

## Mobile Plant in the Vicinity of High Voltage Conductors

### Summary

This procedure supports the Power System Safety Rules and its requirements assembled under:

- Category 3 - Work in Substations General; and
- Category 6 - Overhead Lines and Equipment.

By following a systematic process that involves implementing and maintaining hazard control measures, this procedure shall be used to manage the risks associated with mobile plant travelling and operating in the vicinity of high voltage electrical conductors by following the “identify, assess and control” process.

### Document Control

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<b>Process owner:</b>	Manager Health, Safety and Environment				
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## Table of Contents

1. Overview.....	3
1.1. Purpose.....	3
1.2. Policy Base.....	3
1.3. Reference Documents.....	3
1.4. Scope.....	3
1.5. Accountability.....	3
2. Document Location.....	4
3. Introduction.....	4
4. Hazard Assessment.....	5
5. Definitions.....	6
6. Change history.....	6
7. Implementation.....	6
8. Monitoring and Review.....	7
9. Attachments.....	7
Attachment A – Assessing safe approach distance.....	8
Attachment B - Physical restrictions, control devices, barriers, fences and signs.....	10
Attachment C - Safety observer and earthing of mobile plant.....	12

## 1. Overview

### 1.1. Purpose

This procedure shall be used to manage the risks associated with mobile plant travelling and operating in the vicinity of high voltage electrical conductors by following the “identify, assess and control” process.

### 1.2. Policy Base

Document No.	Document
GD SR G1 100	Power System Safety Rules

### 1.3. Reference Documents

Document No.	Document
GD SR G4 154	Portable Earthing of High Voltage Conductors
WorkCover Code of Practice 2006	Work Near Overhead Power Lines
Safework	Guide for Operating Cranes and Mobile Plant near Overhead Electric Lines
ENA 031-2011	ENA National Guideline for Mobile Plant Earthing

### 1.4. Scope

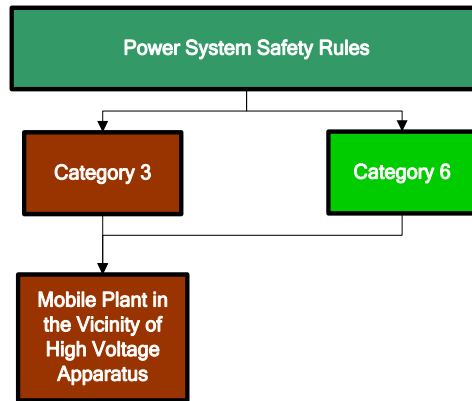
This procedure applies to mobile plant travelling and operating in the vicinity of high voltage electrical conductors, including transmission lines and substation apparatus.

### 1.5. Accountability

Responsible person	Responsibility
Manager Health, Safety and Environment	Maintenance and ownership of this procedure
Mgr – Training	Implementation of training programs associated with this procedure
Authorised persons	Comply with this procedure

## 2. Document Location

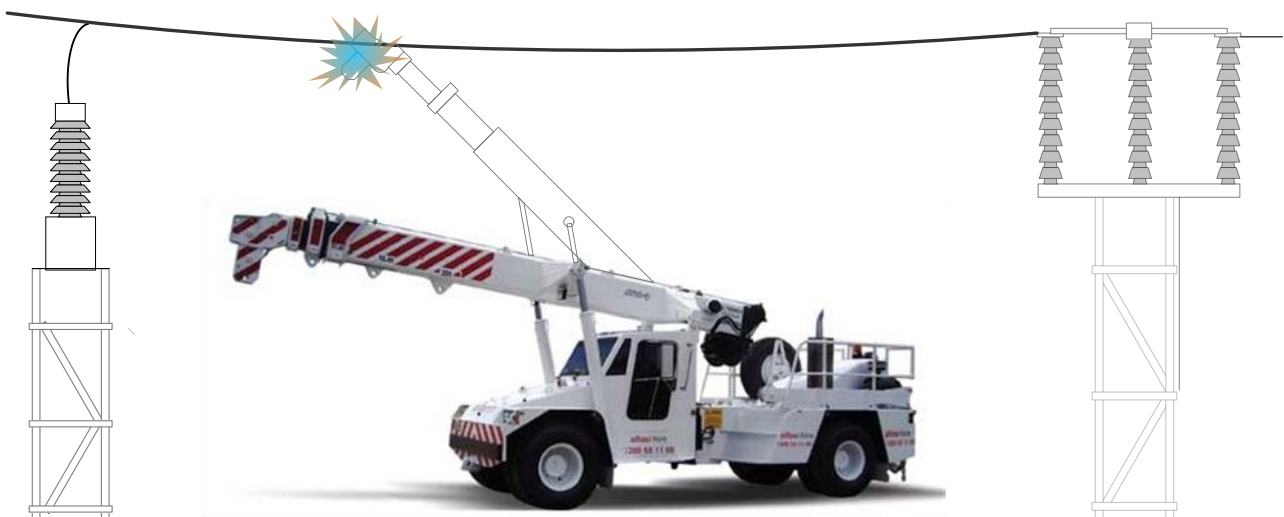
Block diagram showing location of document in relation to others.



