

Mains Maintenance Instruction

Pole and line inspection and treatment procedures

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MAINS MAINTENANCE INSTRUCTION

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MMI 0001 Pole and line inspection and treatment procedures

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1.0 PURPOSE

To set out the minimum requirements of the inspection and treatment of poles and the associated lines in the Endeavour Energy network.

2.0 SCOPE

This instruction covers all of the processes associated with the inspection and treatment of both poles (timber, concrete, steel and composite) and lines. Inspections of transmission poles covered in this standard are in addition to the inspections covered in MMI 0012 - Overhead transmission line routine inspection. This standard does not include transmission towers, which is covered by MMI 0012 - Overhead transmission line routine inspection.

3.0 REFERENCES

Internal

- Company Policy 9.9.1 - Network asset maintenance
- Company Procedure (Network Asset Management) GAM 0006 – Notifying, reporting and conducting a post mortem on failed poles
- Company Procedure (Network Asset Management) GAM 0089 – Authorisations governance and management
- Company Procedure (Network Asset Management) GAM 0090 – Authorisation to carry out overhead and ground line inspections
- Company Procedure (Environment) GPE 0004 - Pesticide Use
- Company Procedure (Health & Safety) GSY0067 - Personal Protective Equipment
- Branch Procedure PAE 1027 - Initial and ongoing training of pole and line asset inspectors for compliance to maintenance standards
- Division Workplace Instruction WNV 1012 – Aerial patrol and analysis
- Branch Workplace Instruction WAE 2034 – Treatment of termites in wood poles
- Environmental Management Standard EMS 0007 - Waste Management
- Mains Construction Instruction MCI 0002 – Attachment of Broadband communication cables to Endeavour Energy poles
- Mains Construction Instruction MCI 0005 – Overhead construction manual
- Mains Design Instruction MDI 0024 – Attachment of non-network items to poles and streetlight columns
- Mains Design Instruction MDI 0031 – Overhead distribution, design standards manual
- Mains Design Instruction MDI 0047 – Overhead transmission mains design
- Mains Maintenance Instruction MMI 0003 – Routine external structural inspection of streetlight columns and LV pillars
- Mains Maintenance Instruction MMI 0012 – Overhead transmission line routine inspection
- Mains Maintenance Instruction MMI 0013 – Clearances to be maintained between power lines and trees
- Mains Maintenance Instruction MMI 0015 – Management of Endeavour Energy's electricity easements
- Mains Maintenance Instruction MMI 0022 – Routine electrical inspection of streetlight columns and LV pillars and associated electrical terminations
- Mains Maintenance Instruction MMI 0034 – Pre-summer Bushfire Inspection
- Substation Maintenance Instruction SMI 113 – Distribution data entry - asset structure and details
- Substation Maintenance Instruction SMI 124 – Maintenance data entry and defect prioritisation
- Company Form FSY 0118 – Worksite Coordination/Hazard & Risk Assessment
- Company Form FPE 0004 – Record of Pesticide Application

- Branch Form FAD 2001 – Notification of Network Alteration Sheet (White Sheet)
- Branch Form FAE 3032 – Pole Condemned - Inspection Report Sheet
- Branch Form FAE 3033 – Pole Reinstate – Inspection Report Sheet
- Branch Form FAE 3034 – Termite Treatment Report Sheet
- Branch Form FAE 3035 – Overhead & Groundline Inspection 1 in 100 Audit Sheet
- Branch Form FAE 3036 – Pole Special Inspection Report Sheet
- Branch Form FAE 3037 – New & Replaced Poles Report Sheet
- Branch Form FAE 3042 – Check List for Completed OLI/GLI Pole Maps
- Branch Form FAE 3057 – Pole-top Inspection of Wood Pole – Report Sheet
- Branch Form FAE 3115 – Waterway inspection checklist
- Safe work Method Statement SWM 1.010 – Overhead and Ground Line Inspection and Audit
- Safe work Method Statement SWM 1.005 – Patrol of overhead mains inspection
- Safe work Method Statement SWM 6.026 – Pole Treatment OLI/GLI
- Safe work Method Statement SWM 6.002 – Handling burnt or burning CCA treated timber
- Safe work Method Statement SWM 6.014 – Removal of foreign objects from conductors and apparatus
- Network Management Plan December 2013 Review
- Endeavour Energy Electrical Safety Rules
- Vegetation Management Common Requirement (VMCR) (October 2014)

External

- *Electricity Supply Act 1995* (as amended)
- *Work Health and Safety Act 2011*
- *Work Health and Safety Regulation 2011*
- ENA National Electricity Network Safety Code (Doc 01-2008)
- AS 1720.2 - Timber structures – Timber properties
- AS 2452.3 - Non-destructive testing – Determination of thickness – Part 3: Use of ultrasonic testing)
- AS 3000:2007 - SAA Wiring Rules
- AS/NZS 7000:2010 - Overhead line design – Detailed procedures

4.0 DEFINITIONS AND ABBREVIATIONS

Authorised pole/line inspector	person with pole and line inspection qualifications, trained, accredited and authorised by Endeavour Energy to carry out inspection duties in accordance with this instruction. Hereafter is referred to as “inspector”.
ADSS	all-dielectric self-supporting cable (used for pilot and communication systems)
Bushfire prone area	areas are defined by maps prepared by local councils (in accordance with the requirements of the <i>Rural Fires and Environmental Assessment Legislation Amendment Act, 2002</i>). Maps prepared by local councils are reviewed by the Rural Fire Service prior to being certified by the Commissioner for the Rural Fire Service. Endeavour Energy uses these certified maps to determine bushfire prone areas within its network franchise area.
Caisson/ sliding sleeve	galvanised steel sleeve used to join a wooden pole to a concrete butt (the caisson is used in rebuted poles)
CCA	copper chrome arsenic

