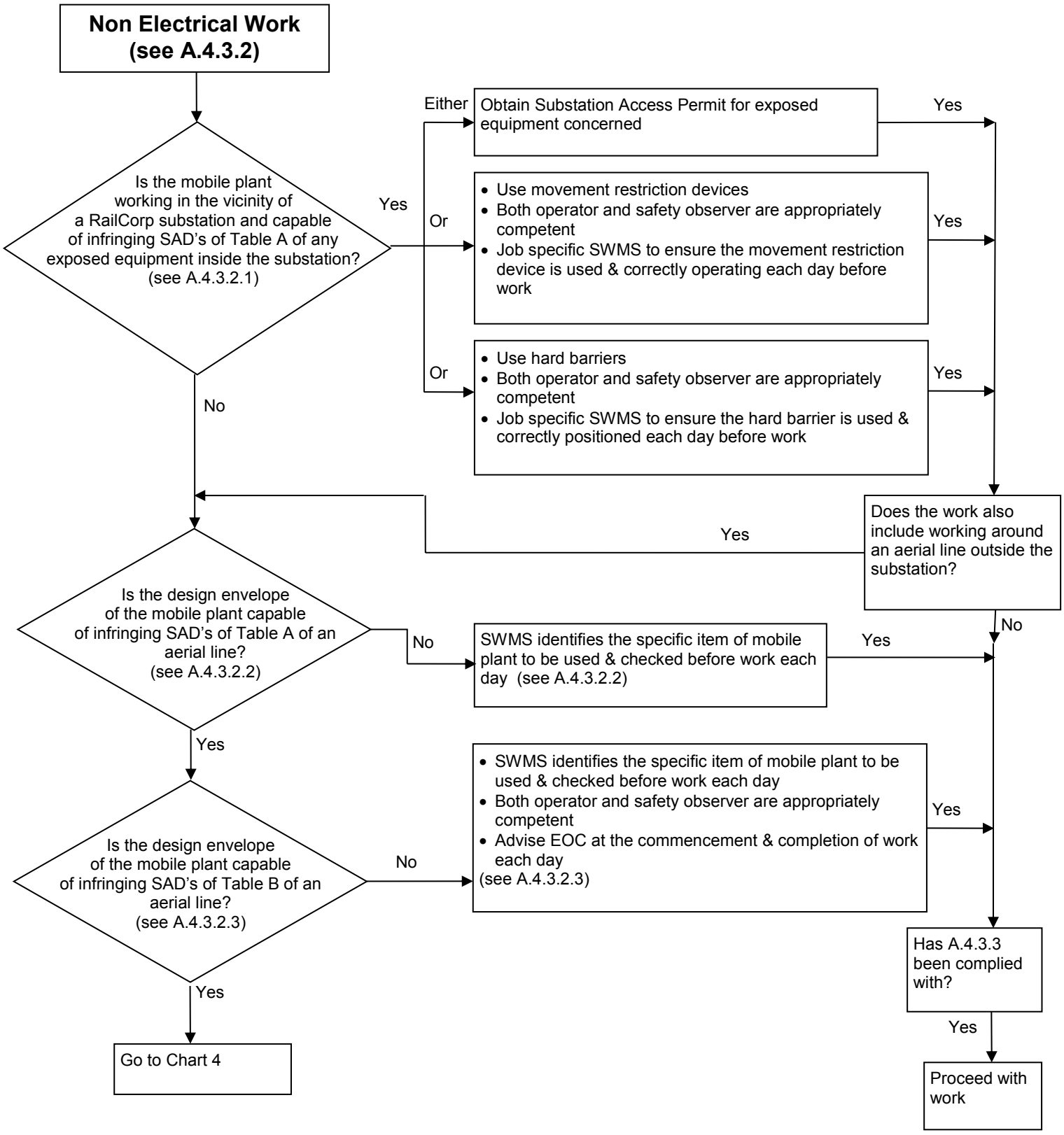


Chart 3

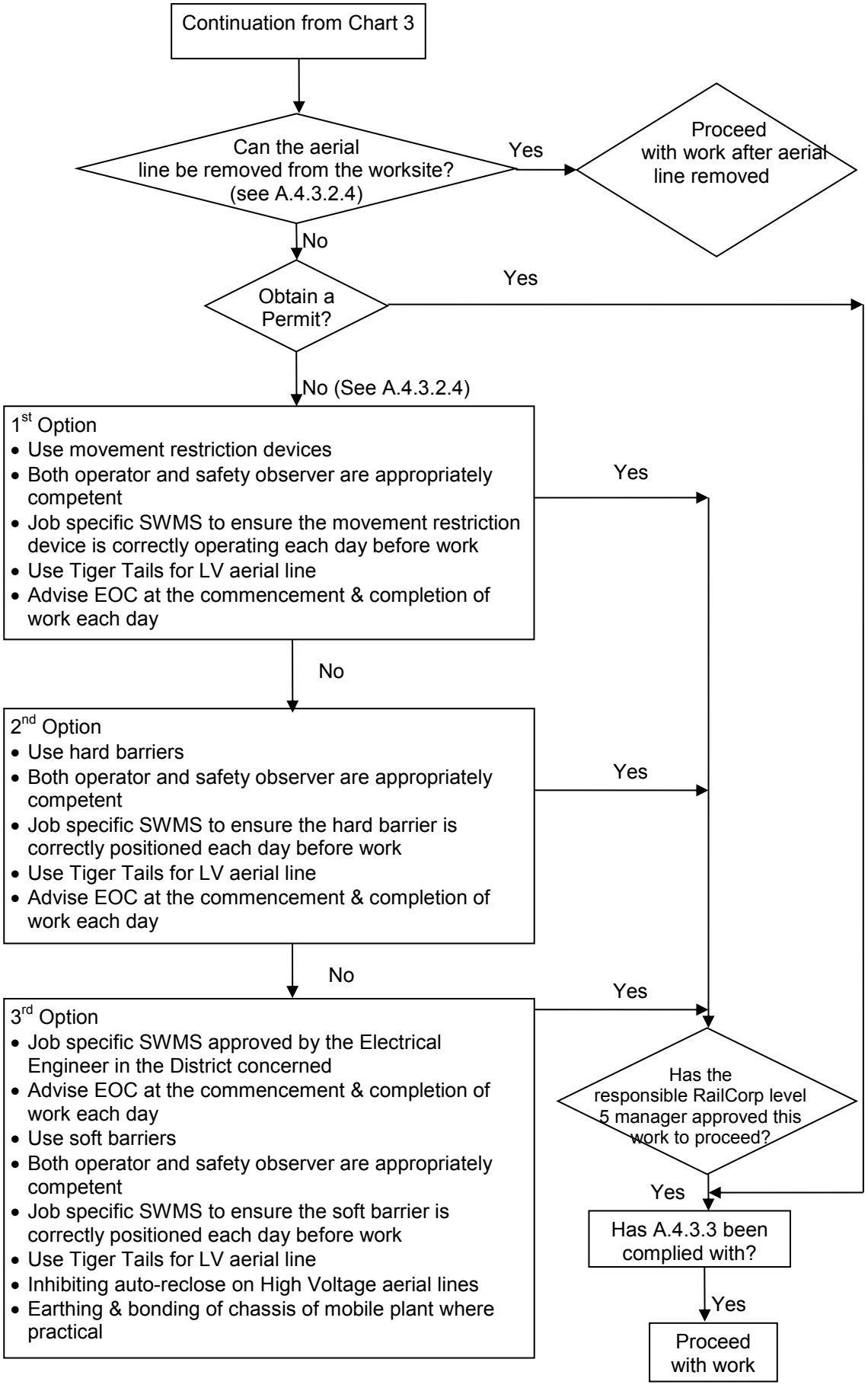


Chart 4

Annex 2 Guidance on "Reasonably Practicable" in connection with either arranging for an Electrical Permit or arranging for the aerial line to be removed from the worksite

The following general guidance is given on the reasonable practicability of controlling the risk of working with mobile plant around aerial lines by eliminating the risk through

either

removing the aerial line away from the worksite (by either deviating the aerial line or undergrounding)

or

arranging for an Electrical Permit to be issued for the aerial line.