## 3. Introduction

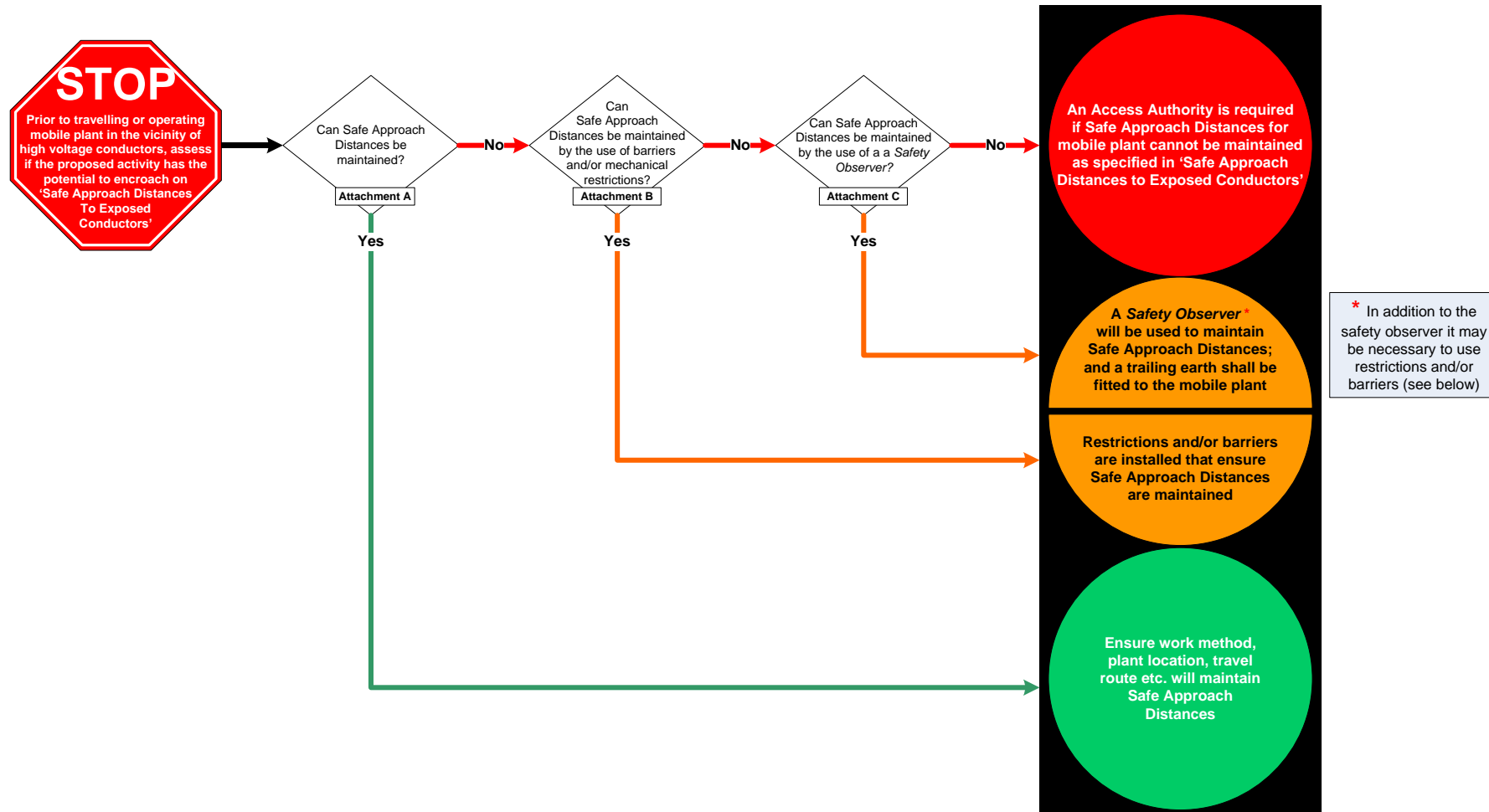
Mobile plant travelling and operating in the vicinity of high voltage conductors introduces the risk of an electrical incident by approaching or making contact with an energised conductor. This procedure shall be used to manage these risks by following the “identify, assess and control” process to select the controls to be used when travelling and/or operating mobile plant in the vicinity of high voltage electrical conductors.

