

Engineering System Integrity
Engineering Instruction
Electrical Distribution Unit

EI D 24-03

Maintenance Work adjacent to live 1500V Overhead Wiring

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

Date in Force: 31/05/2024

Date of Review: 31/05/2025

Approved by:

Sean Budge
A/Associate Director
Electrical Distribution Unit

Authorised by:

Aaron Manvell
A/Engineering Technical
Publications Manager

Audience:

- Network Maintenance Traction Line workers
- Network Maintenance Planners
- Maintenance Operations Managers
- Network Maintenance Elec Team Managers

Main Points:

- Network Maintenance line workers can apply D2018/4081 when undertaking Routine or corrective maintenance adjacent to live 1500V Overhead wiring.
- During the planning phase an Authorised Officer Mains must endorse the D2018/4081 as appropriate for the scope and define any additional controls to be applied and recorded in the pre work brief.

Primary Affected Document: SP D 79050 Safe Use of Mobile Plant around Electrical Equipment

Scope

Network Maintenance request for a waiver for Routine or Corrective Maintenance from the Associate Director EDU to allow the use of mobile plant that might infringe the Safe Approach Distance (SAD) of 1500V Overhead Wiring (OHW) as described in [SP D 79050 Safe Use of Mobile Plant around Electrical Equipment](#) section 8.8.

OFFICIAL

Disclaimer

This document was prepared for use by Sydney Trains and its intended recipient. The information in this document is protected by copyright and no part of this document may be reproduced, altered, stored, or transmitted by any person without the prior consent of Sydney Trains. Errors or omissions in this document should be reported to sydneytrainsstandards@transport.nsw.gov.au. Sydney Trains makes no warranties, express or implied, that compliance with the contents of this document shall be sufficient to ensure safe systems or work or operation.

Background

Routine and Corrective Maintenance of 1500V OHW may require Authorised or Accredited Line workers to undertake work using plant adjacent to roads with live 1500V OHW. [SP D 79050](#) requires approval of a waiver to the ENSR from the Associate Director EDU for works that will be required or might inadvertently infringe the SAD of [SP D 79050](#) Table 1/Column C.

Network Maintenance has developed and published a Safe Work Instruction [D2018/4081 Working on OHW within a track possession adjacent to live OHW tracks using Mobile Plant \(excludes MVEs\)](#).

- [D2018/4081](#) is approved **only** for Routine or Corrective Maintenance with Plant **that has the potential** to encroach the SAD of [SP D 79050](#) table 1/Column C of live 1500V OHW.
- Routine or Corrective Maintenance with Mobile Plant that is **planned** to encroach the safe approach distance of [SP D 79050](#) table 1/Column C of live 1500V OHW **shall not** proceed without a waiver to the ENSR from the Associate Director EDU.

Action required

In planning corrective or Routine Maintenance adjacent to live 1500V the responsible person planning the work shall:

- Define the works to be completed and the locality of the work adjacent to live 1500V OHW.
- Identify the mobile plant to be used, with consideration of the envelope of the plant for the intended work, and when getting onto the track or off the track in its “packed for transport” condition and allowing for uncontrolled tip/tilt of the plant during those actions.
- Request an Authorised Officer Mains (AOM) review of the scope of work and applicability of [SWI D2018/4081](#).

If requested, an AOM (with competence F. hold a 1500V “Authority”) shall:

- Review the applicability of [SWI D2018/4081](#) for the scope of works,
- Consider the hazard and likelihood of infringing the SAD of [SP D 79050](#) table 1/Column C of live 1500V OHW, and either:
 - Approve in writing the application of [SWI D2018/4081](#) for the provided scope; or
 - Approve in writing the application of [SWI D2018/4081](#) with additional controls to be implemented and documented in the Pre-Work Brief; or
 - Reject the application of [SWI D2018/4081](#) requiring isolation of the adjacent 1500V OHW.

If approved by the AOM the nominated Site Supervisor shall:

- Ensure any additional controls nominated by the AOM are recorded on the relevant Pre-Work Briefing, a implemented: and
- Ensure that all staff have been briefed in [SWI D2018/4081](#) within the last six months and maintain records of the briefings: and
- Nominate one or more competent Safety Observers (as defined in [PR D 78700 Working around Electrical Equipment](#) Section 5) for each piece of plant working adjacent to live 1500V Overhead Wiring.

Where one or more Safety Observer/s are engaged, they shall:

- Fulfill the requirements for a safety observer as defined in Equipment [PR D 78700](#) Section 5.4; and
- Not carry out any other activity 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; and
- Have put in place and confirmed the effectiveness of arrangements to communicate with the persons operating the mobile plant as well as persons in the vicinity (e.g. riggers, dogmen, or persons in contact with or controlling the movement of a load) throughout the process, particularly in the event of emergency.

OFFICIAL

EDU Electrical Safety Systems shall:

- Undertake a review of [SWI D2018/4081](#) with a representative of Maintenance Operations and Maintenance Engineering prior to 30/06/2024; and
- Amend [SP D 79050](#) to also include references to approved Safe Work Instructions for routine works endorsed by EDU as an alternative to a waiver in section 8.8.

Associate Director Maintenance Operations shall ensure EDU Electrical Safety Systems endorse any development or revision of Safe Work Instructions for Maintenance work near live electrical equipment prior to approving for publication.

