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**Discipline**

**Engineering Standard - NSW**

**Category**

**Electrical**

**Title**

**Transmission Line Maintenance Standards**

**Reference Number**

**PMP 17 - (RIC Standard: EP 10 01 00 02 SP)**

**Document Control**

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		Refer to Reference Number	T Moore	M Owens	Refer to minutes of meeting 24/01/05

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The technical content of this document has been approved by the relevant ARTC engineering authority and has also been endorsed by the ARTC Safety Committee.

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## **About This Standard**

This Standard indicates those common conditions which should trigger corrective maintenance actions on transmission line equipment in order to ensure safety, reliability and/or prolong the life of the equipment.

A complete preventative maintenance schedule is provided in the Technical Maintenance Plan - Transmission Lines.

This publication supersedes EP 10 00 00 02 SP “Transmission Line Maintenance Standards” Version 1.0 dated June 1997.

## Document History

**Primary Source** – RIC Standard EP 10 01 00 02 SP Version 1.0

### List of Amendments –

ISSUE	DATE	CLAUSE	DESCRIPTION
1.1	11/03/2005	Disclaimer	Minor editorial change

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## 1 References

- [1] Standards Australia and Electricity Supply Association of N.S.W. publication HB C(b)1, "Guidelines for Design and Maintenance of Overhead Distribution and Transmission Lines".
- [2] Electricity Association of N.S.W. publication ISSC3, "Guidelines for Tree Planting and Maintaining Safety Clearances Near Power Lines".

## 2 Access and Right of Way

### 2.1 Access

Asset / Parameter	Maintenance Trigger
General Condition	Any obstruction which restricts access etc.

### 2.2 Right of Way (Easement)

Asset / Parameter	Maintenance Trigger
General Condition	Any obstruction which restricts access to the transmission line for the purpose of construction, safe operation, maintenance, renewal and replacement.  Obstructions which may prevent access for vehicles and equipment through railway, public or private properties.

## 3 Wood Pole Support

Asset / Parameter	Maintenance Trigger
General Condition	Eroded ground in immediate vicinity of foundation.  Weakened or damaged pole.  Excavation in close proximity of pole foundation.  Signs of fungal growth.  Signs of termite activity.  (Treatment selected for fungal growth and termites shall provide protection commensurate with best industry practice. The treatment selected must be on the basis of the whole of life outcomes, including disposal of treated material).
Pole Steps	Loose or missing pole steps.
Pole Cap	Loose or missing pole cap.
Pole Identification	Missing or incorrect information on signs.  Obscured information.

<b>Asset / Parameter</b>	<b>Maintenance Trigger</b>
Earth Wire Cover Board	Damaged or missing cover board.
Earth Electrode	Broken, damaged or disconnected earth electrode.
Vegetation	Encroachment of vegetation to within 1 metre of pole or vegetation which inhibits maintenance or access.

#### **4 Steel Support Pole or Structure**

<b>Asset / Parameter</b>	<b>Maintenance Trigger</b>
General Condition	Ground erosion in vicinity of foundation. Weakened or damaged steel support. Excavation in close proximity of support foundation.
Pole Steps	Loose or missing structure steps.
Pole Identification	Missing or incorrect information on signs. Obscured information.
Steel Support Manufacturers Stamp	Missing or incorrect information. Obscure sign information
Earth Strap Connection	Broken or damaged earth strap. Broken connections at steel support and earth electrode.
Earth Electrode	Broken, damaged or disconnected earth electrode.
Foundation	Soil and silt covering foundation and/or base of structure.
Vegetation	Encroachment of vegetation to within 1 metre of pole or vegetation which inhibits maintenance or access.

#### **5 Pole Top**

<b>Asset / Parameter</b>	<b>Maintenance Trigger</b>
Insulators	Flashed over or broken insulators. Deep or pitted corrosion that is greater than 0.5 mm deep into the original metal surface of the insulator end fittings.
Conductor Insulator Attachment	Damaged or loose conductor ties. Deep or pitted corrosion that is greater than 0.5 mm deep into the original metal surface of the suspension envelope and components.
Insulator Attachment Arrangement	Bent insulator pin. Deep or pitted corrosion that is greater than 0.5 mm deep into the original metal surface of the insulator pin, suspension eye bolt, clearance hanger or two piece crossarm clamp.

<b>Asset / Parameter</b>	<b>Maintenance Trigger</b>
Conductor Terminating Arrangement	Deep or pitted corrosion that is greater than 0.5 mm deep into the original metal surface of the snail clamp or terminating fittings. Lightning damaged preformed dead ends (wrap on).
Cross Arms	Timber degradation, splitting, rot, burnt or excessive bow. Crossarm slumped on pole.
Cross Arm Attachment to Pole	Buckled strut. Deep or pitted corrosion that is greater than 0.5 mm deep into the original metal surface of the crossarm attachments to pole.
Earth Wire Arrangement	Deep or pitted corrosion that is greater than 0.5 mm deep into the original metal surface of the earth wire raiser bracket or earth wire stand off brackets. Earth wire stand off brackets loose in pole. Missing or loose earth wire attaching staples. Broken earth wire down lead or earth wire connection.