These controls are to be used in conjunction with TransGrid’s [Health and Safety Risk Assessment](#) process which may identify that additional controls are required for particular tasks and situations. It is the responsibility of all workers using mobile plant to follow safe work practices applicable to their work.



The following flow chart details the Stop and Consider risk assessment that shall be used prior to mobile plant travelling and/or operating in the vicinity of high voltage conductors. Attachments are referenced that provide guidance on the selection of control measures.

## 4. Hazard Assessment



**In addition to the above** - for any excavation in a switchyard, the excavating plant shall be earthed via a [trailing earth](#)

(Source: PSSR 3.3.1 Hazard 12)

## 5. Definitions

<b>Load</b>	A load is any substance, material or object being moved, carried, lifted or supported or which is in rotary or vertical motion, in association with a crane or mobile plant, including for example, persons and equipment located on an elevating work platform.
<b>Mobile plant</b>	Cranes, elevating work platforms, tip trucks or similar plant, any equipment fitted with a jib or boom and any device capable of raising or lowering a load
<b>Vehicle</b>	A truck (non tipping), car, utility, or other general purpose conveyance used for the carriage of persons or goods that is not capable of raising or lowering a load
<b>Operating envelope</b>	Dimensions of the mobile plant including all protruding parts and the range of possible movements
<b>Transit envelope</b>	Based on the design of the mobile plant or vehicle when stowed for transport and includes the load, exhaust pipe and attachments such as flashing lights or radio aerials

## 6. Change history

Revision no	Approved by	Amendment
0	Lionel Symth, EGM / Network Services & Operations	Revision 0 New procedure
1	Lionel Symth, EGM / Network Services & Operations	<ul style="list-style-type: none"> <li>Added note regarding need for trailing earth when excavating in a switchyard.</li> <li>Figures revised for conductor sag</li> </ul>
2	Neil Smith, General Manager/Systems Operations	<ul style="list-style-type: none"> <li>Minor editorial and pictorial revisions;</li> <li>Clarification of 'near approach', 'safety clearance' and 'Safe Approach Distances';</li> <li>Definition of 'travel or operating envelope' added;</li> <li>Warning devices added to Attachment C – Safety Observer</li> </ul>
3	Manager Health, Safety and Environment	<ul style="list-style-type: none"> <li>Wording (transit) aligned to PSSR v5.3</li> <li>Definitions revised</li> <li>Attachment C revised</li> </ul>

## 7. Implementation

Training material will be modified to include this change. An alert will be sent to all staff outlining the change (along with a link to the new procedure).

## 8. Monitoring and Review

The Manager Health, Safety and Environment is responsible for the ongoing monitoring and review of the documents associated with the Power System Safety Rules. This can include but is not limited to:

- Requesting regular feedback on the effectiveness of procedures and work instructions;
- Where a change has occurred in our processes; and
- Recommendations arising from incidents.