Contact

If you have any questions or need further clarifications please contact your Line Manager, Safety Professional or the Electrical Distribution Unit.

OFFICIAL

**Engineering System Integrity
Electrical Network Safety Rules**

**Engineering Specification
Electrical Distribution Unit**

Working Near or On/Within

SP D 79050

**Safe Use of Mobile Plant around
Electrical Equipment**

Version 1.0

Date in Force: 1 February 2022

Approved by: Associate Director
Electrical Distribution Unit
Engineering System Integrity

Authorised by: Engineering Technical
Publications Manager
System Integrity

Disclaimer

This document was prepared for use by persons in connection with works near or on/within the rail network electricity system operated by Sydney Trains. Sydney Trains makes no warranties, express or implied, that compliance with the contents of this document shall be sufficient to ensure safe systems or work or operation. It is the document user's sole responsibility to ensure that the copy of the document it is viewing is the current version of the document as in use by Sydney Trains. To the extent permitted by law, Sydney Trains excludes any and all liability for any loss or damage, however caused (including through negligence), which may be directly or indirectly suffered in connection with the use of this document.

Copyright

The information in this document is protected by copyright and no part of this document may be reproduced, altered, stored or transmitted by any person without the prior consent of Sydney Trains.

Document control

Version	Date	Author/ Prin. Eng.	Summary of change
1.0	1 February 2022	ENSR Project Team	First issue as Sydney Trains document. Extracted from SMS-06-GD-0268 V3.2. Reviewed as part of the ENSR Project.

Table of Contents

1	Purpose	4
2	Definitions	4
3	Scope	5
4	Planning for the work using mobile plant	6
4.1	Identification of foreseeable hazards	6
4.2	Assessment of the risks	7
4.2.1	Risk factors to be considered	7
4.3	Requirements to eliminate or control the risks.....	9
4.4	Minimising unexpected movement of the mobile plant	9
4.5	Providing marking barriers to define areas that the mobile plant should not enter.....	10
4.6	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.....	10
4.7	Supplementary Controls that should be considered when operating mobile plant around aerial lines	11
5	Appointment and Duties of Safety Observer’s	12
6	Requirements of a Responsible Manager	12
7	On site verification of competence of mobile plant operators and safety observers ...	13
7.1	Requesting information from the Electrical Engineering Manager	13
8	Diagrams and Tables for Safe Approach Distances	14
8.1	Mobile Plant - Safe Approach Distances	14
8.2	Safe Approach Distances for mobile plant in transit	16
8.2.1	Live Line Work	16
8.2.2	Operating Work using Mobile Plant	16
8.3	Work involving mobile plant with a design envelope that is not capable of infringing the SADs of Table 1/Column A of an aerial line.....	16
8.4	Work involving mobile plant with a design envelope that is not capable of infringing the SADs of Table 1/Column B of an aerial line.....	17
8.5	Work involving mobile plant with a design envelope that is capable of infringing the SADs of Table 1/Column B of an aerial line.....	17
8.5.1	First option	18
8.5.2	Second option.....	19
8.5.3	Third option.....	19
8.6	Electrical Work involving mobile plant with a design envelope that is capable of infringing the SADs of Table 1/Column A of an aerial line.....	20
8.7	Electrical work involving mobile plant with a design envelope that is capable of infringing the SADs of Table 1/Column B of an aerial line.....	21
8.8	Electrical work that will be required to, or might inadvertently, infringe the SADs of Table 1/Column C to an aerial line.....	23
8.9	Work to be performed inside a Substation	23
8.10	Work being performed in the vicinity of TAHE Substations	24
9	Emergency procedure in the event of an incident involving mobile plant	25
10	Reference documents	26
Appendix A	Using mobile plant around electrical equipment flowcharts	27

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 by Transport Asset Holding Entity of New South Wales (TAHE) or Sydney Trains operated and maintained up to and including 132,000 Volt AC and 1500 Volt DC.

Generally, work around electrical equipment using mobile plant must be performed at greater Safe Approach Distances (SADs) than those described in *SP D 79049 Safe Approach Distances (SADs)*.

NOTE

This document applies to the SADs relevant to mobile plant. For information regarding excavation and earth works near or on/within of cables, should be read in conjunction with *PR D 78203 High Voltage Operating Procedure Section 5 High Voltage Cables*.

2 Definitions

Design Envelope	The space encapsulating all possible movements of the mobile plant under maximum unrestricted reach, including: <ul style="list-style-type: none">• any load attached to the mobile plant, or• any person including tools and equipment occupying the basket of an EWP.
Responsible Manager	A person of sufficient level of responsibility who has the duty to manage risk to health and safety for works under their administration being the PCBU, duty holder, e.g. Sydney Trains Level 5 manager or Transport senior service manager.
Transit Envelope	The area encompassing the normal height and width of mobile plant when travelling to or from a worksite.
Tiger Tails or temporary line covers	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.

For further definitions, refer to the **Electrical Safety Definitions** page available on the **RailSafe** site.

3 Scope

This document sets out Sydney Trains requirements for work around Electrical Assets in accordance with and/or above the NSW industry code of practice *SafeWork Work near overhead power lines*.

It is applicable to all persons working with mobile plant, including motor vehicles, around TAHE owned or Sydney Trains operated and maintained electrical equipment.