CCT	covered conductor thick
Contractor	company that employs the inspector
Coring	taking of timber samples by drilling a pole to determine the species and strength of the timber
Date tape	date marked tape placed at the bottom of excavation under drill hole
Defective	assets that are likely to deteriorate to a failed condition and impact on safety, HV system reliability or the environment, or impose unacceptable operational constraints on the network
De-sapped durable (DD) pole	pole that has its sapwood fully or substantially removed by a machining process and which relies upon natural durability for protection from termites or fungal infection
DECCW	Department of Environment, Climate Change and Water (NSW)
Double insulation	Insulation comprising both basic insulation and supplementary insulation. Refer to AS 3000 for further information.
Ellipse	Endeavour Energy's asset management database
F category pole	high voltage customer or private property pole that was located within the former Nepean River County Council area prior to 1980
Fire prone area	as defined by the NSW Rural Fire Service and specified on the Bushfire Prone Land Maps stored on the Endeavour Energy GIS
Full length preservative treated (FPT) pole	pole that has been protected by either a chemical introduced by pressure or applied by the thermal dip (PI) method
GLI	groundline inspection. The GLI will require excavation to assess the condition of the pole at and below the groundline.
High wind event	A wind with speeds greater than 100km/h.
HV	High voltage - a voltage exceeding or equal to 1000V AC. Refers to 11kV, 12.7kV and 22kV in this instruction.
HV operational pole	pole with HV links, dropout fuses or air break switches
Inspection cycle	period between two (2) consecutive inspections
LV	Low voltage - a voltage not exceeding or equal to 1000V AC.
SDS	safety data sheet, previously referred to as the material safety data sheet (MSDS)
Natural round (NR) pole	pole whose sapwood has not been preserved by chemical treatment
Neutral axis	the direction through a pole which has no compression and tension forces. Refer to Annexure 1 for examples.
OLI	overhead line inspection. In this document OLI refers to the inspection of the pole above groundline and all of the pole hardware (for example, crossarm, conductors and insulators).
OLI/GLI	combined overhead, ground and below ground inspection
OLI/GLI Manager	person assigned by Endeavour Energy to manage the inspection contract
PI pole	pressure impregnated pole
Reinstated pole	pole that has had additional supports attached to increase its strength to an acceptably safe level
ROI	report of inspections
SF6	sulphur hexafluoride

Splint/nail	galvanised steel section used to reinforce a decayed pole at the groundline area
Square sawn pole	sawn beam of suitable wood that complies with AS 3000
Transmission asset	asset with a nominal voltage of 33kV and above
SWER	single wire earth return overhead line system
Termite tag	tag nailed to a pole when termites are found
Urban	area where the majority of available land is zoned for residential and/or industrial use, or a town or city area that is adjacent to other similar town or city areas
Leakage detector	combined high and low impedance multimeter, for example, Fluke 117

5.0 ACTIONS

5.1 Authorisation, accreditation and training

The contents of this instruction must only be carried out by persons with suitable qualifications and certifications in accordance with Company Procedures GAM 0089 - Authorisations governance and management, and GAM 0090 - Authorisation to carry out overhead and ground line inspections. This includes the following inspections:

- Pole and line inspection and treatment;
- Pre-summer bushfire inspection;
- Aerial inspections (for example, helicopter and LIDAR);
- Waterway crossings; and
- Pole-top (EWP) inspection of wood poles.

Persons undertaking any sub tasks must also comply with the relevant requirements in GAM 0089 - Authorisations governance and management, and GAM 0090 - Authorisation to carry out overhead and ground line inspections.

5.2 Inspection requirements

5.2.1 Inspection intervals

The inspection intervals for all poles and overhead lines must be as shown below:

Description	Inspection interval	
Full length preservative treated (FPT) poles (including private).	First three (3) inspections	OLI only every 4.5 years
	Fourth (4 th) and subsequent inspections	Full OLI and GLI every 4.5 years.
Natural round (NR)/de-sapped durable (DD) poles	Full OLI and GLI every 4.5 years.	
All reinstated poles	Full OLI and GLI every 4.5 years.	
All square sawn poles	Full OLI and GLI every 4.5 years.	
Steel poles ¹	Sureline and Ingal steel mains poles	OLI only every 4.5 years. See clause 5.11.4 for additional details.
	Other steel poles	Full OLI and GLI every 4.5 years.
Concrete and composite poles	Poles with distribution assets (22kV and below)	Full OLI every 4.5 years, no GLI required

	Transmission only poles (33kV and above)	Inspection covered by MMI 0012.
Waterway crossings – refer GIS for details of all river crossings		
Inspect condition of warning signs and vegetation encroachment	Covered by MMI 0012.	
Overhead line inspection	Every 4.5 years with pole inspection.	
Measurement of line clearances	Covered by MMI 0012.	
Fire prone areas (refer to Endeavour Energy)		
Pre-summer patrol of all network and private lines in bushfire prone areas	Refer to MMI0034 Pre-summer Bushfire Inspection.	

¹ Does not include street light columns. The inspection of street light columns is covered by MMI 0003 - Routine external structural inspection of streetlight columns and LV pillars and MMI 0022 - Routine electrical inspection of streetlight columns and LV pillars and associated electrical terminations.

5.2.2 Inspection notification

Private property access	
Mains/poles owned by Endeavour Energy on private property	Reasonable effort must be made at the time of the inspection to inform the customer that their property is to be entered. If the property owner cannot be contacted, the inspection should continue.
Mains/poles owned by customers	The customer must be contacted and approval obtained before commencing the inspection.

5.2.3 Pole identification categories and inspection requirements

Pole owned by	Endeavour Energy Transmission mains on pole?	Other details	Code	Inspection		
				OLI	GLI	Treat
Endeavour Energy	Yes	No Telstra or other assets on pole	A	✓	✓	✓
Endeavour Energy	Yes	Telco joint use ²	B	✓	✓	✓
Customer	No	Private LV lines	D	✓	✓	✓ ¹
Endeavour Energy	No	Private LV lines ⁴	F	✓	✓	✓
Telstra	No	Common use ³	G	✓		
Customer	Yes	Private transmission line ⁵	H	✓	✓	
Endeavour Energy	No	Telco joint use ²	J	✓	✓	✓
Endeavour Energy	No	Ausgrid mains on pole	K	✓	✓	✓
SRA	No	Endeavour Energy's mains on pole	L	✓		
Transgrid	Yes	Endeavour Energy's mains on pole	M	✓		

Ausgrid	No	Endeavour Energy's mains on pole	N	✓		
Customer	No	Private HV line ⁵	P	✓	✓	
Endeavour Energy	Yes/no	Rebutted pole	R	✓	✓	
Endeavour Energy	No	Stay pole	S	✓	✓	✓
Customer	No	Private HV line	Q	✓ ¹	✓ ¹	
NSWFB	No	NSW Fire Brigade	X	✓	✓	✓

¹ Inspection or treatment does not always apply, see clause 5.2.4 for further information.

² Joint use poles – a pole owned by Endeavour Energy that also supports Telco assets (such as aerial communication cables).

³ Common use poles – a pole owned by a Telco that also supports Endeavour's overhead mains.

⁴ Code F is to be used for private LV lines in areas such as the former Nepean River County Council, where Endeavour Energy has accepted responsibility for the pole because of a pre-1980 agreement with the customer.

⁵ Codes H and P are used only for some existing lines where Endeavour Energy has accepted responsibility for the pole because of an agreement with the customer. No new lines should be marked as H or P category.