## 9. Attachments

- A. Assessing safe approach distance
- B. Physical restrictions, control devices, barriers, fences and signs
- C. Safely observer and earthing of mobile plant

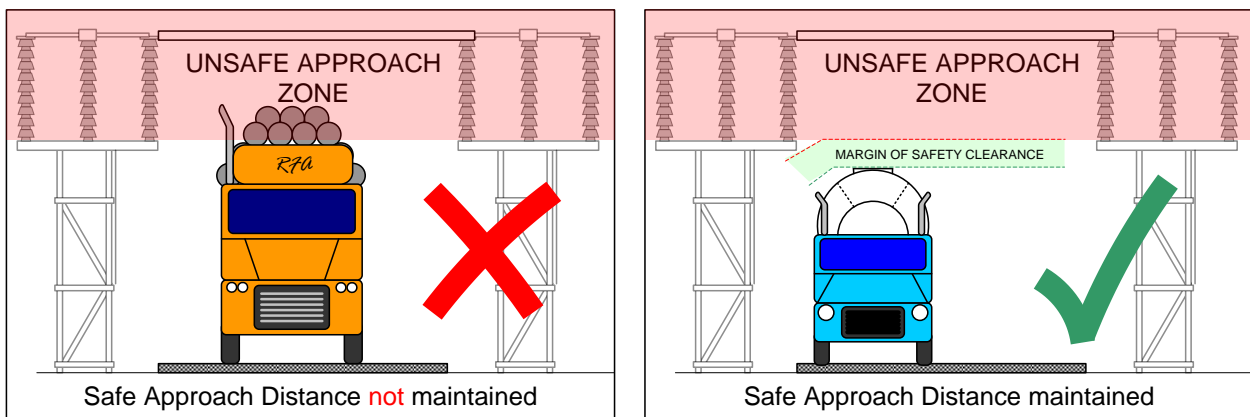
## Attachment A – Assessing safe approach distance

Before mobile plant or a large vehicle travels and/or operates in the vicinity of high voltage conductors it is essential that the height and voltage of the high voltage conductors is known and the [Safe Approach Distances to Exposed Conductors](#) is assessed accurately. A number of factors are to be considered including:

- Estimating/measuring distances;
- The transit and/or operating envelope of the mobile plant or large vehicle; and
- Expansion, contraction and swing of conductor.

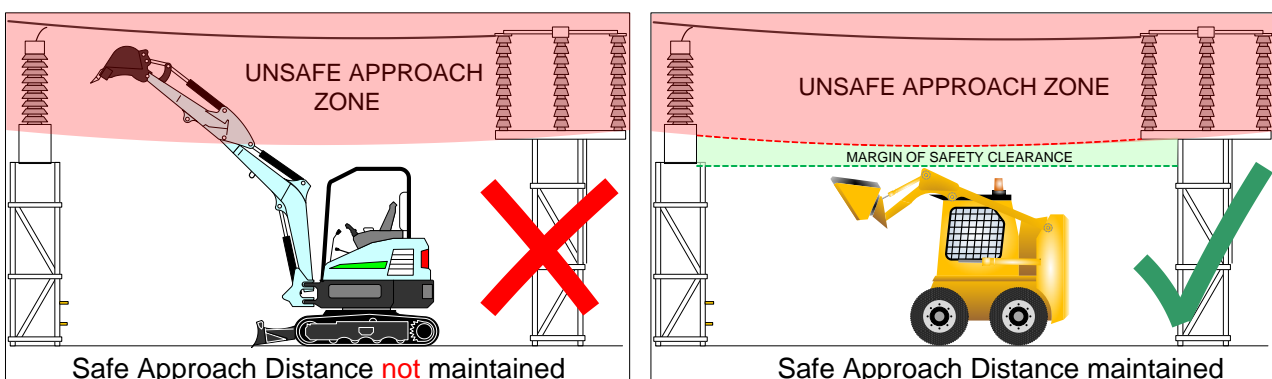
It is essential that a measurement method that provides an accurate distance is used, for example, a laser measuring device or high voltage operating stick.

Assessment of the transit and/or operating envelope shall take into account all protruding parts of the mobile plant or large vehicle and includes the load, exhaust pipe and attachments such as rotating/flashing lights or radio aerials and the range of possible movements, for example, slewing or extension.