While 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 document 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 TAHE property, then Sydney Trains ICON Electrical is to be advised of the planned work to allow the ICON Electrical to make appropriate arrangements should the isolation affect supply to 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 by TAHE or maintained by Sydney Trains).
- 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.

4 Planning for the work using mobile plant

Prior to commencing work planning 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 be doing the work and must include:

- an identification of the foreseeable hazards involved in performing work around the aerial line or electrical equipment (refer to Section 4.1), and
- an assessment of the risks (refer to Section 4.2), and
- understanding and planning to implement the relevant requirements necessary to eliminate or control the risks (refer to Section 4.3).

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 by TAHE or operated and maintained by Sydney Trains 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 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.

NOTE

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.

4.2 Assessment of the risks

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 Electrical Engineering Manager or delegate concerned is to be contacted to obtain accurate information (refer to Section 7.1).

- 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 Electrical Engineering Manager or delegate 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 1: Illustration of aerial lines 'sag or swing').

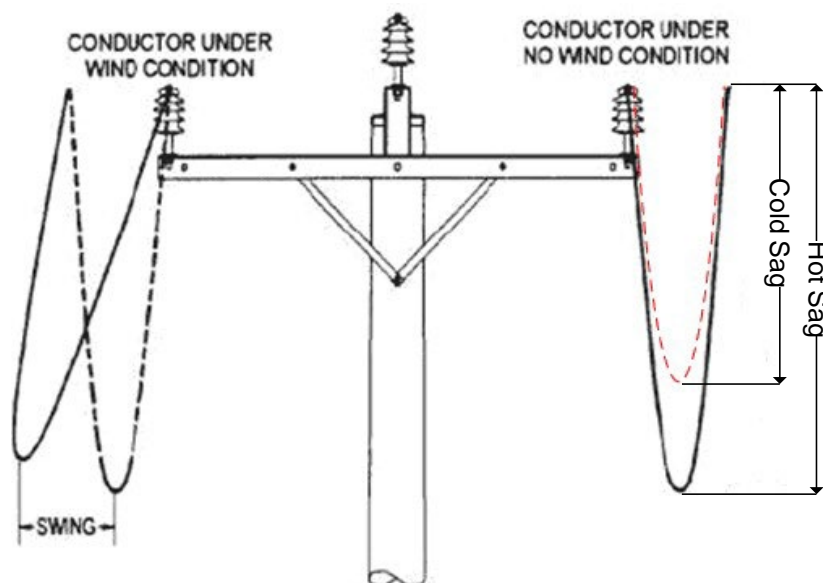


Figure 1: Illustration of aerial lines 'sag or swing'

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 2: Illustration of design envelope of mobile plant.

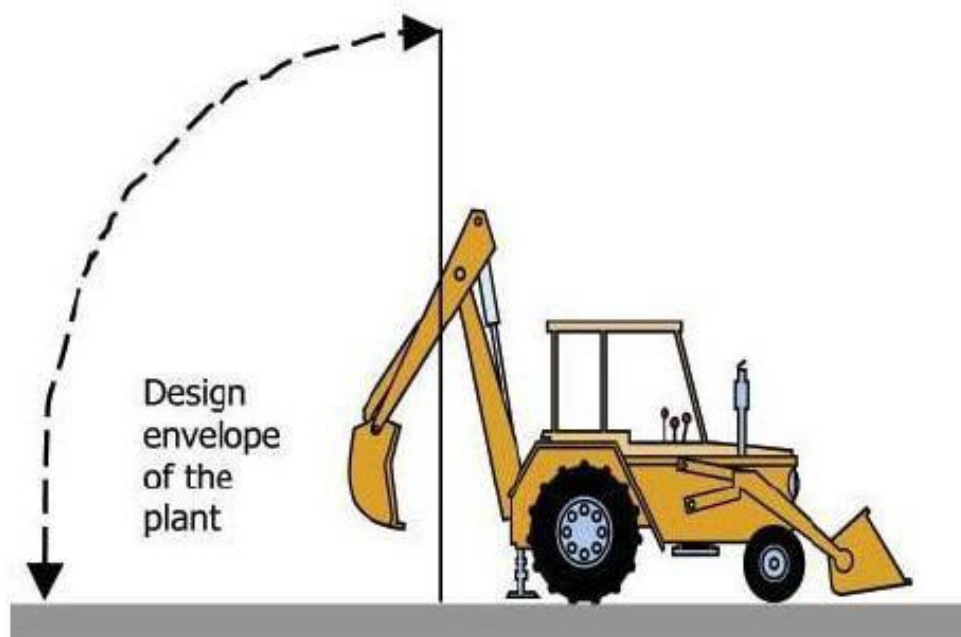


Figure 2: Illustration of design envelope of mobile plant

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 document are as detailed in 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 of material which would infringe on the Safe Approach Distances.

4.3 Requirements to eliminate or control the risks

The requirements to eliminate or control the risks vary depending on the proximity to electrical equipment, as well as rescue and recovery plans for plant operators.

All supervisors must complete the appropriate risk assessment relevant to the task being executed.

4.4 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.

4.5 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 Electrical Engineering Manager or delegate concerned to mark the limit of the Safe Approach Distance with high visibility 'bunting' or similar (refer to Figure 3 below).



