

# Electrical Safety Guidelines for Forestry Operations

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## Staying Safe

1. Contact the lines owner to discuss your plan and assess the electrical risks
2. Consider getting an outage to reduce the electrical hazard
3. Assess the entire forestry operation from initial earthworks and site planning to felling and extraction
4. Always have an agreed Electrical Hazard Management Plan (EHMP) on site
5. Have clear lines of communication with the lines owner and keep them informed throughout your operation, especially if your plan changes
6. Use skilled staff with appropriate felling techniques when felling around Power Lines

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This document was developed by the Forest Industry Contractors Association in association with Transpower, Scanpower, Unison Networks and Powerco. It is a guide to safe operations and summarises the information contained in the Reference Documents. It does not replace the need for a site specific hazard analysis and liaison between the lines owner and forestry contractor.

## Introduction

Harvesting within two tree lengths of power lines adds a significant risk to forestry workers and must be closely managed. These trees must not be felled until a suitable Electrical Hazard Management Plan (EHMP) is in place<sup>1</sup>.

### Removing the lines from service during harvesting (outages)

WorkSafe (based on the Health and Safety at Work Act 2015) requires, where reasonably practicable, the electrical risk to be eliminated when harvesting. Power outages must be planned well in advance and will not always be possible due to system constraints. You should provide the electricity network owner with enough notice to allow them to plan an outage. Most network owners need at least six weeks' notice, while Transpower requires at least 12 weeks' notice of harvesting near lines to assess if an outage is possible.

### The Electrical Hazard Management Plan (EHMP)

The EHMP is a site-specific document that details safe procedures that minimise the electrical hazard during the forest harvest. Information about what should be included in the EHMP is summarised below. A detailed explanation and an example template are on the Safetree website (<https://safetree.nz/>). The EHMP does not need to be a complicated document but is a requirement to keep everyone safe. The electricity network owner can help you develop your plan.

You should meet with the electricity network owner on site to identify the hazards and discuss how these hazards can be eliminated or minimised. You can find the Network Owner on the Electricity Networks Association (ENA) <https://www.ena.org.nz/lines-company-map/>.

Your EHMP must cover the following:

1. Identify all the power lines in the harvest area and along, across or adjacent to access ways.
2. Identify trees within two tree lengths and within fall distance of the lines.
3. A site-specific risk assessment and identify effective management controls;
  - a. Assessing the impact of terrain and site layout
  - b. Specific control methods for felling trees within two tree lengths
  - c. Showing how logs can be extracted safely including the location and operation of skid sites and haulers
  - d. Ensure that mobile plant can operate safely keeping at least 4m from the lines
  - e. Explain how changes in the plan will be reviewed with the electricity network owner
4. Emergency procedures for safety critical events such as trees or machinery striking the lines.

### Associated works

Foresters also need to consider the impact of their operations before and after harvesting. The creation of access tracks or skid sites around power lines and earthworks near structures, poles or lines can cause an

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<sup>1</sup> As per the Approved Code of Practice for Safety & Health in Forest Operations, 2012; section 2.4 (Working around 'Live' power lines) and specifically clause 2.14.3 to have a felling plan agreed on by the forest owner/manager, the asset/network owner and the contractor.

electrical risk by altering ground levels and decreasing electrical safety distances or undermining network structures.

## **Electrical Safety**

### **Electrical Hazards**

1. Power lines that make direct contact with or any tree or forestry equipment create an electrical hazard, and trees or equipment being near the power lines can be an electrical hazard. Both scenarios are electrical contact as electricity can travel through the air to nearby objects as an arc or electrical “flashover”.
2. All power at any lines voltage is potentially fatal to persons working on or near trees that have electrical contact with that power line.
3. All power line conductors move about (downwards/sideways) under the influence of conductor temperatures and wind. Sometimes the movement can displace conductors by metres vertically and sideways as well. This can mean that power lines appearing to have adequate clearance on calm or perhaps cool days, may become close enough to trees or equipment to create electrical hazards on hot days or on windy days. Ensure powerline movement is accounted for in the Electrical Hazard Management Plan
4. When a tree or piece of equipment contacts a live power line, the entire tree or piece of equipment may become electrically live, creating a serious electrical safety hazard. The surrounding ground can also become electrically live. To touch the equipment and the ground around it could be fatal.
5. Fires burning under a power line may cause a conductor-to-ground or phase to phase conductor (between the lines) flashover.