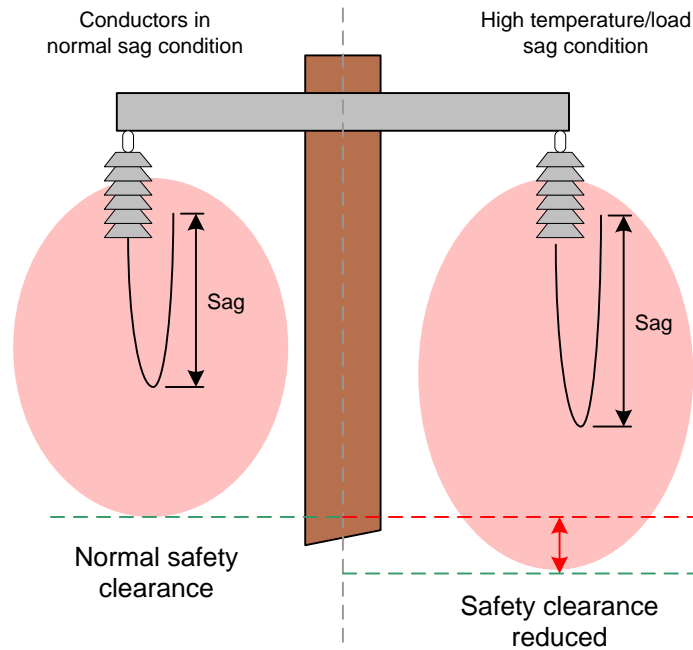
An increased margin of transit or operating safety clearance, should be allowed for where the risk assessment identifies, for example, the possibility of:

- the load or lifting gear (crane hook, chains and slings) moving or swinging towards high voltage conductors when the mobile plant is operated;
- inadvertent movement of the plant while operating; and
- changes in ground conditions, such as spoil built up by the operation of the mobile plant.

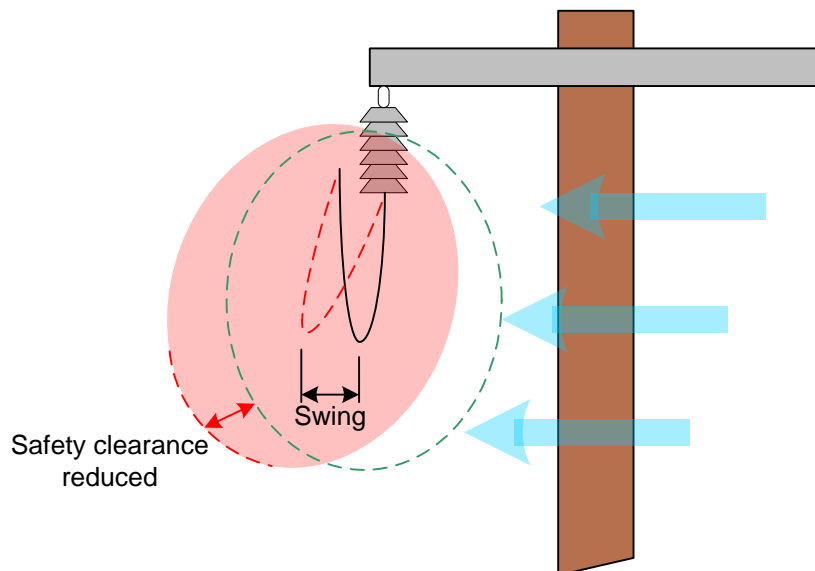




As shown in the following diagram high voltage conductors are subject to expansion and contraction when heated and cooled. This can be a direct result of high ambient air temperature and/or electrical current passing through the conductors. Any expansion will result in gravity causing the conductors to sag downwards and must be taken into account.