Concerning a particular planned worksite in question, advice must be sought from the Maintenance Engineer Electrical concerned.

Warning :–
Where the risk assessment indicates that the work using the mobile plant cannot commence until the aerial line is either removed from the worksite or isolated and an Electrical Permit issued, then this work must not commence until either one or the other of these controls has been implemented.

AN.2.1 The reasonable practicability of removing an aerial line from a mobile plant worksite

AN.2.1.1 1500V Overhead Wiring

It is not reasonably practical to consider the removal of 1500V DC Overhead Wiring away from a worksite as this would also require the deviation of the associated track under the Overhead Wiring concerned or the closing of the track to electric rolling stock.

AN.2.1.2 High Voltage aerial lines

Only in exceptional circumstances would consideration be given to the removal of an aerial line from a mobile plant worksite. This is due to the complexity of the design and documentation, cost and resource intensiveness of the work.

The decision to implement this control would normally require the approval of the RailCorp General Manager Infrastructure.

AN.2.1.3 Low Voltage aerial lines

Only in circumstances involving a mobile plant worksite operating over a period of prolonged duration would consideration be given to the removal of a low voltage aerial line from a mobile plant worksite. This is due to the cost and resource intensiveness of the work.

The decision to implement this control would normally require the approval of the RailCorp District Manager Infrastructure in the District concerned.

AN.2.2 The reasonable practicability of obtaining an Electrical Permit for a mobile plant worksite

AN.2.2.1 1500V Overhead Wiring

Planning for work using mobile plant requiring an Electrical Permit to be issued for a section of 1500V Overhead Wiring must include an enquiry to the Maintenance Engineer Electrical concerned as to the next planned possession / power off period for the track and Overhead Wiring section concerned.

In general, planned power off periods for most sections of the 1500V Overhead Wiring system for continuous periods of up to 7 days occur at least once annually and Electrical Permits for a section have to fit in with the track possession / power outage configurations which are planned 12 months in advance i.e. the next planned track possession / power outage allowing an Electrical Permit to be issued for a particular mobile plant worksite may not be occurring until up to 12 months into the future. A suitable track possession / power outage may be available by chance at shorter notice and the Maintenance Engineer Electrical concerned should be consulted as to the availability of obtaining an Electrical Permit when planning for the work.

It is stressed that the existence of a planned track possession and power outage for a particular section of Overhead Wiring does not guarantee that the Maintenance Engineer Electrical concerned will be able to arrange the issue of an Electrical Permit due to the limited resources available to perform this Electrical Permit issuing.

When an Electrical Permit is to be requested, form SMS-06-FM-0484 Request for Electrical Permit to Work must be completed and submitted to the Maintenance Engineer Electrical concerned.

AN.2.2.2 High Voltage aerial lines

Planning for work using mobile plant requiring an Electrical Permit to be issued for a High Voltage aerial line must include an enquiry to the Maintenance Engineer Electrical concerned as to the next planned maintenance isolation for the aerial line concerned.

High Voltage aerial line isolations generally do not have the same operational impacts as 1500V isolations and it may be possible for a high voltage aerial line isolation to be arranged specifically for the mobile plant work.

For short duration (single day and clear of peak hours) worksites, it is generally reasonably practicable to obtain an Electrical Permit for a high voltage aerial line provided the required 6 weeks notice of the Electrical Permit is given as required by SMS-06-FM-0484 Request for Electrical Permit to Work. If the isolation of the high voltage aerial line affects supplies to RailCorp locations such as workshops and / or private customers, longer planning times would be involved due to arrangements necessary to find a suitable time for the interruption to supply to the customer or the arranging of alternate supply to the customer.

It is stressed that neither the existence of a planned maintenance isolation for a particular high voltage aerial line nor the submitting of a request for an Electrical Permit 6 weeks prior to the planned mobile plant work guarantees that the Maintenance Engineer Electrical concerned will be able to arrange the issue of an Electrical Permit due to the limited resources available to perform this Permit issuing.

For longer duration worksites (multiple day or requiring isolations over the peak hours), longer planning times will be required to allow options to be considered to mitigate the risks associated with such isolations. This planning must include the RailCorp System Control Engineer as well as the Maintenance Engineer Electrical. Generally, weekday isolations must be planned to be clear of peak hours and such isolations are therefore limited to the hours of 10am to 2pm. Again, it is stressed that limited resources are available for Electrical Permit issuing and it is likely that allocation of such resources for longer duration worksites will require approval of the RailCorp District Manager Infrastructure in the District concerned.

AN.2.2.3 Low Voltage aerial lines

Planning for work using mobile plant requiring an Electrical Permit to be issued for a Low Voltage aerial line must include an enquiry to the Maintenance Engineer Electrical as to the next planned maintenance isolation for the aerial line concerned.

{Remainder of page left intentionally blank}

Annex 3 Emergency Procedure following contact with live overhead power lines or apparatus

(Reproduced from the WorkCover Code of Practice for Work Near Overhead Power Lines)

Should contact be made with a live overhead power line or a flash-over occurs between a live overhead power line and a crane or an item of mobile plant, the following actions shall be taken:–

- An attempt should be made to break the machinery's contact with the live overhead power line by moving the jib or driving the machine clear.
- If it is not possible to break the contact with the live overhead power line, the operator of the crane or mobile plant should remain inside the cabin of the crane or on the plant item. The network operator should be called immediately to isolate power to the live overhead power line. The operator must remain in place until the power has been isolated, and the 'all clear' given by the network operator.

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

- Warn all other personnel and members of the public to keep 8 metres clear from the crane or item of plant. Do not touch or allow persons to touch any part of the crane or plant item and do not allow persons to approach or re-enter the vehicle until an Authorised Person has determined the site safe.

If it is essential to leave the cabin or the operator's position due to fire or other life threatening reason, then jump clear of the equipment. Do not touch the equipment and the ground at the same time. When moving away from the equipment, the operator should hop or shuffle away from the plant item (with both feet together) until at least 8 metres from the nearest part of the crane or plant. Under no circumstances run or walk from the crane or item of plant as voltage gradients passing through the ground may cause electricity to pass through the body resulting in an electric shock.