5.2.4 Extent of pole inspection and treatment

Pole inspection and treatment	
Poles owned by Endeavour Energy on public property	Poles must be inspected and treated.
Poles owned by Endeavour Energy on private property	Attempts must be made to contact the customer prior to the inspection. The customer must agree to allow the inspection and treatment. If the customer cannot be contacted, the inspection must still be performed, but no treatment is to be used.
Poles owned by customers (excluding poles owned by other authorities below)	All poles must be inspected up to the main switchboard, except for Code Q poles, which are to be inspected up to and including the high voltage metering point or the first point of protection (for example, dropout fuses, circuit breaker or switch fuse), whichever is first. If there is no high voltage metering point, all poles must be inspected for the entire line length. The customer must be contacted prior to the inspection. Treatment must only be applied to steel poles.
Fire hose poles	Poles must be inspected and treated. This applies to poles owned by fire brigades and Endeavour Energy
Poles located within Endeavour Energy's depots and substations	Poles must be inspected and treated. Access to live switchyards must take place only while the inspector is accompanied by authorised staff.
Poles located in water catchment areas, national parks, organic farms, and Cattle Care areas	Poles must be inspected however no groundline treatment or termiticide is to be applied.
Poles owned by other authorities	Poles owned by other authorities are to be inspected by the owner only. Examples of other authorities are Essential Energy, Ausgrid, Rail Corp, Telstra, Transgrid.

Note: Out of service Endeavour Energy poles must also be inspected and treated in accordance with the above.

5.2.5 Extent of mains inspection

Mains inspection	
Mains owned by Endeavour Energy	All mains must be inspected, including those on private property and on poles owned by other authorities.
Mains owned by customers	Mains must be inspected in conjunction with any poles inspected up to the main switchboard according to clause 5.2.4. An exception is where the customer's mains become underground; no inspections are required beyond this point.

5.2.6 Defect management

Defects	
Mains/poles owned by customers	If the customer's installation is found to be defective, the faults are to be recorded in the record of inspection and sufficient detail included to enable follow-up action by Endeavour Energy (refer clause 5.20).
Mains/poles owned by Endeavour Energy	All defects must be recorded to enable follow-up action by Endeavour Energy (refer clause 5.20).

5.3 Emergency situations and contact arrangements

Under normal circumstances, if a hazardous condition and/or unsafe situation, such as a live or failed pole is found, it must be reported immediately to the local **Depot Operations Manager**.

If the hazardous condition is related to a customer installation, contact the **OLI/GLI support employees**.

In an **emergency**, call the **System Operator, System Control** on **131 003**.

5.4 Precautions before commencing any work

5.4.1 Safety standards

The contractor, their employees, and any subcontractors, must abide by the Endeavour Energy Safety Rules, and any amendments to these documents, for the duration of the works to be carried out as a result of this instruction.

5.4.2 Worksite hazard and risk assessment and Safe Work Method Statements

Prior to commencing any work on site, a Worksite Hazard and Risk Assessment (FSY 0118) is to be completed.

Safe Work Method Statements to be used are:

- SWM 1.010 – Overhead and Ground Line Inspection and Audit;
- SWM 1.005 – Patrol of Overhead Mains Inspection
- SWM 6.026 – Pole Treatment (OLI/GLI) when using chemicals to treat poles for termites and fungal decay;
- SWM 6.002 – Handling burnt or burning CCA treated timber;
- SWM 6.014 – Removal of Foreign Objects from Conductors & Apparatus

5.4.3 Duty of care

The contractor, their employees, and any subcontractors, must display a duty of care to

the public, other Endeavour Energy contractors and Endeavour Energy employees, during the course of their work.

If a potential safety issue is identified, the inspector must correct the problem, make the problem safe, or advise the responsible person to repair it at a later date.

5.4.4 *Clothing*

All employees, contractors or subcontractors must be appropriately dressed at all times in accordance with Company Procedure GSY0067 – Personal Protective Equipment.

5.4.5 *Tools*

All tools and equipment must be kept in reasonable working condition so that they are safe to use at all times. Any tools and equipment that require inspection must be current in their period of inspection and tagged/logged accordingly.

5.4.6 *Environment*

All noise, waste materials/run off/cleaning solvents, such as water and oil, must be controlled to meet DECCW and local council guidelines.

5.4.7 *Pole treatment chemicals*

It is the pole inspector's responsibility to check that the chemicals used for the preservative treatment of poles are approved for use by the relevant environmental body and Endeavour Energy.

Pole inspectors must also have a copy of the current SDS for all chemicals carried.

The public must be notified of pesticide use and an environmental risk assessment must be carried out according to Company Procedure GPE 0004 – Pesticide Use.

5.4.8 *Pole Inspections involving burnt CCA poles*

Staff performing pole inspections on burnt CCA poles must:

- Record the location on the pole of the burnt sections.
- Report the pole as having been burnt to the relevant depot.

A strength determination is to be carried out in accordance with MDI 0031 – Overhead distribution, Design standards manual, and clause 5.12.3 of this document where the timber burnt away is treated as a defect, causing either a general reduction in diameter, or a bite, as appropriate.

The charred material must be removed in accordance with SWM 6.002, so that the extent of the reduction in diameter of the pole can be measured. Only depot staff trained in the removal of charred material must carry out the material removal. Regional design staff will be required to determine if the pole is suitable to remain in service.

If the pole remains serviceable, all charred material is to be removed and any raw timber coated with copper naphthenate (CN) paint. All free ash must be collected, placed in sealed plastic bags and transported back to the pole depot for assessment to EMS 0007, followed by disposal using the appropriate method.

5.4.9 *Visual preliminary overhead inspection*

Before any excavation, sounding, boring or dressing of a pole takes place, the inspector must commence each inspection by visually checking the above ground portion of the pole for any serious defects, as set out in clause 5.10.

If, for example, a high voltage conductor is dislodged from an insulator, or if any component is so loose that it could fall during the inspection, the pole is to be bypassed and reported to Endeavour Energy on the number indicated in clause 5.3, for further action. A 48 hour defect is to be raised and the full pole inspection delayed until the

defect is repaired.

Any unauthorised advertising signs and any protruding fixing nails or screws that can be effectively reached from ground level must be removed from the pole. These must be removed immediately after the voltage leakage test (refer clause 5.4.10). Unauthorised advertising signs that are unable to be reached are to be reported for removal. Further detail of unauthorised material is set out in MDI 0024 - Attachment of non-network items to poles and streetlight columns.

Following remedial safety work, the normal inspection/assessment may proceed.

5.4.10 Voltage leakage check

Before commencing any related inspection activities of any pole, such as excavation and sounding, the inspector must carry out a voltage leakage check on the pole.

The inspector must be suitably attired with low voltage insulating gloves worn on both hands to perform the voltage leakage test and to prove the pole safe to touch before direct contact is made with the pole and attachments.