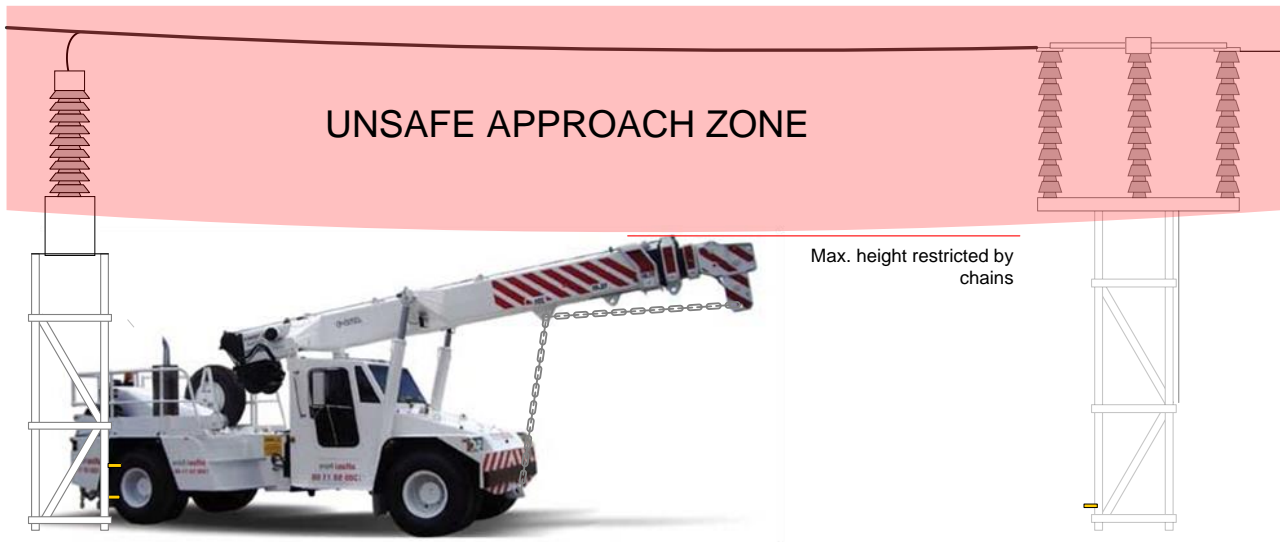
Wind can also cause the high voltage conductors to swing from side to side as shown in the following diagram.



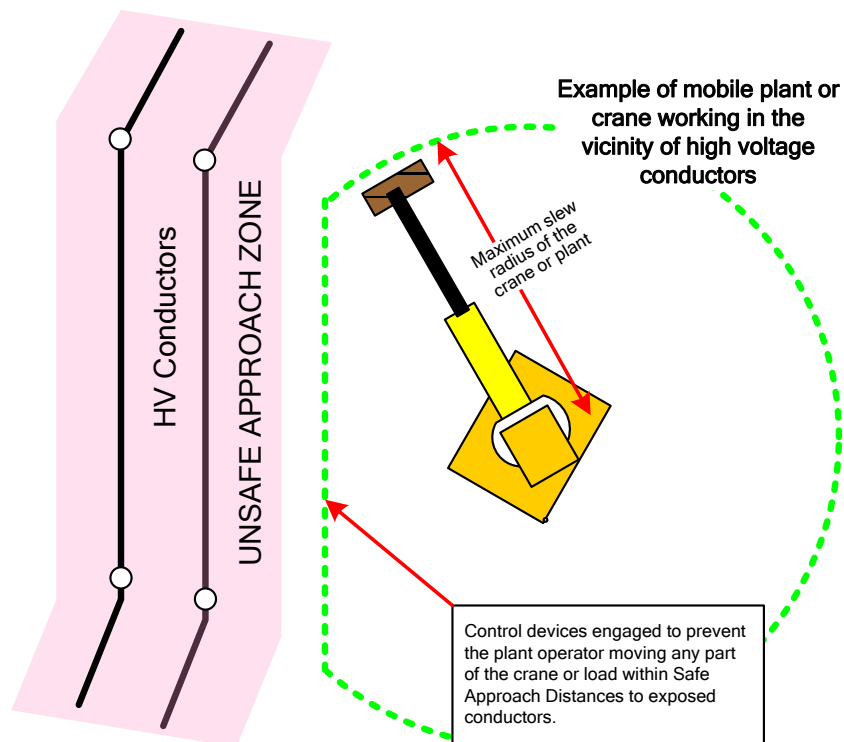
For these reasons an increased margin of safety clearance should be allowed for either vertically and/or horizontally by the amount of assessed conductor sag or swing at the point of work.

## Attachment B - Physical restrictions, control devices, barriers, fences and signs

The use of physical restrictions, such as chains, are employed that prevent the plant operator extending or slewing any part of the mobile plant or load within [Safe Approach Distances to Exposed Conductors](#).