- Warn all other personnel and members of the public to keep 8 metres clear from the crane or item of plant. Do not touch or allow persons to touch any part of the crane or plant item and do not allow persons to approach or re-enter the vehicle until an Authorised Person has determined the site safe.
- Untrained, unequipped persons should not attempt to rescue a person receiving an electric shock. All too often secondary deaths occur because others get electrocuted trying to help earlier victims. If the crane or plant operator is immobilised, ensure the power supply has been isolated and the site has been made safe before giving assistance.

{Remainder of page left intentionally blank}

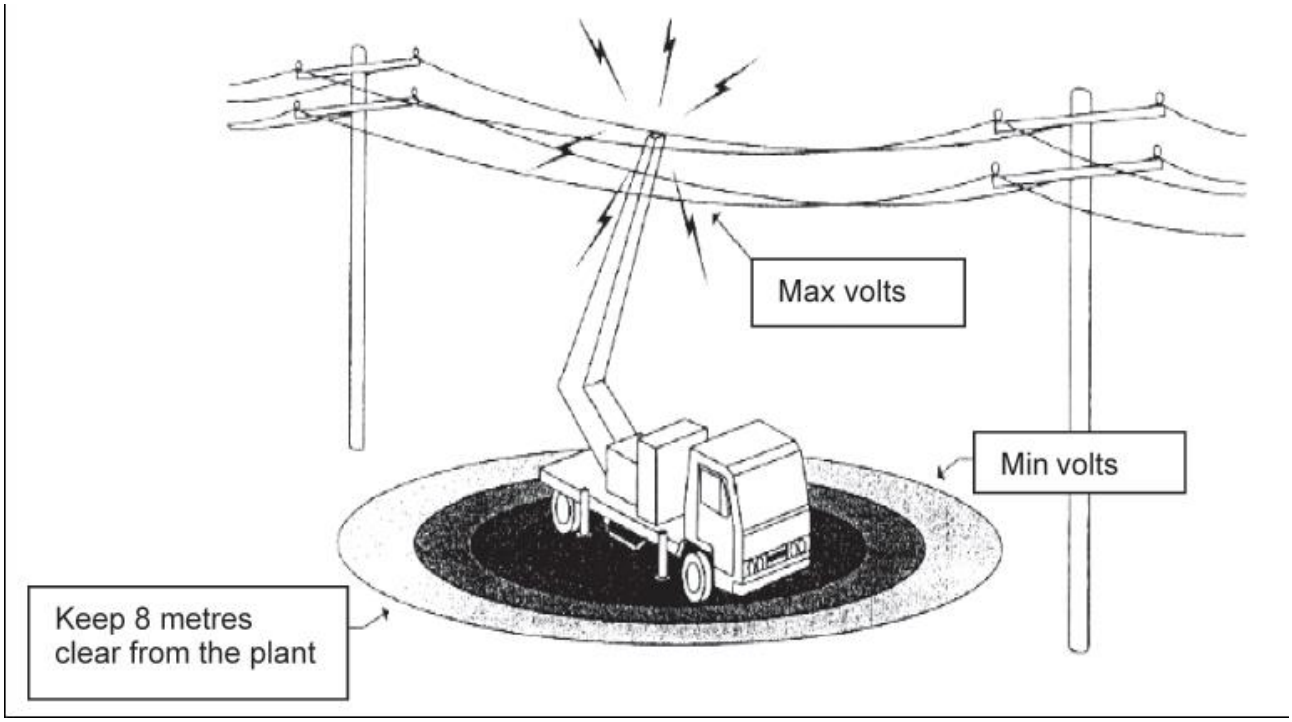


Figure AN3 – Affected area surrounding mobile plant when in contact with a live overhead power line

Post – incident inspection by a competent person

When a crane or item of mobile plant has been in contact with a live overhead power line, it should checked by a competent person for any damage to the components of the crane or mobile plant. Any actions recommended by the competent person are to be completed before the crane or mobile plant is returned to service.

Tyres on cranes and mobile plant that have been in contact with overhead power lines where electrical flash-over and current flow occurs through the rubber tyres should be considered as a potential hazard.

These rubber tyres may catch fire, with the obvious potential for them to explode. Additionally, a lesser known danger may occur, which results when combustion takes place within the tyre, with no apparent external signs. When excessive heat is developed in or applied to a tyre as in the case from contact with overhead power lines, it can initiate a process known as pyrolysis, which is the decomposition of a substance by heat. This can generate a build up of flammable gases and pressure within the tyre, which may ultimately rupture or explode.

Vast amounts of energy can be released by a tyre explosion, often leading to significant equipment damage, serious injures or fatalities. Pyrolysis related explosions are very unpredictable, and have been known to occur immediately or up to 24 hours after initiation. An explosion can occur where no fire is visible and the danger area can be up to 300 metres from the tyre.

Any rubber tyred crane or plant item involved in an incident where contact is made with overhead power lines which results in discharges or flash-over of electrical current through the tyres should be considered as a potential hazard. The risk should be managed by:–

- parking the crane in an isolation zone, with a minimum 300 metre radius,
- removing all personnel from the area, and not allowing access to isolation zone for 24 hours, and
- alerting fire fighting services.

Appendix B Temporary Structures around Electrical Equipment

B.1 Purpose

To provide information about the hazards, controls and the additional safety requirements to be complied with specifically associated with temporary structure work, such as scaffolding and scaffolding work, around electrical equipment owned or maintained by RailCorp up to and including 132,000V AC and 1500V DC.

Generally, work around electrical equipment using temporary structures must be performed at greater SADs than those described in Tables 1 and 2 of Section 11. This Appendix includes the SADs relevant to temporary structure work.

B.2 Scope

This Appendix is applicable to all workers undertaking temporary structure work, such as scaffolding, around RailCorp owned or maintained live exposed electrical equipment.

This Appendix provides information on the hazards and controls associated with temporary structure work:

- around aerial lines, 1500V DC OHW and associated electrical equipment owned or maintained by RailCorp; and
- inside electrical substations owned or maintained by RailCorp.

This Appendix does not apply to temporary structures and temporary structure work around electrical equipment owned or maintained by another Electricity Network Operator, which is to be carried out in accordance with that Electricity Network Operator's safety instructions.

For general information on the hazards and safety requirements associated with working around electrical equipment, refer to the main body of this Guide.

Note

Management of non-electrical hazards associated with temporary structure work is addressed by SMS-06-GD-2066 Managing Construction Hazards.

Work that involves a risk of a person falling more than 2 m, construction work carried out on or near energised electrical installations or services or other types of construction work as defined in the Regulation are defined as 'high risk construction work' (WHS Regulation 2011 section 291)

B.3 Definitions

Temporary Structure includes but is not limited to temporary: access platforms, barriers, catch platforms, cantilever platform bays, framework, formwork, landing platforms, loading platforms, scaffolding, stairways, support members and the like, used for construction works or working platforms. A temporary structure can be fixed, transportable or portable.

Temporary structure work(s) refers to the erection, alteration, or dismantling of a temporary structure and any associated rigid barriers.