Figure 3: Illustration of a visual tape bunting fitted under overhead power lines

4.6 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 Section 8.1 Mobile Plant - Safe Approach Distances Table 1/Diagram 1 of an aerial line not covered by an 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 Section 8.1 Mobile Plant - Safe Approach Distances Table 1/Diagram 1:

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 Section 8.1 Mobile Plant - Safe Approach Distances Table 1/Diagram 1 of an aerial line not covered by an 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:
 - o the mobile plant and load are stationary, and
 - o 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 may make simultaneous contact between the bucket and the overhead wiring support structure provided the requirements of *PR D 78306 1500 Volt DC 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 Section 8.1 Mobile Plant - Safe Approach Distances Table 1/Diagram 1 of an aerial line not covered by an 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.

4.7 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 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 4: Overhead power lines warning sign

5 Appointment and Duties of Safety Observer's

A safety observer is utilised as a control measure in some instances where applicable. Refer to *PR D 78700 Working around Electrical Equipment* Section 7.4 Onsite Risk Assessment and *PR D 78700* Section 5.4 Safety Observer in relation to the appointment and duties of Safety Observer's.

6 Requirements of a Responsible Manager

A responsible manager is a person of sufficient level of responsibility who has the duty to manage risk to health and safety for works under their administration being the PCBU and/or duty holder e.g. Sydney Trains Level 5 manager or Transport senior service manager.

The responsible manager within the ENSRs are based around a senior manager with relevant accountabilities ensuring that appropriate processes and procedures have been followed and that the risks (including safety and operational) have been managed to SFAIRP. They should meet the following requirements:

- Be a current employee of Transport for NSW.
- Be directly associated with the work being conducted.
- Have currency of knowledge about the project, the people, the processes, the tasks, the potential hazards and work site conditions.
- Have access to and awareness of relevant codes of practice and guidance material relating to managing electrical risks in the workplace and working in the vicinity of aerial lines as published by Safework Australia and the ENSRs.
- Have demonstrated understanding of the PCBU Safety Management System, risk management processes, application of SFAIRP, current legislative requirements and codes of practice.
- Have read *SP D 79053 Risk Management: Mobile Plant in proximity to aerial lines and Overhead Wiring*.

7 On site verification of competence of mobile plant operators and safety observers

Where required, this document stipulates that the 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.

7.1 Requesting information from the Electrical Engineering Manager

Where the planning risk assessment identifies that the Electrical Engineering Manager or delegate 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 Electrical Engineering Manager concerned.

Upon receiving a written request for information, the Electrical Engineering Manager or delegate 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 Electrical Engineering Manager or delegate 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 document must be complied with.

8 Diagrams and Tables for Safe Approach Distances

8.1 Mobile Plant - Safe Approach Distances

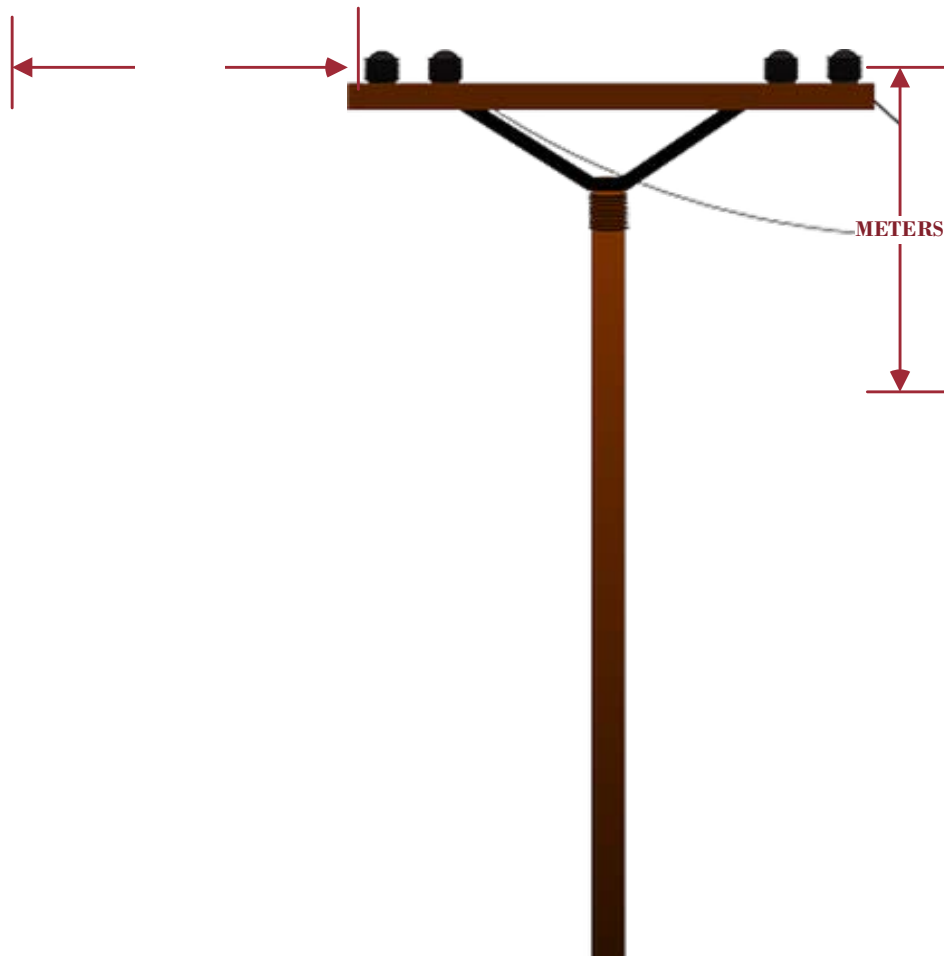


Diagram 1: Measure in meters for Safe Approach Distances apply both horizontally and vertically