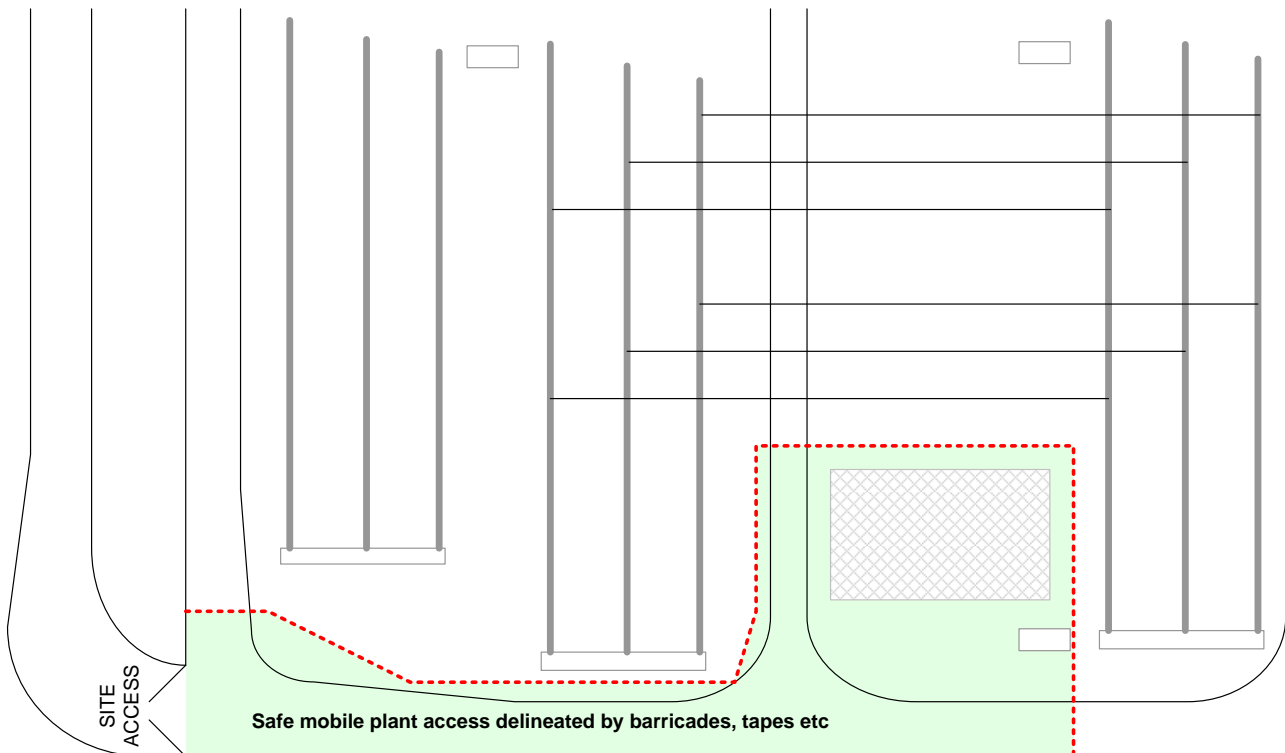
Control devices, such as computerised lockouts, are engaged that prevent the plant operator extending or slewing any part of the mobile plant or load within [Safe Approach Distances to Exposed Conductors](#).



Barriers, fences and warning signs are installed to delineate safe work areas and/or restrict the mobile plant operator moving any part of the mobile plant or load within [Safe Approach Distances to Exposed Conductors](#).

Areas that the mobile plant should not enter are defined by:

- Using rigid or tape barriers to mark off areas; and
- Installing warning signs to indicate the location of high voltage conductors.



Warning signs (as shown below) shall be erected where there are high voltage conductors adjacent to the work area from which mobile plant will need to keep clear.