{Remainder of page left intentionally blank}

B.4 General requirements

This Appendix should be implemented in addition to any relevant requirements identified in the documents identified below or the documents called up within these documents:

- SMS-06-GD-2066 Managing Construction Hazards, and
- Work Health and Safety Regulation 2011 section 225, and
- WorkCover NSW 'Erecting, altering and dismantling scaffolding, and
- AS/NZS 1576.1 Scaffolding Part 1: General requirements, and
- AS/NZS 4576 Guidelines for scaffolding. AS/NZS 4576 "*gives practical guidance for the training and certification of scaffolders, the preparation of sites for scaffolding, and the safe selection, supply, erection, alteration, dismantling, maintenance, inspection and use of scaffolding and scaffolding equipment".*

B.5 Planning the work

Prior to undertaking any temporary structure works or use of temporary structures around live exposed electrical equipment, planning for this work must be carried out by the person requiring this work to be performed.

This planning must be done in consultation with the persons who will actually be doing the work and must include:–

- An identification of the foreseeable hazards involved in performing work around the live exposed aerial line or electrical equipment (see B.5.1), and
- An assessment of the risks (see B.5.2), and
- Understanding and planning to implement the relevant requirements necessary to eliminate or control the risks (see B.5.3).

B.5.1 Identification of the foreseeable electrical hazards

Workers performing temporary structure works or using temporary structures near, or in the vicinity of, live exposed electrical equipment, 1500V DC OHW, aerial lines and associated electrical equipment are at a substantial risk of death or serious injury. Accordingly such work process shall be

- controlled to ensure that health and safety risks are eliminated, so far as is reasonably practicable, or
- if it is not reasonably practicable to eliminate those risks, to minimise those risks so far as is reasonably practicable (SFAIRP).

Refer to Section

Control of work process of this Guide for further details.

1500V OHW or an aerial line, and associated electrical equipment owned or maintained by RailCorp shall be treated as **live** by a person unless that person has signed onto an Electrical Permit covering that 1500V OHW, aerial line or equipment and covering the work being performed by that person whilst that Electrical Permit is current.

Contact (or near contact) between either a component member of the temporary structure or a person working on the temporary structure, and

- live exposed electrical equipment, and/or
- a live exposed aerial line, and/or
- live 1500V DC OHW,

can result in:

- Electric shock (possible cardiac arrest)
- Arcing
- A rain of molten metal
- Fire
- Explosion
- Swift, unpredictable aerial line conductor whip lash
- Loss of electrical power supply to the rail network, which may have major implications for rail safety

Note
It is important to remember that the above risks can arise by arcing from close approach as well as from direct contact with live exposed aerial lines, 1500V DC OHW and/or associated electrical equipment.

B.5.2 Assessment of the risks

B.5.2.1 Electrical Risk Factors

In addition to the risk assessment and planning requirements of Section Risk assessment and planning of this Guide, risk factors which shall be considered include, but are not limited to:

a) the voltage of the aerial line and / or the associated equipment

If the aerial line includes multiple feeders erected on the same pole route, then the voltage of each of the individual feeders shall be considered in order to determine the risk.

If the voltage of the aerial line and associated equipment is not known and cannot be definitely determined, then the Maintenance Engineer Electrical (or their representative) concerned is to be contacted to obtain accurate information. (See Section B.5.2.3 of this Appendix.)

b) the height of the conductors and horizontal distance to the conductors

When looking up at conductors it is often difficult to judge distances. This is particularly the case where higher voltages are involved and the distances are large. Where possible the situation is to be viewed from several angles to make sure that the required safe approach distance is not infringed.

Warning
Do not attempt to directly measure the height or horizontal position of aerial lines or 1500V OHW with a measuring tape, stave or other physical measuring device. If the distance cannot be determined by sighting or measured with a non contact measuring device, contact the Maintenance Engineer Electrical concerned to arrange an Authorised Person to perform the measurement

Aerial conductors are made of metal and can expand and contract when heated and cooled. This can be a result of high ambient air temperature and / or heating caused by load current passing through the conductors. Regardless of the cause, any expansion will result in gravity causing the power lines to sag downwards. Wind can also cause the power lines to swing from side to side. For this reason, the safe approach distances (SAD) shall be increased either vertically or horizontally by the amount of conductor sag or swing possible at the point of work. Refer to Figure B 1.

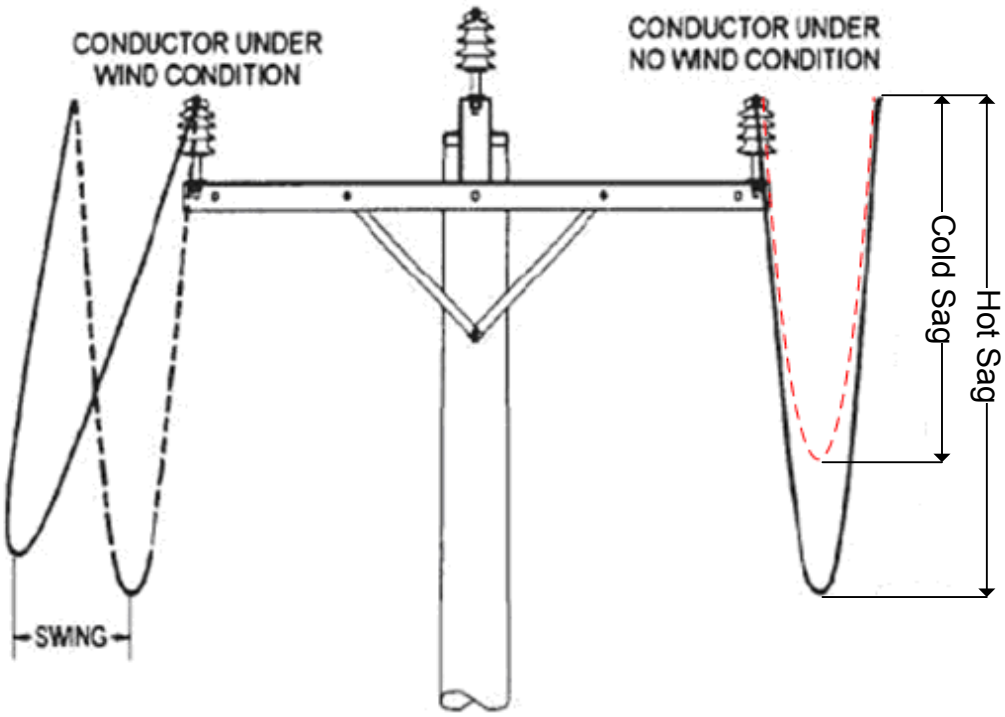


Figure B 1 Illustration of aerial lines 'sag or swing'

c) magnification of movement

Another important risk factor is the magnification of movement that occurs with tall items of equipment on relatively narrow bases. Any movement due to uneven ground, subsidence or the like may be magnified several times in the resultant movement at the top of the item.

d) temporary structure material

Temporary structure members may be metallic or non-conductive. For example, non-conductive scaffolding comprises long members of non-conductive material such as timber or fibreglass.

A non-conductive temporary structure system may include small metallic components such as couplings, adjustable bases and castors. When used with non-conductive long members, these components are considered non-conductive for safety purposes.

Warning
Metallic members or components of temporary structures must not be placed on, in contact with or bridge the rails.

e) the safe approach distances (SAD) required to be maintained from the temporary structure being used or during temporary structure works. (See Section B.5.2.2 of this Appendix.)

B.5.2.2 Safe Approach Distances (SADs)

The SAD is the closest distance which any part of the temporary structure or any person, hand held tool, equipment or material being used in connection with temporary structure works or temporary structure usage may come to live exposed electrical equipment such as 1500V OHW, an aerial line (HV or LV) and associated electrical equipment.