The integrity of the meter must be checked in accordance with clause 5.4.10.1. After each pole check, the functionality of the device must be re-checked in accordance with the manufacturer's instructions.

5.4.10.1 Multimeter check

The multimeter used to perform the voltage check must have a function to measure both LOW and HIGH impedance (proximity test), for example, *Fluke 117*.

Prior to and after checking any pole for voltage leakage, the multimeter must be checked for integrity. This test must be performed in accordance with the manufacturer's instructions by either:

- using a known voltage point such as a power point or another known live circuit; or,
- as this meter is sensitive to static electricity, it can be checked for functionality by vigorously rubbing the meter on a cotton shirt sleeve.

When used as a proximity tester (*Volt Alert* setting), the multimeter will indicate the presence of an electrical field with a light and an audible buzz.

A spare 9v alkaline battery must be carried by the inspector as a back-up for the meter as replacement of the battery may be required at any time.

5.4.10.2 High impedance check

Approach the pole and visually inspect for burnt grass, electrical tracking on pole, or any other indication of an electrical failure.

Using a high impedance (Z) capacitively coupled measuring device, such as a *Fluke 117* meter on the **Volt Alert** setting and on **Lo** RANGE, stand approx one (1) metre from the



Figure 1: Multimeter voltage tester

pole and extend at elbow height, moving towards the pole, and touch the surface.

- Repeat for all metal (conductive) surfaces.
- A *positive* indication (light and buzz sound) must be treated with caution and the voltage level confirmed using the *Fluke 117* meter set to the *AUTO-V LoZ* setting, as described in the voltage test below.

5.4.10.3 Voltage test

Upon receiving a positive high impedance indication, perform a *voltage test* measurement using a low impedance resistively coupled device, such as the *Fluke 117* set to **AUTO-V LoZ**. Probes are to be connected between an earth/ground stake or similar driven into the ground a minimum of approximately one (1) metre from the pole and the pole surface. Where available, the test is to be performed at a metallic fitting, such as a pole disk indicator or pole number aluminium plate tag.

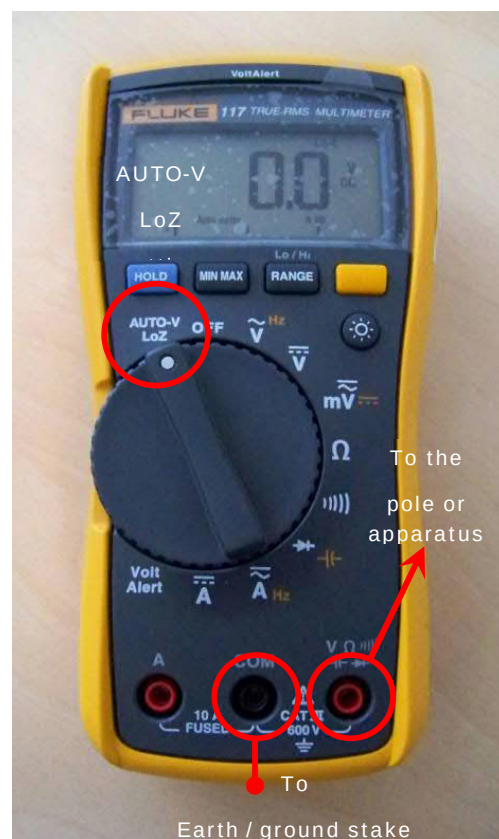


Figure 2: Settings for voltage test

If the voltage on the *AUTO-V LoZ* setting is less than 5V, no further action is required and work may proceed on the pole.

If the voltage on *AUTO-V LoZ* is equal to or greater than 5V, guard the pole and immediately report the problem for attention by qualified personnel.

If a hazardous condition and/or an unsafe situation is found, such as a live or failed steel pole, it must be reported immediately as set out in section 5.3.

In addition, the following action must be taken:

The inspector must:

- cordon off the area where the hazardous conditions exists;
- prevent the public from entering the area;
- notify the supervisor that a hazardous condition has been found;
- stand by until emergency staff have arrived; and,
- not proceed with any further work on the pole until advised that it is safe by an authorised person, and a further voltage leakage check confirms that the pole is safe.

5.5 Termite infestations

5.5.1 General

Following the safety checks indicated in clause 5.4, the pole and the adjacent soil must be carefully examined for evidence of termite infestation.

See Annexure 2: Typical termite pictures, to assist in termite identification.

Special note 1: *If *Glyptotermes* are detected, the pole must be marked and condemned with no treatment carried out. Regardless of the previous statement not to disturb the soil, the inspector should look for flight holes at the area 300mm below groundline (most cases) and up to two (2) metres above groundline (extreme cases). The flight holes should be cut with a sharp axe to disclose cross grain galleries. Poles with evidence of brown rot fungus infection can be prone to these termites.*

Special note 2: **Nasutitermes* detected in the pole can generally be eradicated by destroying the nest and spreading it across the ground. An effort is to be made to locate and kill the queen. Termite affected sapwood must be removed to 300mm above ground to discourage further attack.*

Subterranean termites are generally the most destructive of Australian termites. If, when checking a pole, the inspector is unsure of a species, advice should be sought from a specialist.

5.5.2 Procedure upon finding termites

If termite infestation is found, the normal inspection is to continue, however the pole must not be treated with preservative.

The pole is to be reported for a follow-up approved termite treatment and appropriate defects must be entered into Ellipse. Poles must be appropriately marked with a termite tag (see clause 5.15.4) and the defect is to be assigned a three (3) month priority. Each treatment is to be recorded into the one Ellipse work order as a separate *Task*, and the date of treatment is to be recorded into the *Task Completed Date* field. The first treatment must be completed and recorded into Ellipse within one (1) month of the defect raised date.

Note: Details of the application of an approved termiticide where termite infestation is detected are given in Branch Workplace Instruction WAE 2034 – Treatment of Termites in Wood Poles.

5.5.2.1 Hazardous pole replacements

If the pole is found to be in a hazardous condition, it must be reported immediately to Endeavour Energy on the number indicated in clause 5.3 for necessary action.

Replacement of a hazardous pole is to proceed immediately without waiting for further treatment. Treatment must be applied (in accordance with Branch Workplace Instruction WAE 2034 – Treatment of Termites in Wood Poles) to the replacement pole in order to eradicate any termite colonies still present and also prevent possible re-infestation.

5.5.2.2 *Non-hazardous pole replacements*

If the termite infested pole is not immediately hazardous and awaiting replacement, it must be treated in accordance with Branch Workplace Instruction WAE 2034 – Treatment of Termites in Wood Poles, to eradicate the colony and prevent possible re-infestation. This treatment must be carried out only by authorised persons.