Table 1: Mobile Plant Safe Approach Distances

Nominal phase to phase AC voltage (Volts)	Safe Approach Distance (m)		
	Note a		
	(A) General Note b	(B) Special Controls Note c	(C) Electrical System Wk Notes d, e
Low Voltage aerial conductors up to 1000	3	1.0	0.5
Above 1000 up to and including 33000	3	1.2	1.2
Above 33,000 up to and including 66000	3	1.4	1.4
Above 66,000 up to and including 132000	3	1.8	1.5
Nominal overhead wiring to rail DC voltage (Volts)	Safe Approach Distance (m)		
1500	3	1.0	0.7

NOTES to Table 1

- a. Safe Approach Distances extend vertically to the sky
- b. General minimum Safe Approach Distances for mobile plant work unless the work is performed under an Electrical Permit. Refer to Section 8.3.
- c. Special minimum Safe Approach Distances for mobile plant work used under appropriate special controls as specified in this document - unless the work is performed under an Electrical Permit. Refer to Section 8.6 and 8.7.
- d. Special minimum Safe Approach Distances for mobile plant work used under appropriate controls as specified in this document unless the work is performed under an Electrical Permit. – Maintenance or construction of the Electrical System Only – (see *Note 1 below). Refer to Section 8.8.
- e. The erection, modification and dismantling of 1500 Volt OHW support structures is not considered to be electrical system work.

NOTE 1

Mobile Plant 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-OP-3026 Work Health and Safety (WHS) Risk Management*. Where a worker has to stand on or gain access to the top of the vehicle, the SADs of Table 1 apply.

8.2 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 2 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 Table 1 apply.

Table 2: Minimum Safe Approach Distances for Vehicles in Transit

Nominal phase to phase AC 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 DC voltage (Volts)	Safe Approach Distance (m)
1500	0.9

8.2.1 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 *PR D 78403 Work on Live Low Voltage Equipment*.

8.2.2 Operating Work using Mobile Plant

Operating Work of the TAHE Distribution Network using an EWP shall be done in compliance with SP D 79049 which determines the Safe Approach Distance of the EWP.

8.3 Work involving mobile plant with a design envelope that is not capable of infringing the SADs of Table 1/Column A of an aerial line

- a. 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
- b. 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.

8.4 Work involving mobile plant with a design envelope that is not capable of infringing the SADs of Table 1/Column 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 1/Column 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, ICON Electrical are to be advised of the work, and
- at the completion of work each day, ICON Electrical is to be advised of the completion of the work.

8.5 Work involving mobile plant with a design envelope that is capable of infringing the SADs of Table 1/Column 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 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 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 Safe Approach Distance is to be undertaken.

Where either of the above methods of risk elimination is not reasonably practicable the planning risk assessment must indicate why and the responsible manager accepting the risk may or may not approve the work to proceed. However, work can only proceed if the Line Manger can demonstrate to the responsible manager accepting the risk:

- via their documented risk assessment why it is not reasonably practicable to obtain an Electrical 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, and
- The Safe Work Method Statement is reviewed by an AOM or electrical authorised worker that hold the appropriate qualifications as per *PR D 78701 Personnel Certifications – Electrical* and *SP D 79055 Electrical Competency Specific Certifications*.

NOTE

If and when needed, the responsible manager accepting the risk is to consult the relevant Electrical Engineering Manager on any electrical technical matters prior to approving work to proceed. Records in accordance with SMS requirements (refer to *SMS-09-TP-4508 Local Safety Records Register*) of any advice sought should be kept by the responsible manager accepting the risk.

8.5.1 First option

- a. 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, and
- b. 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
- c. 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, and
- d. Where the aerial line concerned is Low Voltage, then arrange for tiger tails or temporary line 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 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
- e. Prior to the work commencing each day, arrange for ICON Electrical to be advised of the work, and
- f. At the completion of work each day, arrange for ICON Electrical to be advised of the completion of the work.

8.5.2 Second option

- a. 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 can be infringed, and
- b. 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
- c. 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, and
- d. 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
- e. Prior to the work commencing each day, arrange for ICON Electrical to be advised of the work, and
- f. At the completion of work each day, arrange for ICON Electrical to be advised of the completion of the work.

8.5.3 Third option

Arrange for a job specific SWMS covering the work using the mobile plant to be approved by the Electrical Engineering Manager concerned. This SWMS must include the following controls as a minimum:

- a. Prior to the work commencing each day, arrange for ICON Electrical to be advised of the work, and
- b. At the completion of work each day, arrange for ICON Electrical to be advised of the completion of the work, and
- c. 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.

OR

Is about to actually infringe the SADs. Such soft barriers include:

- ground level rigid or tape barriers, or

- high visibility bunting hung below the aerial line conductors by authorised electrical staff (refer to Section 4.5 for further details of this bunting),

and

- d. 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

- e. The inhibiting of auto-reclose on High Voltage aerial lines where it is possible for ICON Electrical to remotely inhibit auto-reclose, and
- f. Where practical, the earthing and bonding of the chassis of the mobile plant, and
- g. Where the aerial line concerned is Low Voltage, then the Electrical Engineering Manager must arrange for tiger tails or temporary line 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 Electrical Engineering Manager 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 regularly by an Authorised Person (Mains) should the worksite require the tiger tails to remain in service at the location for periods of long duration.