### **Avoiding Electrical Hazards**

1. Unless advised otherwise by the electricity network owner, always treat all power lines as electrically “live”.
2. Do not climb power line support structures.
3. Do not fell any tree or branch that could touch or involve electrical contact or flashover with any power lines.
4. Do not touch any part of a tree or object that is in contact with any power line.
5. Do not touch or approach any fallen power line or any collapsed or damaged support structures.
6. Do not light fires under any power line.
7. Do not use any power line support structures (e.g. poles, towers) as anchors or supports.
8. Do not excavate near the foundations of a line structure or any associated bracing without the written consent of the electricity network owner(s).

## Procedure for Working Around Powerlines

Good communications are crucial for a safe harvesting operation. A point of contact for planning liaison and emergency response must be established between the contractor, logging supervisor and electricity network owner.

### Tree Felling and Harvesting:

Identify trees that are;

1. within two tree lengths
2. within fall distance plus 4m
3. in the Competent Worker Zone (Refer table 1)
4. high-risk trees e.g. leaning towards the lines, on unstable ground or double leaders

Where any part of any tree is inside the “Competent Worker Zone” (CWZ), this work may only be completed by a suitably qualified person. Consult with the electricity network owner. Transpower does not allow close approach tree work.

Once the tree or vegetation is removed from the CWZ then the appropriate method can be used to complete the removal of all trees within the two tree lengths area. Trees must be felled directionally away from the lines.

**Note:** A close approach permit/consent is required to work within 4 metres of distribution lines.

**Transpower does not allow close approach tree work**

### Tree Felling Conditions:

1. All activities shall be in accordance with the relevant Approved Codes of Practice, and Industry Guides.
2. Prestart site meeting and Tailgate completed by staff on site to discuss site-specific identified hazards and methods of control and the daily plan.
3. The tree feller will be assessed and ticketed as competent for all felling methods to be used.
4. All trees that are felled using Machine Assistance, shall be in accordance with ACOP for Safety and Health in Forest Operations (2012) Section 11.8, and the Best Practice Guide for Tree Felling and the machine operator shall be ticketed for the task (as per matrix).
5. No tree driving is permitted.
6. Exposed trees should not be left standing within fall distance of the lines.
7. No part of the tree or assisting machine shall enter within 4m of any part of the electrical network, including lines, poles and support structures/stay wires without the approval of the network owner and supervision of a safety observer.
8. Before felling, carefully assess all trees and weather conditions, especially damaged or multi-leader trees.
9. All trees must be felled away from power lines or back-pulled/pushed away using machine assistance.

10. All machine operators working within two tree lengths of power lines must be experienced and be competent for the task.
11. If the difficulty and safety involved in felling any trees is such that it is beyond the skill and training of the logging crew then other options should be looked at, i.e. using specialised services.
12. No processing, skid operations, 'safe zones' or machinery maintenance is to occur beneath power lines.
13. No wire ropes are to be anchored or laid out beneath powerlines at any time.
14. Do not chain/unchain loads near powerlines.

The EHMP must detail how the tree felling procedures and conditions are applied in the specific situation of the planned forest harvest, it should consider the terrain, tree and line height, span length, line movement and tree assessment etc.

## The “Competent Worker Zone” (CWZ):

The CWZ is a radial distance measured from the conductor closest to the vegetation and can include any part of a tree which is leaning over or are above the horizontal radius distance.