The SADs specified in this document are as detailed in Tables A and B below. These are the minimum distances to be maintained. Additional clearance is to be added to these distances to allow for the risk factors relevant to the work such as conductor movement due to the effects of wind and temperature or inadvertent movement or mishandling of material which would infringe on the SAD.

The SADs specified in Table A below define a rectangular area around the aerial line as depicted in Diagram A below. The Table A SAD's determines the dimensions of this rectangle which temporary structure work must not impinge unless performed under an Electrical Permit.

The SADs specified in Table B below define a rectangular area around the aerial line as depicted in Diagram B below. The Table B SAD's determines the dimensions of this rectangle which must not be impinged when using a temporary structure unless performed under an Electrical Permit.

{Remainder of page left intentionally blank.}

Table A – Minimum Safe Approach Distances for a Temporary Structure / Temporary Structure Work and Live Exposed Electrical Equipment unless performed under an Electrical Permit

Electrical equipment type	Temporary structure material			
	Conductive		Non-conductive	
	Vertical[1]	Horizontal	Vertical[1]	Horizontal
1500V DC Aerial feeders	4.0m	4.0m	2.7m	1.5m
1500V DC Overhead Wiring (clearance to OHW and extremity of pantographs)	4.0m	Structure gauge[2] + 4.0m	2.7m	Structure gauge[2] + 1.5m
Up to and including 1000V AC	4.0m	4.0m	2.7m	1.5m
Above 1000V AC up to and including 33kV AC	4.0m	4.0m	3.5m	2.1m
Above 33kV AC up to and including 132kV AC	4.0m	4.0m	4.0m	3.0m

NOTES

1. The vertical distances given are the minimum distances that the highest part of the temporary structure work, including handrails must remain **below** the live exposed electrical equipment unless the necessary horizontal SAD's are met.
2. Structure Gauge is "*a defined envelope around the track, within which no structure is permitted*". Refer RailCorp standard ESC 215 Transit Space for details. Consult the track discipline representative for values of the Structure Gauge if there is any doubt
3. No temporary structure work is permitted above live exposed electrical equipment.
4. In relation to aerial lines, the abovementioned SAD's are only for aerial lines having a maximum span of 125 m. For aerial lines having a span greater than 125m contact the Chief Engineer, Electrical. (See AS/NZS 4576 Table 5.4.3 for context.)

Diagram A – Minimum Safe Approach Distances (SADs) for Temporary Structure Work unless performed under an Electrical Permit (to be used in conjunction with Table A)

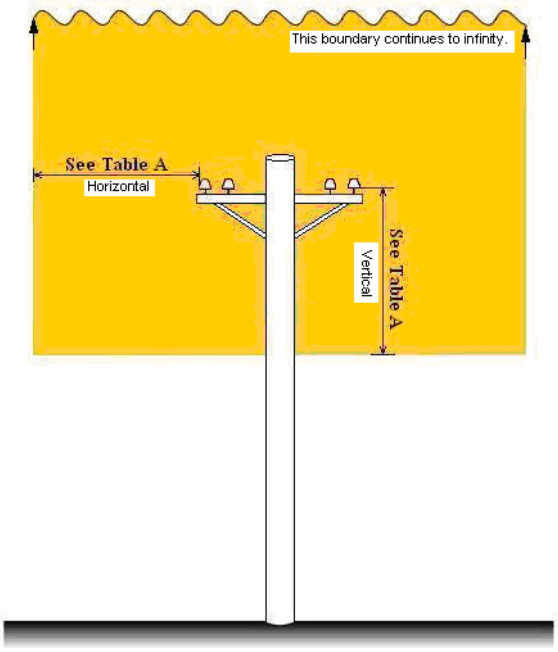


Table B – Minimum Safe Approach Distances between a Temporary Structure and Live Exposed Electrical Equipment after completion of Temporary Structure Work unless under an Electrical Permit

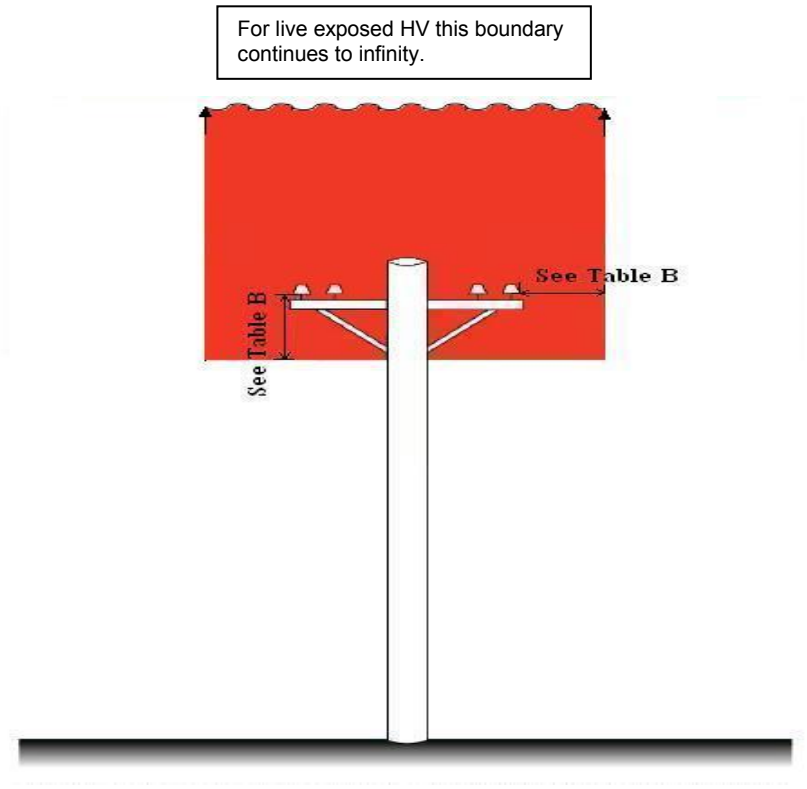
Location	Around aerial lines		In substations
	Vertical	Horizontal	Both vertical and horizontal
1500 Volt Equipment			
1500V DC Aerial feeders	2.7m[1]	0.6m	N/A
1500V DC Overhead Wiring (clearance to OHW and extremity of pantographs)	2.7m[1]	Structure Gauge[3] + 0.6m	N/A
Substation equipment	N/A	N/A	0.3m
High Voltage Equipment			
Above 1000V AC up to and including 33kV AC	3.5m[2]	1.5m	0.3m
Above 33kV AC up to and including 66kV AC	4.0m[2]	2.0m	0.6m
Above 66kV AC up to and including 132kV AC	4.0m[2]	2.5m	1.1m
Low Voltage Equipment			
Up to and including 1000V AC	2.7m[1]	0.6m	0.3m

NOTES

1. The vertical distances given are the minimum distances that the highest or lowest part of the temporary structure work, including handrails must remain **below** or **above** the live exposed electrical equipment unless the necessary horizontal SAD's are met.
2. The vertical distances given are the minimum distances that the highest part of the temporary structure work, including handrails must remain **below** the live exposed electrical equipment unless the necessary horizontal SAD's are met.
3. Structure Gauge is "*a defined envelope around the track, within which no structure is permitted*". Refer RailCorp standard ESC 215 Transit Space for details. Consult the track discipline representative for values of the Structure Gauge if there is any doubt.