8.6 Electrical Work involving mobile plant with a design envelope that is capable of infringing the SADs of Table 1/Column A of an aerial line

- a. SWMS developed must be reviewed by an electrically accredited person that has relevant training and experience of the task:
 - 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,
- b. 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

- c. 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
- d. A Safety Observer who is certified in resuscitation and releasing and rescuing a person from live electrical apparatus, 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,must be used for the work, and

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.

- e. 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
- f. Prior to the work commencing each day, ICON Electrical are to be advised of the work, and
- g. At the completion of work each day, ICON Electrical is to be advised of the completion of the work, and
- h. 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.

8.7 Electrical work involving mobile plant with a design envelope that is capable of infringing the SADs of Table 1/Column B of 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 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 Safe Approach Distance is being undertaken.**

Where an Electrical Permit is not reasonably practicable to obtain, 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. A job specific SWMS is to be prepared and approved by an Authorised Officer (Mains) who also holds "Field – Authorised Engineering Authority". Refer to *ETN 12/02 Field Engineering Authority for RailCorp 1500V OHW Design Activities*.
- b. 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.
- c. 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 Operatoror
 - 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.

- d. Prior to the work commencing each day, ICON Electrical is to be advised of the work.
- e. At the completion of work each day, ICON Electrical is to be advised of the completion of the work.
- f. 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.

8.8 Electrical work that will be required to, or might inadvertently, infringe the SADs of Table 1/Column 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 1/Column 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 1/Column C Safe Approach Distance is being undertaken.

When an Electrical Permit to Work is to be put in place *PR D 78501 FM01 Request for Electrical Permit to Work* must be completed and submitted. The work must then be conducted in accordance with *PR D 78501 Electrical Permit to Work*.

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 (refer to Appendix A), the risk assessment must indicate the reasons why an Electrical Permit is not reasonably practicable to obtain and a waiver to the ENSR from the Associate Director EDU 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 *PR D 78403*.

8.9 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 *PR D 78502 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 1 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 Section 7 On site verification of competence of mobile plant operators and safety observers,
- and
- a Safety Observer shall be utilised who either:
 - is qualified to operate the mobile plant concerned in accordance with Section 7 On site verification of competence of mobile plant operators and safety observers 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 Officer (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 Associate Director Electrical Distribution Unit for the work to proceed.

8.10 Work being performed in the vicinity of TAHE Substations

- Where the mobile plant is performing work in the vicinity of a TAHE Substation and the mobile plant is capable of infringing the Safe Approach Distances of Section 8.1 Mobile Plant - Safe Approach Distances Table 1/Diagram 1 of exposed electrical equipment located inside the Substation, then:

EITHER

- A Substation Access Permit must be arranged in accordance with PR D 78502 to cover the isolation and earthing of this exposed electrical equipment whilst the work which is capable of infringing the Section 8.1 Mobile Plant - Safe Approach Distances Table 1/Diagram 1 Safe Approach Distance is being undertaken. This Electrical Permit can be requested by contacting the Electrical Network Engineers 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 Section 8.1 Mobile Plant - Safe Approach Distances Table 1/Diagram 1

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 Section 8.1 Mobile Plant - Safe Approach Distances Table 1/Diagram 1
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 Section 8.1 Mobile Plant - Safe Approach Distances Table 1/Diagram 1 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
and
- Use of Cranes or Plant in a substation shall only undertake under the direct and constant supervision of an Authorised Operator.

9 Emergency procedure in the event of an incident involving mobile plant

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

All staff on site must be briefed in the emergency procedure prior to commencing work and have the ICON Electrical Number readily available.

The *WorkCover Work Near Overhead Power Lines Code of Practice (2006)* includes an emergency procedure following contact with live overhead power lines.

10 Reference documents

ETN 12/02 Field Engineering Authority for RailCorp 1500V OHW Design Activities

PR D 78203 High Voltage Operating Procedure

PR D 78306 1500 Volt DC Overhead Wiring Structure to Rail Voltage Test

PR D 78403 Work on Live Low Voltage Equipment

PR D 78501 Electrical Permit to Work

PR D 78501 FM01 Request for Electrical Permit to Work

PR D 78502 Substation Access Permit

PR D 78700 Working around Electrical Equipment

PR D 78701 Personnel Certifications – Electrical

SMS-06-OP-3026 Work Health and Safety (WHS) Risk Management

SMS-09-TP-4508 Local Safety Records Register

SP D 79049 Safe Approach Distances (SADs)

SP D 79053 Risk Management: Mobile Plant in proximity to aerial lines and Overhead Wiring

SP D 79055 Electrical Competency Specific Certifications

WorkCover Work Near Overhead Power Lines Code of Practice (2006)