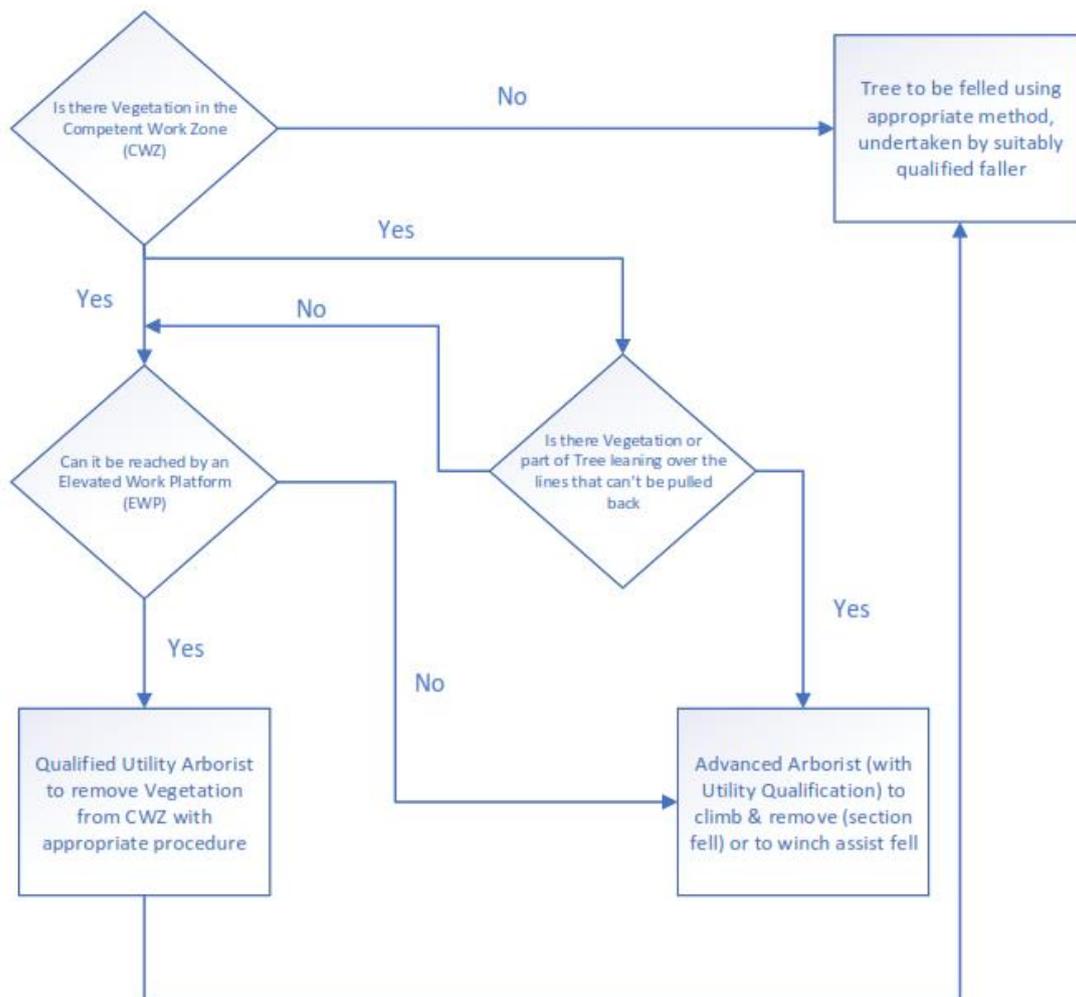
The distance of the CWZ is dependent on the voltage of the power lines and only a qualified person using Network approved methods can clear the vegetation from this zone.