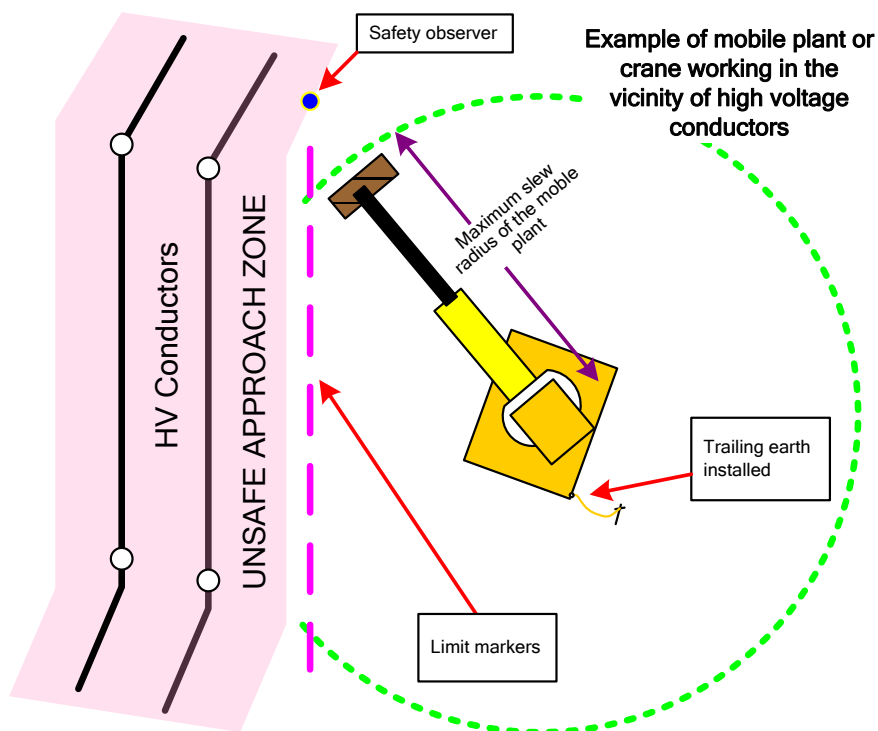
## Attachment C - Safety observer and earthing of mobile plant

### Safety Observer

A safety observer is a person competent for the task and specifically assigned the duty of observing and warning against unsafe approach of mobile plant (and its load) when travelling and/or operating in the vicinity of high voltage conductors.

The safety observer shall:

- Be authorised:
  - Category 3.3 for work in a substation
  - Category 6.1 for work involving overhead lines and equipment
- Consult with the plant operator and establish limits for the travel or operation of mobile plant. From this consultation it may be agreed to:
  - install limit markers, for example, traffic cones or painted lines; and
  - use a warning device such as a whistle (Stockcode: 359877) or horn;
- Monitor the work activity being carried out and warn the operator if any part of the mobile plant, load or persons are about come within [Safe Approach Distances to Exposed Conductors](#);
- Be positioned at a suitable location to effectively observe both the mobile plant and the high voltage conductors;
- Be able to immediately and effectively communicate with the operator of the mobile plant, and other persons if required;
- Not be required to observe more than one item of mobile plant at a time;
- Not carry out any other work while acting as a safety observer; and
- Have the authority to suspend the work at any time.



## Earthing of mobile plant

The desired outcomes achieved by earthing mobile plant include:

- Controlling induced voltages; and
- In the event of near approach to high voltage conductors, provides electrical current a direct path to earth, enabling high speed protection operation and lower touch voltages.

### Trailing Earth

Where a trailing earth is used, mobile plant shall be connected to the nearest available earth point by a standard portable earth lead. The following hierarchy shall be considered:

#### 1. Permanent network earth

The earth connection shall be made to a permanent substation or transmission tower earth. Transmission towers are considered permanent network earths.

#### 2. Independent temporary earth electrode

This is a steel rod driven into the ground to a depth of 600mm. The earth stake associated with the mobile plant shall be bonded to the tower (or pole earth) with a standard portable earthing lead in situations where:

- The mobile plant and/or earth stake are within 30 metres of a tower (or pole); and
- Other persons are working at ground level near the tower (or pole).

Connection to the mobile plant is carried out using either a:

- CATU MT 847 hand operated surface penetration clamp; or
- CATU MT 815S to an earth stub installed on the mobile plant.

The trailing earth shall first be attached to the earthing point and then the other end attached to the mobile plant. When applying the clamp:

- It shall be located on a part of the mobile plant that is electrically continuous with any part that could encroach on Safe Approach Distances (in some circumstances earthing of a boom may be necessary, with the chassis of the mobile plant also earthed); and
- Electrostatic shocks from the discharge of induced voltages shall be avoided by using an insulated handle or insulating gloves.

Note: Trailing earths shall not to be lengthened by a clamp to clamp connection but may be joined using hardware as described in '[Portable Earthing of High Voltage Conductors](#)'.