Appendix A Using mobile plant around electrical equipment flowcharts

Chart 1

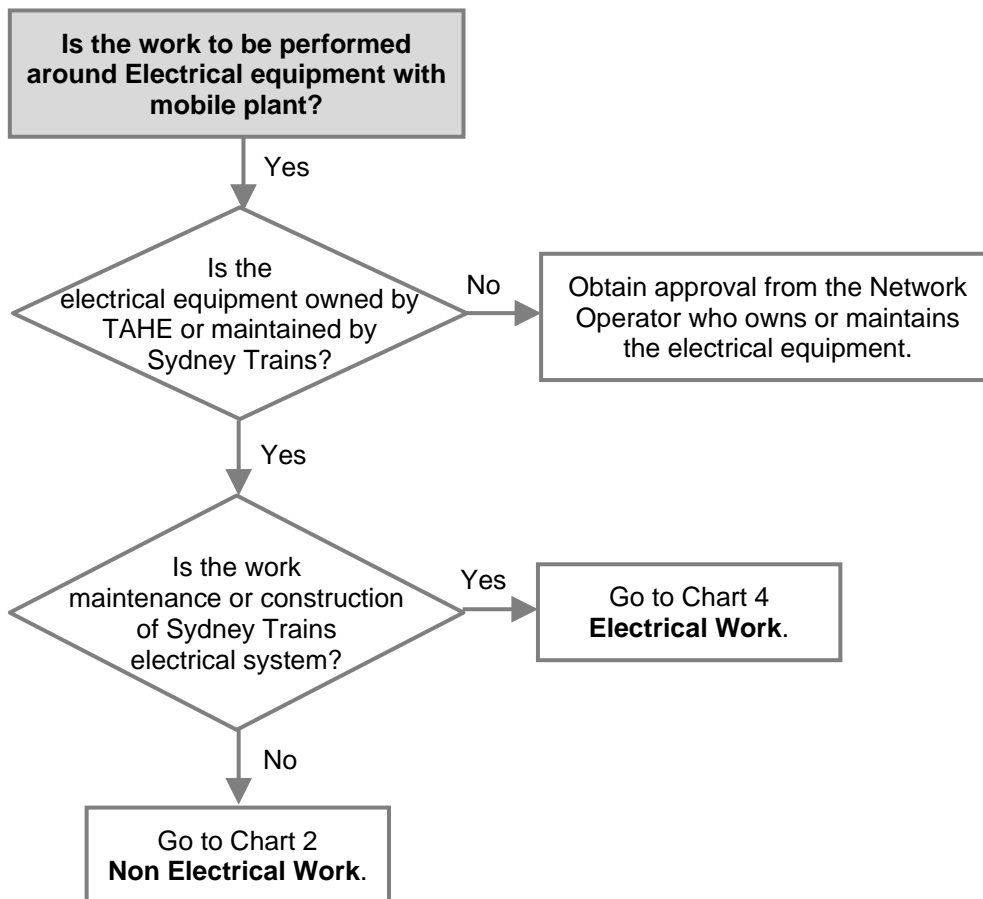