## 6 Conductors

<b>Asset / Parameter</b>	<b>Maintenance Trigger</b>
General Condition	Signs of burning, stranding, annealing of conductors. Signs of fatigue at rigid points of attachment.
Clearances	Infringement of safe clearances to ground, other structures and other circuits. Infringement of safe clearances to vegetation. See Appendix A for risk categories and maintenance triggers.
Sags	Dissimilar sags between conductors in the same span and circuit.

## 7 Conductor Connections

<b>Asset / Parameter</b>	<b>Maintenance Trigger</b>
Splice Arrangements	Signs of overheating, burning and annealing.
Feeder Connections	Signs of overheating or burning. Deep or pitted corrosion that is greater than 0.5 mm deep into the original metal surface of the steel bolts and nuts.



## 8 Conductor Accessories

Asset / Parameter	Maintenance Trigger
Vibration Dampers	Missing, damaged or out of position.
Aircraft Warning Markers	Missing, damaged, faded or out of position.
Bird Flight Diverters	Missing, damaged, faded or out of position.

## 9 Guy Arrangements

Asset / Parameter	Maintenance Trigger
Stay Pole	See section 3 or 4 as applicable.
Ground Anchor	Excavation or erosion of ground in close proximity. Deep or pitted corrosion that is greater than 0.5 mm deep into the original metal surface or damage to anchor rod.
Stay (Guy) Wire Arrangement	Mechanical damage or stranding. Deep or pitted corrosion that is greater than 0.5 mm deep into the original metal surface of the stay wire and components. Soil covering stay wire.
Guy Insulator	Degradation of timber beam or fibreglass insulator. Damaged fibreglass or porcelain loop strain insulator due to vandalism or lightning.
Sight Board	Missing or damaged.
Earth Connection	Missing, broken or damaged earth wire. Broken connections at stay wire/guy rod and earth electrode.
Earth Wire Cover Board	Missing or damaged.

## 10 Signs

Navigable Waters Warning Signs	Missing or damaged signs. Missing or incorrect information on signs. Obscured sign information.
Access Road Direction Signs	Missing or damaged signs. Obscured information.

## 11 Appendix A – Vegetation Clearance - Maintenance Triggers and Risk Categories

Voltage	Risk category	Clearance at pole to nearest conductor in rest position	Clearance along middle 2/3 of span to nearest conductor in rest position
Up to 1,000V	<b>High</b> – All areas – correct within 7 days	0 – 0.5m	0 – 0.5m
	<b>Medium</b> – Correct within 4 weeks	0.5 – 1.0m	0.5 – 1.0m
	<b>Low</b> – Correct within 3 months	1.0 – 1.5m	1.0 – 1.5m OR sag at 50°C plus 1.0m (which ever is greatest).
Greater than 1,000V up to 22kV	<b>Emergency</b> – In public areas or bush fire risk – Correct immediately November to March inclusive	0 – 0.5m	0 – 0.5m
	<b>High</b> – All areas – correct within 7 days	0 – 1.0m	0 – 1.0m
	<b>Medium</b> – Correct within 4 weeks	1.0 – 1.5m	1.0 – 1.5m
	<b>Low</b> – Correct within 3 months	1.5 – 2.0m	1.5 – 2.0m OR sag at 50°C plus 1.0m (which ever is greatest).
Greater than 22kV up to 66kV	<b>Emergency</b> – In public areas or bush fire risk – Correct immediately November to March inclusive	0 – 0.5m	0 – 0.5m
	<b>High</b> – All areas – correct within 7 days	0 – 1.5m	0 – 1.5m
	<b>Medium</b> – Correct within 4 weeks	1.5 – 2.25m	1.5 – 2.25m
	<b>Low</b> – Correct within 3 months	2.25 – 2.75m	2.25 – 2.75m OR sag at 50°C plus 1.0m (which ever is greatest).
Greater than 66kV up to 132kV	<b>Emergency</b> – In public areas or bush fire risk – Correct immediately November to March inclusive	0 – 1.0m	0 – 1.0m
	<b>High</b> – All areas – correct within 7 days	0 – 2.0m	0 – 2.0m
	<b>Medium</b> – Correct within 4 weeks	2.0 – 3.0m	2.0 – 3.0m
	<b>Low</b> – Correct within 3 months	3.0 – 3.5m	3.0 – 3.5m OR sag at 50°C plus 1.0m (which ever is greatest).
11 kV Aerial Bundled Cable Screened and insulated Low Voltage service Lines	<b>High</b> – 16mm diameter branches resting, rubbing on cable – Correct 48 hours	0	0
	<b>Medium</b> – 16mm diameter branches in clearing space – Correct within 4 weeks	0 – 0.5m	0 – 1.0m
	<b>Low</b> – Branches than 16mm in clearing space – Correct within 3 months	0.5 – 0.7m	1.0 – 1.5m OR sag at 50°C plus 1.0m (which ever is greatest).

**NOTE:** During hot weather highly flammable gases are given off from most native trees and these gases can be easily ignited by contact between the conductor and trees. This consequence must be taken into account when assessing the category of clearance infringement.

These clearances allow for fire hazard areas and for normal whip by trees in high winds. Additional allowances should be made for very slender trees.

No limbs should be permitted to overhang the clearance space or any conductor in any fire hazard area.