**Table 1**

Competent Worker Zone (CWZ)			
Voltage of Line	Radius of CWZ	Voltage of Line	Radius of CWZ
230/400V	0.5m	66,000V	3.0m
11,000V	1.5m	110,000V	4.0m
22,000V	2.0m	220,000V	6.0m
33,000V	2.5m		

**Transpower does not allow close approach tree work**

Figure 1 CWZ vegetation elimination process



## Emergency Procedures

Emergencies include direct contact between or flashover from power lines to trees, mechanical plant or equipment. The electricity network owner will induct forestry staff on emergency procedures where required or on request.

Below is a generic set of emergency procedures for guidance.

### Emergency Procedures for Persons on the Ground

1. Stay away from the fallen power lines/hazard area.
2. Move away from the downed power line/hazard area.
3. Stay away from fences, gates, metal or conductive equipment.
4. Advise everyone not to enter the area.
5. Contact the electricity network company emergency contact and site safety observer immediately.
6. Contact Emergency Services immediately, if appropriate.
7. Do not return to the area until the network company has given clearance.
8. Attend to the immediate needs of injured people, including appropriate medical care, if it is safe to do so.

### Emergency Procedures for People in Mobile Plant

1. Stay on the plant.
2. Turn off your machine.
3. Advise everyone to remain clear of the area.
4. Contact the electricity network emergency contact and site observer immediately.
5. If it is not safe to stay on your machinery, jump well clear with your feet together and away from the hazard area. Do not contact the machinery and ground at the same time.
6. Contact Emergency Services immediately, if appropriate.
7. Do not return to the area until the electricity network owner has given the all clear.
8. Attend to the immediate needs of injured people, including appropriate medical care, only if it is safe to do so.

## Earthworks

1. All activities shall be in accordance with the relative Approved Codes of Practice, and Industry Guides.
2. Pole Lines. Written consent from the electricity network owner must be obtained before any earthworks are performed near any support structure, where the earthworks:
  - a. are at a depth greater than 300mm and within 2.2m of a pole or support structure; or
  - b. at a depth greater than 750mm and within 5m of a pole or support structure; or
  - c. create a potentially unstable batter.
3. Tower Lines. Written consent from the electricity network owner must be obtained before any earthworks are performed near any tower structure, where the earthworks:
  - a. are at a depth greater than 300mm and within 6m of the outer edge of the tower foundation; or
  - b. at a depth greater than 3m and within 6m – 12m of the outer edge of the tower foundation; or
  - c. create a potentially unstable batter.
4. Earthworks shall never reduce the minimum vertical clearance distance between earth and power line as specified in NZECP 34 - Section 4 (see below).

### Minimum Safe Distances of Conductors from the Ground

Circuit voltage	Vertical distance to ground (m)			Radial distance (m)
	Across or along roads or driveways	Any other land traversable by vehicles (including mobile plant) but excluding across or along roads or driveways	Any land not traversable by vehicles (including mobile plant) due to its inaccessibility (e.g. steepness or swampiness)	
Not Exceeding 1 kV and insulated	5.5	4.0	2.7	2
Not Exceeding 1 kV	5.5	5.0	4.5	2
Exceeding 1 kV but not exceeding 33 kV	6.5	5.5	4.5	2
Exceeding 33 kV but not exceeding 110 kV	6.5	6.5	5.5	3
Exceeding 110 kV but not exceeding 220 kV	7.5	7.5	6.0	4.5
Exceeding 220 kV a.c. or d.c.	8.0	8.0	6.5	5

### Earthworks Procedure:

The EHMP must contain information on;

1. Why earthworks are needed
2. Where they will take place around power lines or their support structures
3. When they will be done
4. The impact they will have on the line clearance from ground level
5. Consider whether the Dial before you dig (Identity and underground services) is required