Chart 2

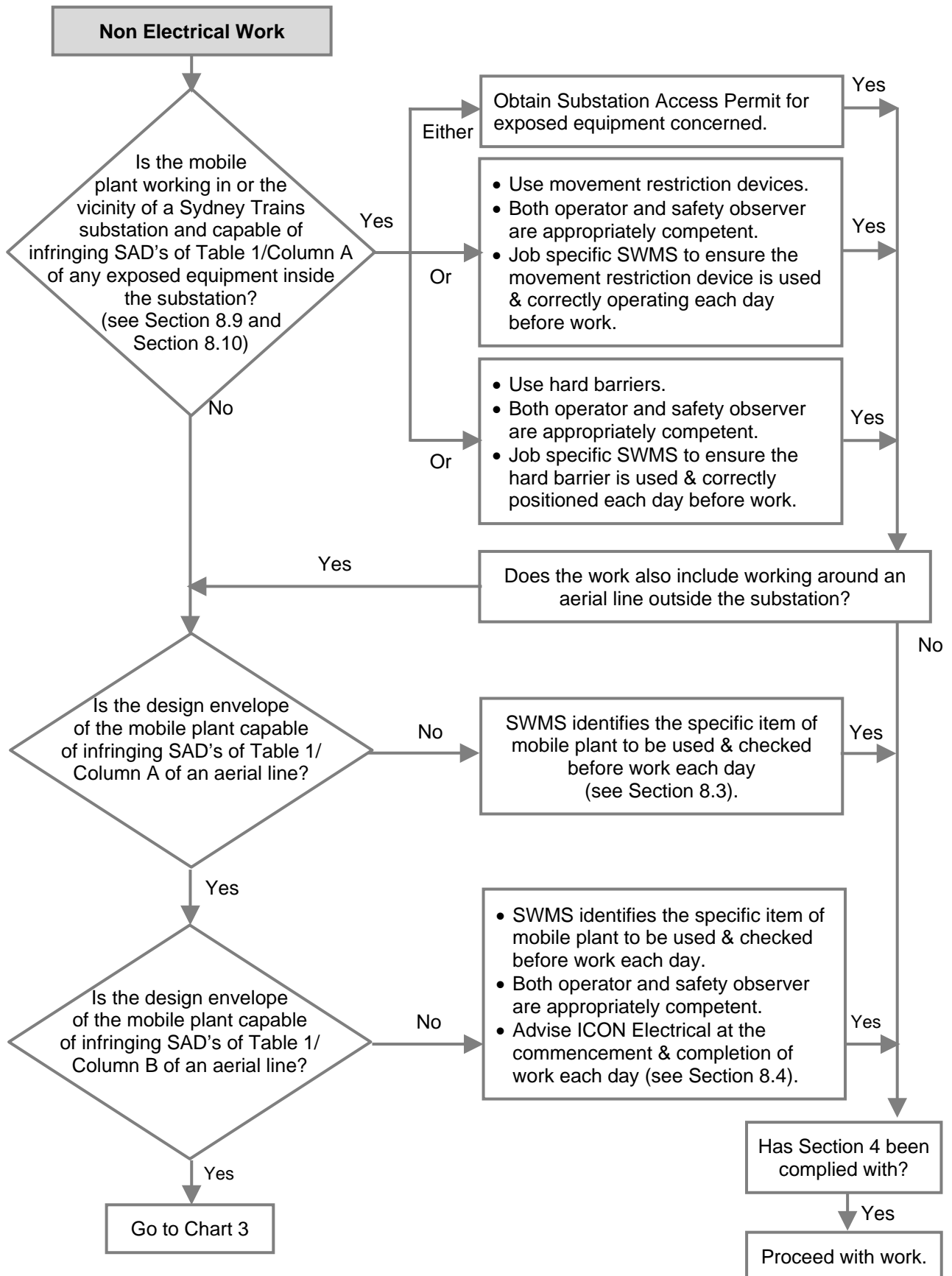


Chart 3

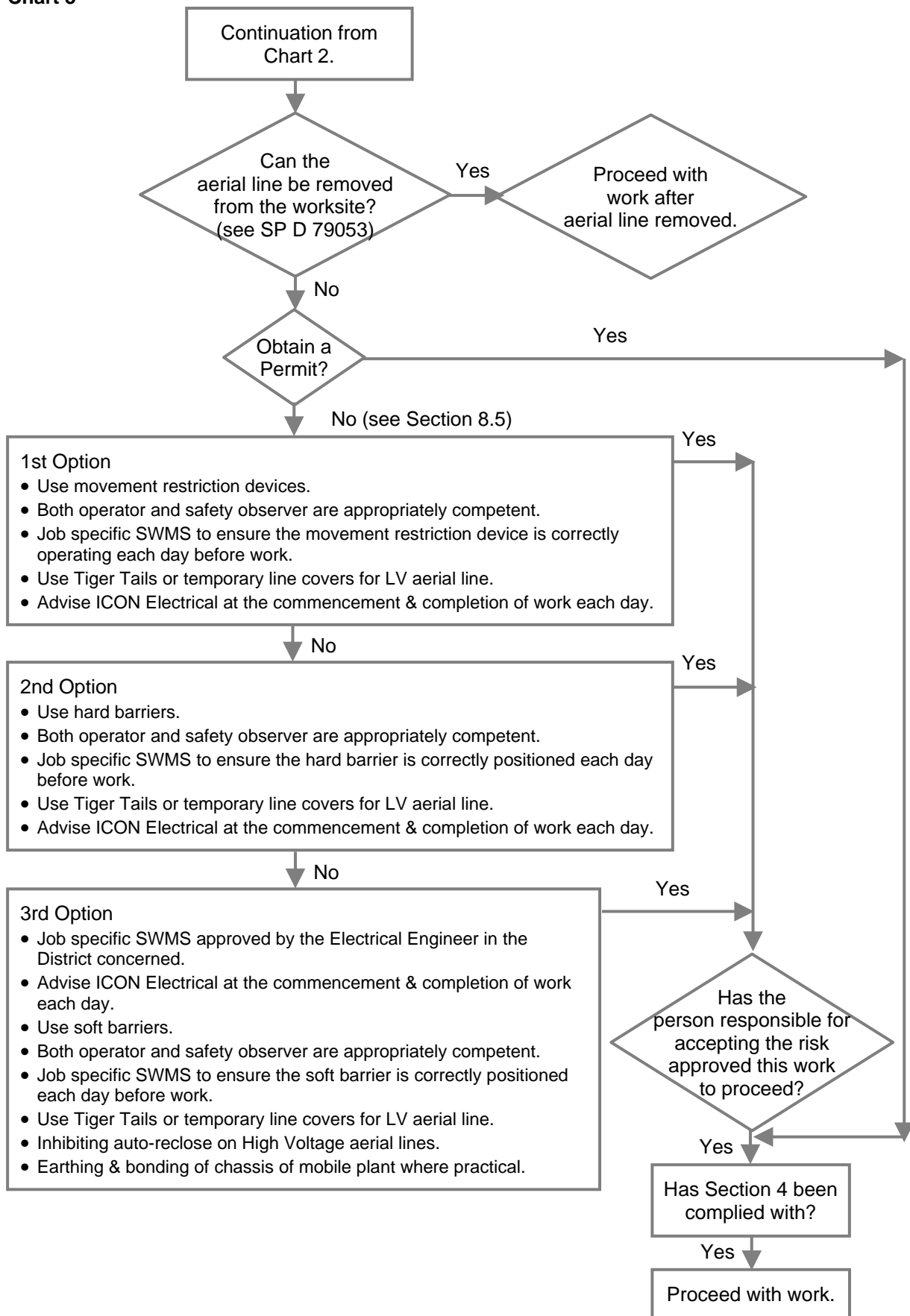


Chart 4