{Remainder of page left intentionally blank.}

Diagram B – Minimum Safe Approach Distances between a Temporary Structure and Live Exposed Electrical Equipment after completion of Temporary Structure Work unless under an Electrical Permit (to be used in conjunction with Table B)



{Remainder of page left intentionally blank.}

B.5.2.3 Requesting information from the Maintenance Engineer Electrical.

Where required, any requests for information (e.g. voltage, height, horizontal clearance, etc) from the Maintenance Engineer Electrical shall be made in writing.

Where such a request is made, no work shall commence until a written response has been received from the Maintenance Engineer Electrical.

Upon receiving a written request for information, the Maintenance Engineer Electrical shall ensure that an Authorised Person inspects the proposed work location with the worker requesting the information, and understands the work that is being planned.

The Maintenance Engineer Electrical shall then respond to the request in writing, providing all of the requested information and other advice considered relevant to the proposed work. The written advice shall remind the requestor that the requirements of this Guide shall be complied with.

B.5.3 Requirements to eliminate or control electrical risks

B.5.3.1 General

RailCorp does NOT allow work or permit temporary structure work or the use of temporary structures above live exposed HV aerial lines or equipment. Temporary structures fitted with a continuous rigid barrier are NOT exempt from this requirement.

Temporary structure work or the use of temporary structures:

- adjacent to live exposed HV aerial lines or equipment, or
- adjacent, above or below live exposed Low Voltage or 1500V DC overhead wiring or equipment,

is permitted provided the work is to be carried out under an appropriate Electrical Permit, or the:

(a) work is to carried out in accordance with an approved SWMS, and

(b) specific work is to approved by an Authorised Officer (Mains or Substations), and

(c) appropriate requirements of Sections B.5.3 of this Appendix are complied with.

B.5.3.2 Temporary structure works that will be required to, or might inadvertently, infringe the SADs of Table A to Live Exposed Electrical Equipment

Where the planning assessment concerning the temporary structure work reveals that the work will be required to, or might inadvertently, infringe the SADs of Table A of this Appendix, **the first consideration shall be to eliminate the risk by arranging for an Electrical Permit to be issued covering the temporary structure work around the live exposed electrical equipment prior to work commencement.**

When an Electrical Permit to Work is to be put in place, SMS-06-FM-0484 Request for Electrical Permit to Work shall be completed and submitted. The work shall then be conducted in accordance with SMS-06-SW-0267 Working in Accordance with an Electrical Permit.

{Remainder of page left intentionally blank.}

\

Warning
Where an Electrical Permit is used, work shall not commence until the Electrical Permit is issued to the person in charge of the work, all workers have been briefed on the conditions of the Electrical Permit and have signed onto the Electrical Permit

Where an Electrical Permit is not reasonably practicable to obtain due to operational factors, the risk assessment shall indicate the reasons why an Electrical Permit is not reasonably practicable and the approval of the Chief Engineer, Electrical shall be obtained in writing before the work can proceed.

Where temporary structure work has been carried out under an Electrical Permit, this Electrical Permit shall only be cancelled under the following conditions:-

Either

The erected temporary structure does not infringe the SADs of Table A of this Appendix and the use of the temporary structure will not infringe the SADs of Section Safe Approach Distances (SADs) Tables 1 and 2 of this Guide.

Or

All of the following conditions are met:

- The erected temporary structure, including rigid barriers, does not infringe the SADs of Table B of this Appendix.
- Continuous rigid barriers are installed to prevent workers who will be using the temporary structure, or tools and equipment to be used by these workers, from infringing the SADs specified in Section Safe Approach Distances (SADs) Tables 1 and 2 of this Guide. These SADs shall be achieved as a taut string distance to the top, side and bottom extremities of the barrier. (Refer Section B.5.3.4 of this Appendix for further requirements for erecting and using continuous rigid barriers.)
- The decision is based on a documented risk assessment that considered the nature of the work and the continuous rigid barriers and the RailCorp Level 5 Manager provides written authorisation for the reduction in SADs from Table A of this Appendix. Use the SMS-06-FM-0107 WHS Risk Assessment Form or a Safe Work Method Statement to record the risk assessment.

NOTE
The risk assessment is to be completed, reviewed and accepted prior to the commencement of Temporary Structure works.

- A competent person has inspected the temporary structure after its erection and before its use, to certify that the temporary structure is fit for its intended purpose and has been erected in compliance with the manufacturer's specifications or the design drawings. A temporary structure handover certificate is to be provided and kept at the site. (Refer to SMS-06-GD-2066 and AS/NZS 4576 for inspection and recording requirements.)
- If the temporary structure comprises metallic members, it is effectively earthed, or in the case of 1500 Volt equipment, is connected through a spark gap to a rail. The proposal to earth / rail connect shall be documented and presented to the Maintenance Engineer Electrical for review and approval before such work takes place.
- If the aerial line is low voltage, then the low voltage aerial conductors are covered with cable covers (Tiger Tails). These Tiger Tails:
  - are to extend a minimum of five metres beyond the extremities of where the temporary structure has been erected.

- are to be installed by an Authorised Person (Mains)
- are not to be regarded as providing mechanical protection or electrical insulation but rather as a visual indication and reminder of the presence of the low voltage conductors
- are to be inspected by the person in charge of the temporary structure work each day prior to commencing the temporary structure work. This inspection is to ensure that the tiger tails have not moved or been damaged. Should such movement or damage be detected, then an Authorised Person (Mains) shall be contacted to ensure the Tiger Tails are placed in the correct position prior to the temporary structure work re-commencing.

Or

Written approval for the cancellation of the Permit is obtained from the Chief Engineer, Electrical.

NOTE
*If the Chief Engineer, Electrical (CEE) is to be called upon to provide approval to cancel the SAP, then **prior** to starting temporary structure works the CEE shall approve such works.*

B.5.3.3 Use of Temporary Structures around Live Exposed Electrical Equipment

An Electrical Permit to Work is not required under any of the following three circumstances:

1) The temporary structure does not infringe the SADs of Table A of this Appendix and the work carried out using the temporary structure will not infringe the SADs of Section Safe Approach Distances (SADs) Tables 1 and 2 of this Guide, or

2) The temporary structure does not infringe the SADs of Table B of this Appendix and continuous rigid barriers in accordance with Section B.5.3.4 of this Appendix have been installed so that the SADs of Section Safe Approach Distances (SADs) Tables 1 and 2 of this Guide cannot be infringed by workers or tools and equipment being used by them. These SADS shall be achieved as a taut string distance to the top, side and bottom extremities of the barrier.

   If the aerial line is low voltage, then the LV aerial conductors are covered with tiger tails as per Section B.5.3.2 above, or

3) Written approval to perform the work without a Permit is obtained from the Chief Engineer Electrical.

   Otherwise, an Electrical Permit to Work shall be issued to allow the use of the temporary structure.