5.6 **Sounding of poles**

5.6.1 *Above groundline sounding*

Inspectors must sound the pole in order to get a general indication of the pole's condition. The strength assessment of the pole is determined in section 5.12.

For **wood poles**, use the flat side of a hammer, and for **steel poles**, use the round end of a ball pein hammer. Sufficient force should be used to give an indication of the pole condition, but not enough to dent the steel pole or affect a timber pole's sapwood layer.

Sounding must be done by striking the pole with the hammer from several directions, beginning at its base, as close as possible to the groundline. A sound pole should produce a ringing sound.

For **steel poles**, work upwards to 100mm above groundline listening for the sound of any internal rust falling down the inside of the pole dislodged by sounding. For **wood poles**, work as high as can be effectively reached until the full circumference of the pole (360°) has been checked.

5.6.2 *Below groundline sounding*

After excavation around the pole is complete, the underground section of the pole must also be sounded to check for possible decay/rust.

This must be done by striking the pole from several directions with the hammer, beginning at the base of the excavation, and then upwards to approximately 100mm above groundline until the full circumference of the pole (360°) has been checked.

In steel poles, a measure of the amount of internal rust can be gained by listening for the sound of any rust falling down inside the pole.

5.6.3 *Sounding result*

If by sounding, the pole's condition is doubtful, the process that must be followed is:

Wood poles – An internal inspection at the location of possible decay must also be carried out in addition to the usual internal inspection process. Above ground internal inspections are to be done according to 5.10.1.1 and below ground internal inspections are to be done according to 5.12.1.4. The allowable wall thickness and safety factor for this inspection is given in the *Assessment of serviceability* flowchart (clause 5.9.3).

Steel poles – If the inspector considers the pole to be hazardous, it is to be reported for rectification.

The local Operations Manager is to be contacted to arrange temporary pole support and the OLI/GLI Manager notified. Private steel poles found in this condition are to be reported to the customer (if available) at the time of inspection.

5.7 Easements and access tracks

Property developments, structures and swimming pools that encroach onto Endeavour Energy easements must be recorded for follow-up by Endeavour Energy. Easement widths are, generally:

<i>Description</i>	<i>Voltage</i>	<i>Nominal easement width</i>
Aerial bundled conductors	230/400V	6m
Aerial bundled conductors (NMS)	11kV - 22kV	6m
CCT – vertical construction	400V - 22kV	6m
Bare conductor and CCT horizontal construction	400V - 22kV	9m
Single pole with cross arm construction	33kV	18m
Single pole with cross arm construction	66kV	25m
Double pole/H-pole	33kV - 132kV	30m
Single pole vertical/delta post insulators	66kV	18m
Single pole vertical/delta post insulators	132kV	25m
Steel tower twin circuit	132kV	30m
Pole stays/ground stays	N/A	6m

Inspect access tracks and associated infrastructure for excessive damage, degradation, and obstruction to assets. If access to assets is not possible or unsafe, OLI/GLI must be notified immediately (before completion of the map).

5.8 Pole identification disc information and data capture

It is important that pole disc information is recorded correctly. Where poles are fitted with an identification disc, the details must be checked against those recorded in the data capture tool and updated where required.

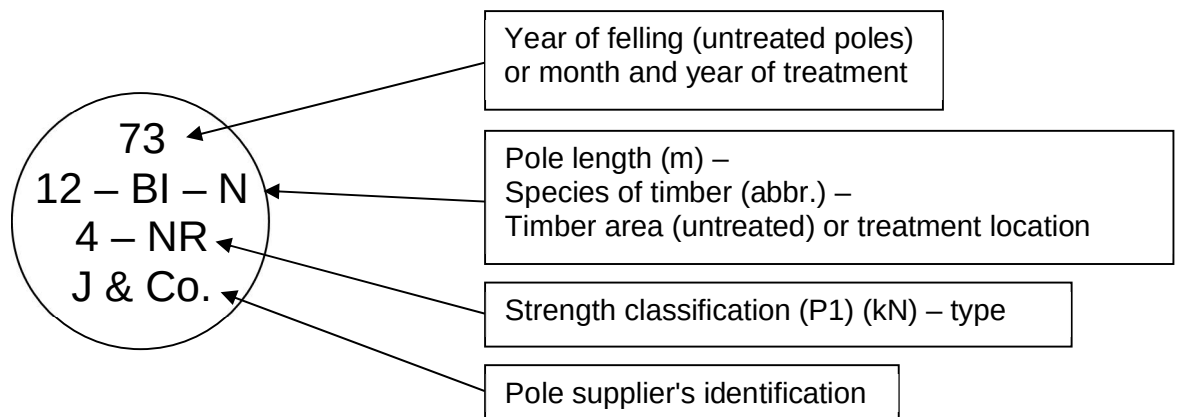
This check and update **must also apply to all circuit option fields** in the data capture tool. Shown below are examples of the type of information that may be found on wood pole discs however this may vary depending on suppliers and specific contracts.

The latest layout used by Endeavour Energy is Option 1 (modified), Figure 5.8, AS 2209-1994 shown as Example 4.

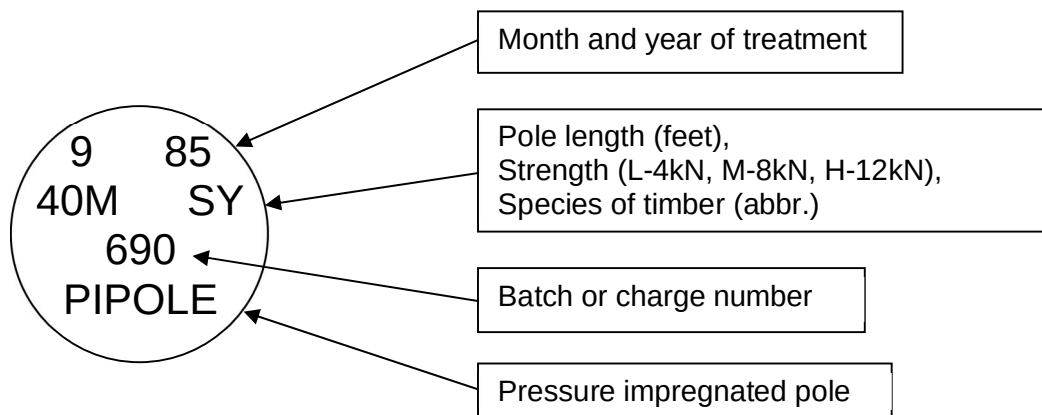
The identification plate for concrete and steel poles is shown in Drawing no. 053999. Concrete and steel poles must have the following updated: Name of manufacturer, month and year of manufacture, length of pole and pole strength (both ultimate and working).