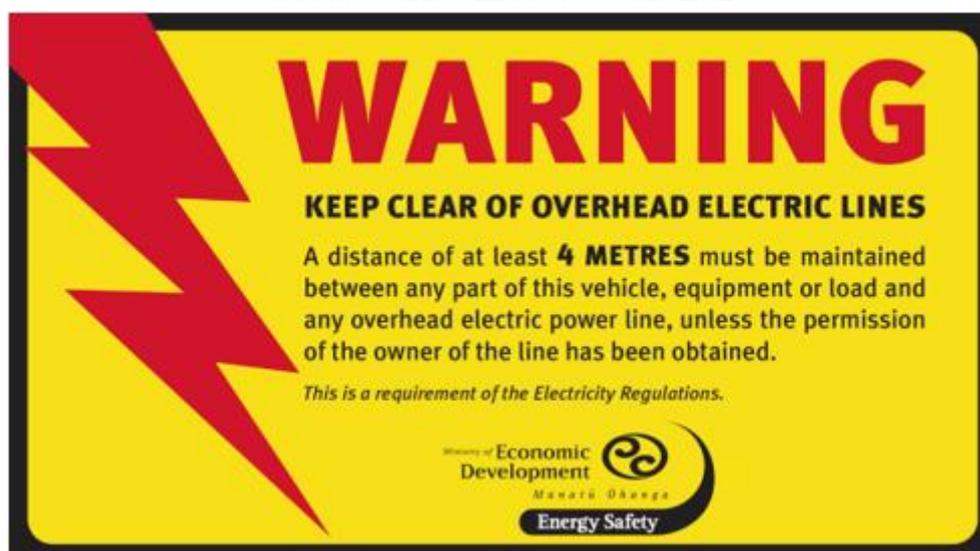
## Mobile Plant

NZEC 34 is a mandatory code of practice that sets out minimum safe electrical distance requirements for mobile plant operating near power lines. Mobile plant includes tip trucks, excavators, cranes, skidders or similar machines. Also, refer to the EEA guide for mobile plant.

### Mobile Plant Procedures

1. Mobile Plant working near power lines can cause damage to the line and create hazards for the plant operator, the mobile plant and people in the vicinity
2. Conductors may move from their normal position due to changes in the wind or the conductors' temperature. This requires special consideration by mobile plant operators
3. No part of any mobile plant, including their attachments or loads carried, are permitted to approach closer than 4.0 metres to any part of any power line at any time, including while moving between work sites. Any exemption to approach closer than 4.0 metres can only be granted on request from the electricity network owner(s) and must be in writing.
4. Any written consent granted by the network owners for distances reduced below the minimum approach distance must always be available on site
5. Where necessary, safety observers should be used to ensure the 4-metre minimum approach distance is not encroached
6. Where any mobile plant is likely to be used at any time near power lines, the mobile plant owner or operator shall affix a warning notice in a conspicuous place as near as practicable to the operator's position. The notice shall be maintained in a legible condition and shall state:

**“WARNING KEEP CLEAR OF POWER LINES”**



7. Employees and other persons shall keep well clear of mobile plant and any load or attachments when the plant is working near power lines
8. Mobile plant or any load carried shall not operate above the conductors of any power line unless the operator has received prior written consent from the electricity network owner

The EHMP must describe how these mobile plant procedures will be applied to ensure safe work around the power lines present in the harvest area.

## References

The Electricity Engineers Association (EEA) Guide to Electrical Safety for Forest and Woodlot Felling and Logging Operations July 2013

The Electricity Engineers Association (EEA) Guide for Non-Electrical Industry Employees Using Mobile Plant Near Powerlines and Electrical Cables February 2013

Approved code of Practice for Safety and Health in Forest Operations (December 2012) Ministry of Business Innovation and Employment.

Approved Code of Practice for Safety and Health in Tree Work Part 2 Maintenance of Trees around Power Lines (February 1996) Department of Labour

WorkSafe Practice Framework Operational Guidance-Tree Felling Near Powerlines in Forestry Operations (2018)

NZEC34 New Zealand Electrical Code of Practice for Electrical Safe Distances 2001

Safetree work plans, Forestry Industry Safety Council (FISC) (<https://safetree.nz/wp-content/uploads/2016/11/How-to-make-a-work-plan-booklet.pdf> )