B.5.3.4 Erection and Use of Continuous Rigid Barriers on Temporary Structures

All the following conditions shall be met for the use of continuous rigid barriers on temporary structures:

- The material used shall be non-conductive, e.g. sheets of 9mm marine ply.
- The material used shall be designed to be adequately protected against damage that might reasonably be expected due to its expected period of use, environmental and other external influences to which it may be exposed under the conditions of its use. Damages from such influences may include mechanical damage, and damage because of exposure to weather, water, flora, fauna, excessive dampness, corrosive fumes, galvanic action, accumulation of dust, oil, temperature or vibration etc.

- The continuous rigid barrier or its supporting structure shall not be attached to the structure supporting electrical assets.
- Gaps between fitted sheets of material shall not exceed 3mm.
- No exposed cut or drilled holes are permitted in the sheets of material.
- The continuous rigid barrier shall be so erected that:
  a) Its horizontal distance (refer Diagram C, D or E) from exposed electrical equipment shall not be less than the minimum horizontal clearance distances of Table B of this Appendix, and
  b) Its vertical limits (refer Diagram C, D or E) shall not be less than the minimum vertical SAD from exposed electrical equipment of Table B of this Appendix for both the upward and downward directions.
- Warning signs shall be affixed to the safe side of the barrier, warning of the presence of the electrical hazard on the other side of the barrier, and warning that the barrier shall not be removed.
- The design and installation of the continuous barrier, being an integral component of the temporary structure, is carried out in accordance with Section B.5 of this Appendix.
- Written approval shall be provided by the competent person who provides certification of the structural limitations of the proposed barrier to resist the forces that may be imposed during the work process. This certification shall document the work processes and resultant maximum loads to be applied to the barrier. For temporary structure / barrier arrangements to be used inside Substations or above exposed electrical equipment, the designer shall ensure that the same level of care is taken as would be applied to a permanent structure.
- A competent person shall visually inspect the barrier on a daily basis to ensure that the sheets of material are in a satisfactory condition and remain impenetrable. Records of inspection shall be maintained. (Refer to SMS-06-GD-2066 and AS/NZS 4576 for additional inspection and recording requirements, e.g. inspection of scaffold by a competent person at intervals not exceeding 30 days or after repair or modification.)
- If a barrier is used above a temporary structure, and this barrier could be used as an accessible area, the Chief Engineer, Electrical is to provide written approval for the arrangements to exclude anyone from the upper surface of this barrier.