A pole strength conversion table is given in Annexure 3. Details of manufacturers' codes and plant locations are given in Annexure 4. Timber species and durability classifications and identification brands are given in Annexure 5.

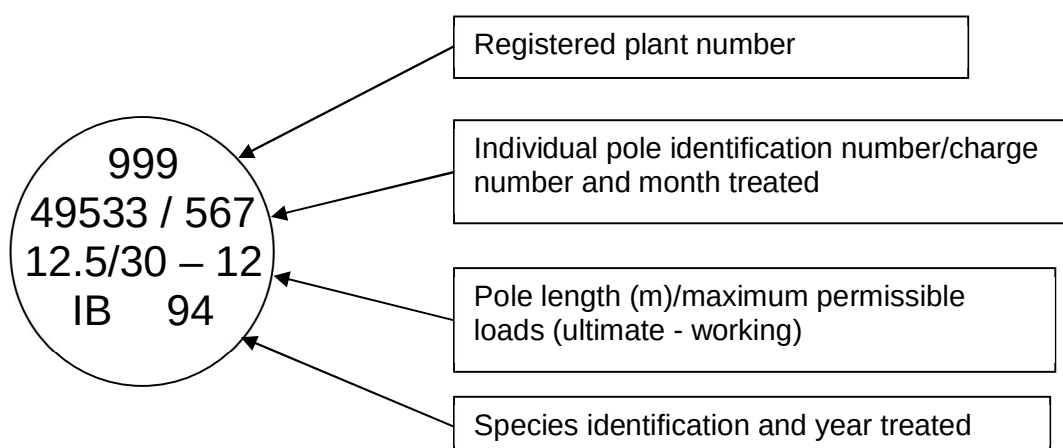
5.8.1 Example 1 – about 1970 to 1979 (EA of NSW)



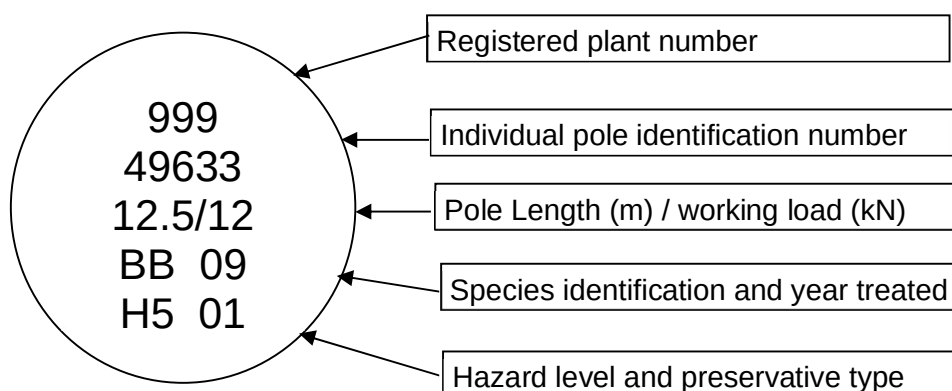
5.8.2 Example 2 – about 1979 to 1994 (AS 2209 - 1979)



5.8.3 Example 3 – about 1994 to 2009 (AS 2209-1994)



5.8.4 Example 4 – October 2009 to present (AS 3818 – 2009)



5.9 Assessment of the serviceability of poles

The inspector must follow the procedures set out in this instruction and the computer data entry manual for the assessment of the serviceability of wood poles.

5.9.1 Altering the decision to pass or condemn a pole

The officers below may alter the original decision to pass or condemn a pole:

1. Inspector in conjunction with his Manager and the OLI/GLI Manager/Representative.

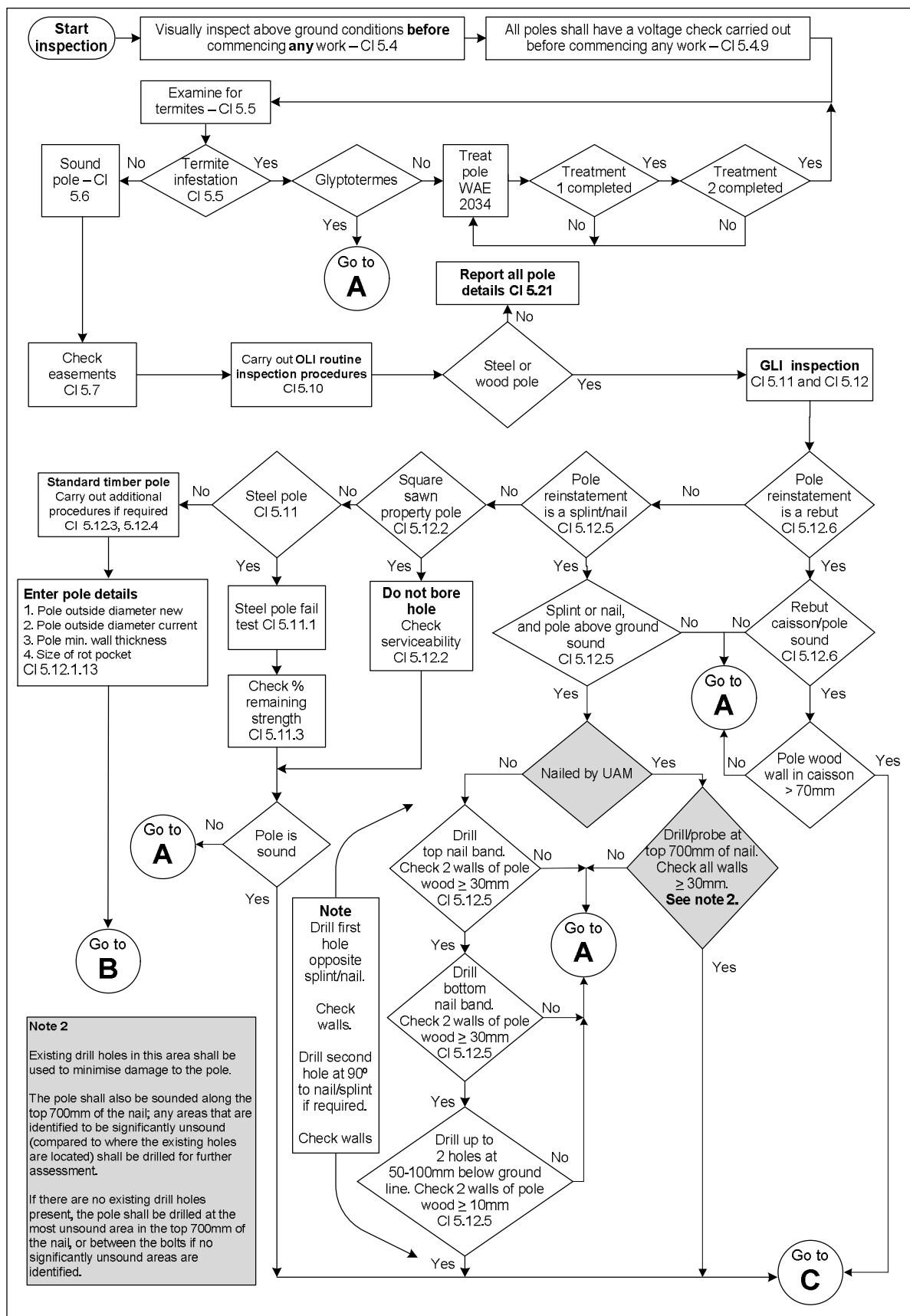
In the case of a pole being designated as serviceable after condemnation by an inspector, the following additional processes must be undertaken:

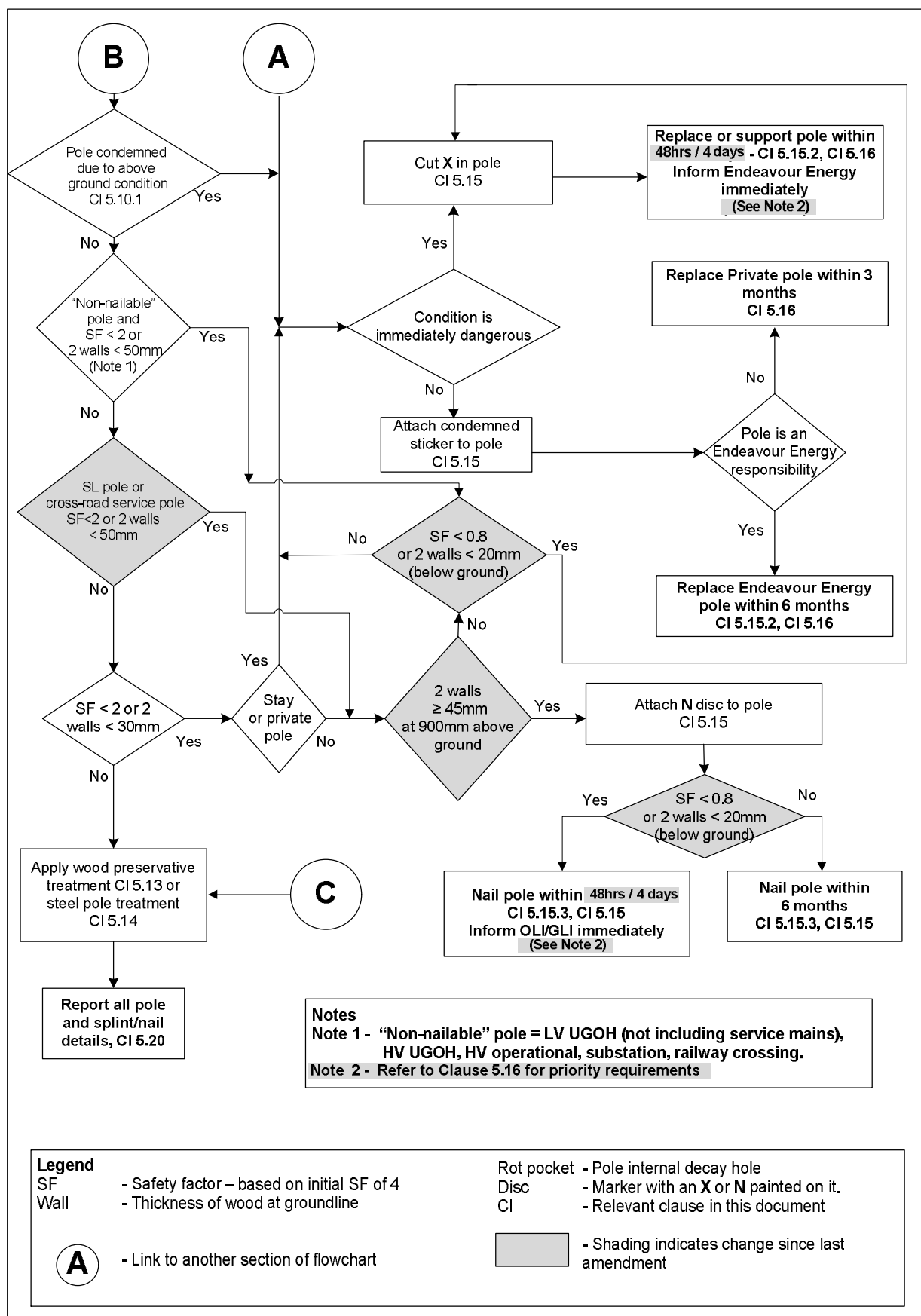
1. The officer changing the decision must undertake a full re-inspection in accordance with this instruction. Whenever practical, this should be carried out in conjunction with the inspector who made the original inspection.
2. Reasons for changing the decision, including the serviceability criteria, are to be given in writing to the inspector and a copy forwarded to the contractor and the OLI/GLI Manager.
3. Status of the pole is then to be amended in Ellipse.

5.9.2 Removal of condemned pole markings

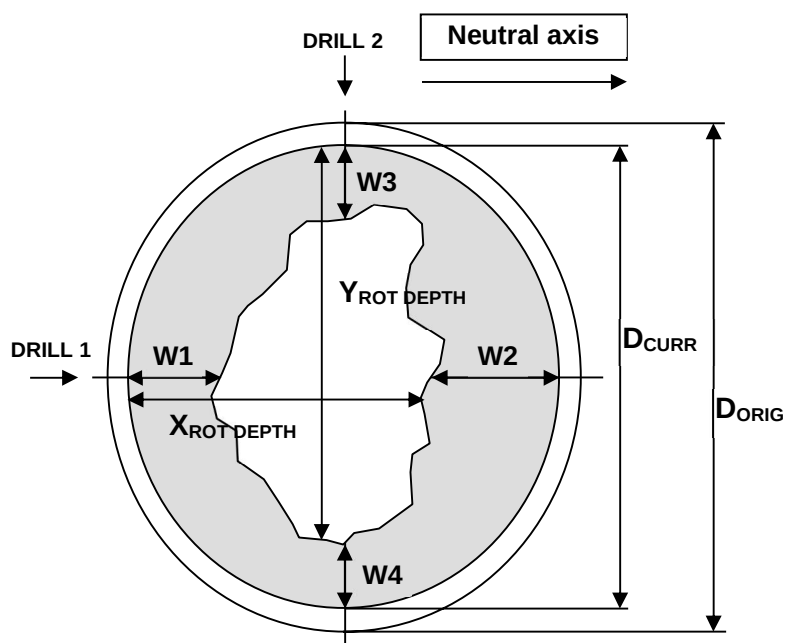
Wherever practical, the markings on a condemned pole must be removed only by the inspector who condemned the pole after he has received the written advice required in clause 5.9. If for any reason this proves impossible, the matter must be referred to the OLI/GLI Manager for final arbitration.