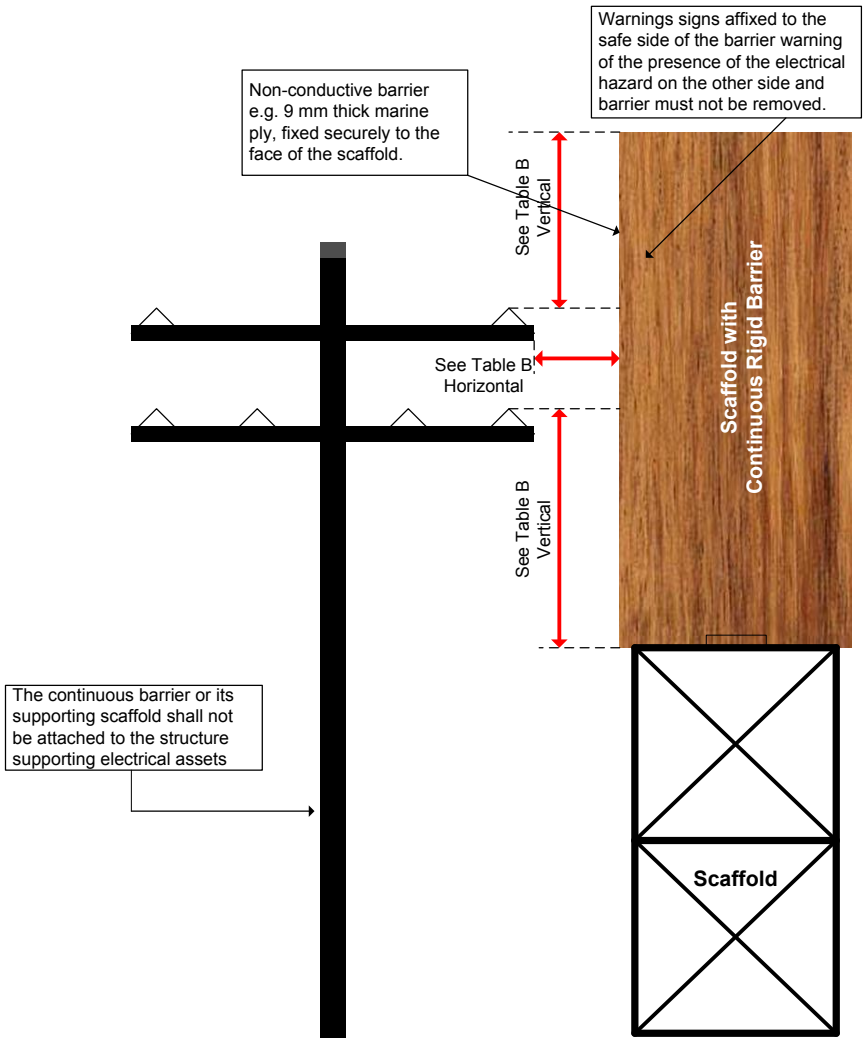


Diagram C – Temporary Structure with Continuous Rigid Barrier

{Remainder of page left intentionally blank.}

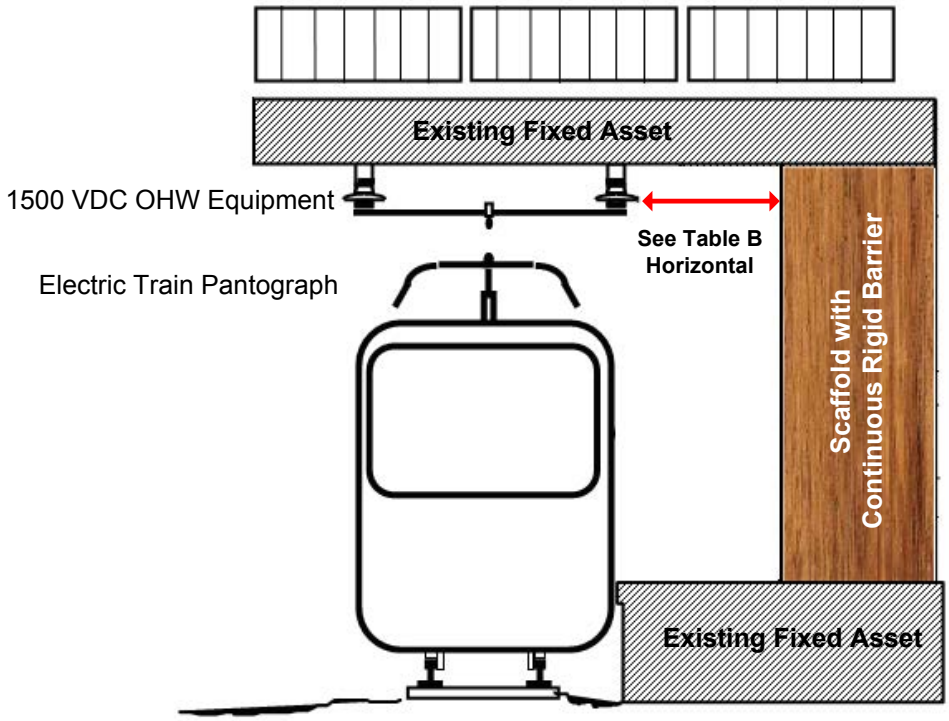


Diagram D – Temporary Structure with Continuous Rigid Barrier

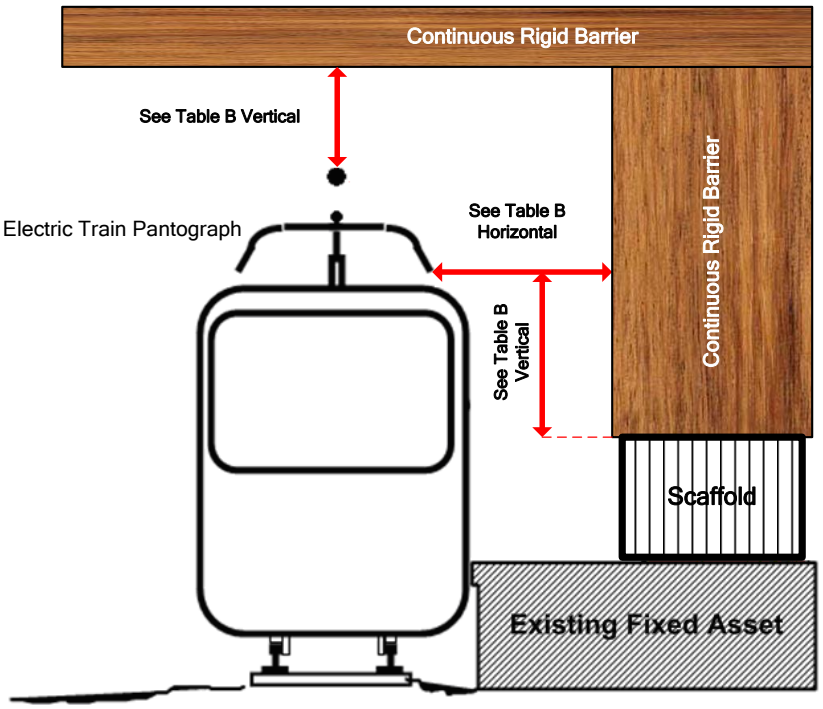


Diagram E – Temporary Structure with Continuous Rigid Barrier

B.5.3.5 Temporary Structure Work and Use of Temporary Structures inside a Substation

(A) Requirements for Temporary Structure Work:

1) A Substation Access Permit (SAP) in accordance with SMS-06-EN-0583 Substation Access Permit shall always be issued.

2) Where the planning risk assessment reveals that the SADs of Table A of this Appendix will not be infringed, no equipment needs to be isolated and earthed. In this case, the SAP will define the area in which the work is permitted to be carried out.

3) The SAP shall always define the route along which the temporary structure components are to be moved to and from the work area.

4) Arrangements are to be made with the Authorised Person (Substations) whom will issue the SAP for a metallic temporary structure to be earthed:

   - as soon as practicable during erection, and
   - until as late as practicable during dismantling.

5) Where the planning risk assessment reveals that the temporary structure work will be required to, or might inadvertently, infringe the SADs of Table A of this Appendix, this equipment shall be isolated and earthed prior to the issue of the SAP.

   The SAP may be cancelled and the equipment re-energised at the completion of the temporary structure work provided that:

   - the temporary structure does not infringe the SADs of Table A of this Appendix, or
   - the erected or altered temporary structure does not infringe the SADs of Table B of this Appendix, and the temporary structure has been fitted with continuous rigid barriers in accordance with Section B.5.3.4 above so that the SADs of Section Safe Approach Distances (SADs) Table 1 of this Guide cannot be infringed by workers who will use the temporary structure or tools and equipment to be used by them. These SADs shall be achieved as a taut string distance to the top, side and bottom extremities of the barrier , or
   - Written approval to cancel the SAP is obtained from the Chief Engineer, Electrical.

NOTE
*If the Chief Engineer, Electrical (CEE) is to be called upon to provide approval to cancel the SAP, then **prior** to starting temporary structure works the CEE shall approve such works.*

(B) Requirements for the Use of Temporary Structures

1) A Substation Access Permit (SAP) in accordance with SMS-06-EN-0583 Substation Access Permit shall always be issued.

2) If the planning risk assessment concerning the work reveals that:

   - the temporary structure does not infringe the SADs of Table A of this Appendix, and
   - the work carried out using the temporary structure will not infringe the SADs of Section Safe Approach Distances (SADs) Table 1 of this Guide,

   then no equipment needs to be isolated and earthed. In this case, the SAP will define the area in which the work is permitted to be carried out.

3) Where the planning risk assessment concerning the work reveals that the work to be carried out will be required to, or might inadvertently, infringe the SADs of Section Safe Approach Distances (SADs) Table 1 of this Guide, this exposed equipment shall be isolated and earthed prior to the issue of the SAP, unless:

Either

All of the following conditions are met:

- The erected temporary structure does not infringe the SADs of Table B of this Appendix.
- Continuous rigid barriers in accordance with Section B.3.3.3 above have been installed so that the SADs of Section Safe Approach Distances (SADs) Table 1 of this Guide cannot be infringed by workers or tools and equipment being used by them. These SADs shall be achieved as a taut string distance to the top, side and bottom extremities of the barrier.
- The decision is based on a documented risk assessment that considered the nature of the work and the continuous rigid barriers and the Authorised Person (Substations) whom issued the SAP provides written authorisation for the reduction in clearances. Use SMS-06-FM-0107 WHS Risk Assessment Form or a Safe Work Method Statement.
- If the temporary structure comprises metallic members, it is effectively earthed.

Or

Written approval for the cancellation of the SAP is obtained from the Chief Engineer, Electrical.

NOTE
*If the Chief Engineer, Electrical (CEE) is to be called upon to provide approval to cancel the SAP, then **prior** to starting temporary structure works the CEE shall approve such works.*

B.5.3.6 Temporary Structure Work adjacent to Substations

Temporary structure work is not to be planned or performed within 5 metres of the boundary fence of a substation without approval of the Maintenance Engineer Electrical.

B.5.3.7 Temporary Structures in Electric Vehicle Maintenance Centres (EVMCs)

Approval shall be sought from the manager of the respective EVMC prior to any temporary structure work or the use of temporary structures within the EVMC.

B.6 References

- AS/NZS 3000:2007 Wiring Rules
- AS/NZS 1576.1:2010 Scaffolding Part 1: General requirements
- AS/NZS 4576:1995 Guidelines for scaffolding
- ISSC 32 Guide for Network Operators to provide Information to the Construction Industry for the use of Cable Covers – December 2007
- RailCorp standard ESC 215 Transit Space
- Safe Work Australia Code of Practice July 2012 “Managing electrical risks in the workplace”
- SMS-06-EN-0583 Substation Access Permit

- SMS-06-EN-0598 Electrical Permit to Work
- SMS-06-FM-0107 WHS Risk Assessment Form
- SMS-06-GD-2066 Managing Construction Hazards
- SMS-06-SW-0267 Working in Accordance with an Electrical Permit.
- WorkCover NSW Guide of November 2010 Erecting, altering and dismantling scaffolding
- WorkCover NSW Code of Practice 2006 Work Near Overhead Power Lines
- Work Health and Safety Regulation 2011