5.9.3 Assessment of serviceability flowchart





5.9.4 Standard measurements for pole and rot pocket details

**LEGEND****D_{ORIG}** = Original pole diameter**D_{CURR}** = Current pole diameter**W₁** = Measured thickness**X_{ROT}** = Measured depth**W₂** = **D_{CURR}** – **X_{ROT}** DEPTH**W₃** = Measured thickness**Y_{ROT}** = Measured depth**W₄** = **D_{CURR}** – **Y_{ROT}** DEPTH**W_{MIN}** = Min of **W_{1,2,3}** or **4****D_{ROT}** = Largest rot pocket diameter
(**X_{ROT}** – **W₁**) or (**Y_{ROT}** – **W₃**)**SF** = Safety factor

Refer to clause 5.12.3 for additional details of measuring natural round poles.

5.9.5 Sample calculations

	Example 1: 2 small rot pockets = effectively 1 large pocket	Example 2: 1 rot pocket and minimum wall at 1 side	Example 3: 1 rot pocket and 2 walls below size	Example 4: Excessive external decay and small rot pocket
D_{ORIG}	360	360	360	400
D_{CURR}	360	360	360	300
W₁	70	75	25	100
X_{ROT} DEPTH	320	285	220	150 (rot not over pole centre)
D_{CURR} – X_{ROT} DEPTH = W₂	360 – 320 = 40	360 – 285 = 75	360 – 220 = 140	300 – 150 = 150
W₃	90	10	28	Not required to be measured
Y_{ROT} DEPTH	270	260	260	Not required to be measured
D_{CURR} – Y_{ROT} DEPTH = W₄	360 – 270 = 90	360 – 260 = 100	360 – 260 = 100	Not required to be measured
W_{MIN}	40	10	25	100
D_{ROT}	320 – 70 = 250	260 – 10 = 250	220 – 25 = 195	150 – 100 = 50
SF	3.1	3.1	3.7	1.7
Dia @ 1.2m	320	320	320	360
Conclusion	Pole serviceable	Pole serviceable	Suitable - nailing	Suitable - nailing
Reason	SF ≥ 2 and 2 walls ≥ 30mm (3 walls are ≥ 30mm)	SF ≥ 2 and 2 walls ≥ 30mm (3 walls are ≥ 30mm)	SF ≥ 2 but 2 walls < 30mm Check if wall @ 900mm ≥ 45mm	SF < 2 and 2 walls ≥ 20mm Check if wall @ 900mm ≥ 45mm

5.10 Procedures for above ground inspection of all poles (OLI)

All defects identified during inspections must be recorded as set out in section 5.20. Inspection and observation must be carried out **with the aid of stabilised binoculars from a minimum of three (3) directions** for all poles and all visible line components.

If practical, an additional inspection from above the pole top (helicopter, telescopic pole mounted camera, unmanned aerial vehicle, or other methods) will provide a more thorough examination, particularly for the top surface of crossarms and pole head decay.

Particular attention must be given to the correct alignment and fitting of the installed pole top attachments along with the specific requirements listed in this section.

5.10.1 Pole condition- wood/concrete/steel/composite

5.10.1.1 Above ground internal inspection of wood poles

All poles are to be sounded as described in section 5.6 and if by sounding doubt exist as to the pole condition above ground an internal inspection at the location of possible decay must also be carried out, in addition to the groundline internal inspection in section 5.12.

Where possible, all the above ground bore holes should be angled slightly upwards (10°) to prevent ingress of water to the holes, sterilised (as set out in clause 5.12.1.6) and sealed with plastic plugs.

Subsequent bore holes should be bored 50mm above or below previous inspection holes.

To determine the internal condition of the pole, the pole must be drilled as follows:

- Using a 12mm auger, the first hole is to be drilled directly into the area of concern. If a pocket/hole is found that extends beyond the centre of the pole, a second drill hole will be required at 90° to the first hole. The thickness of sound timber must be measured with an approved measuring gauge, suitable for 10°-15° drilled holes (**do not use the 45° calibrated gauge**).
- The wall thickness must be determined from the holes drilled. Where only one (1) hole is drilled, consider both walls, and where two (2) holes are drilled, consider the four (4) walls (see clause 5.9.4). The minimum wall thickness must be as indicated in the assessment of serviceability flowchart details.

5.10.1.2 Above ground external inspection of all poles

The general condition of the pole **must be observed** with the aid of stabilised binoculars for the following:

- a) Vertical alignment. Check if the pole is leaning or bending. A pole that is vertical in ground but bending due to structural pole top loading is not considered serious unless there are knot holes or splitting of the timber. Consider whether the pole alignment compromises conductor clearances or obstructs traffic on a road or driveway.

Inspect pole foundation for signs of degradation, subsidence or altered ground level.



Example of a pole with a 7° lean.

This level of lean increases sag in the adjacent spans, reduces ground clearance and results in the conductor being more prone to conductor clashing under wind and fault conditions.

Defects raised must have the entire length of the pole photographed.

Figure 3: Leaning pole

- b) Damage as a result of vehicle impact.
- c) Excessive splits or evidence of rot, particularly at the pole top.
- d) Open knot holes allowing water penetration and possible fungal decay.
- e) Lightning damage.
- f) Pole-top fire.
- g) Loose or missing pole caps (refer to SMI 101 – Section 3.8 for repair details).
- h) Depth altered due to filling or excavation.
- i) External fungal attack or loose sapwood (refer to 5.10.1.3 for FPT poles).
- j) Concrete or steel structures must be inspected for surface damage or deterioration (rust, spalling, holes or impact damage) together with a visual inspection of exposed earthing/bonding.
- k) Composite poles must be inspected for cracking, fibreglass blooming, and any other signs of major surface degradation. As composite poles are on trial in Endeavour Energy, any pole found with major surface degradation is to be reported to the Manager **Asset Standards & Design** for a detailed investigation.
- l) Termite infestation

An assessment of the pole's serviceability must be undertaken with consideration given to the above conditions. Depending upon the severity of the above ground condition of the pole, the inspector may condemn the pole and assign a suitable priority for replacement. Where a priority less than six (6) months is assigned, the relevant depot must be notified immediately.

Where doubt exists to the condition of the pole top or fittings in respect to fungal decay or splitting, the pole must be reported for a close inspection with the use of a EWP by Regional staff as detailed in Annexure 8.

5.10.1.3 Full length preservative treated (FPT) poles

All FPT poles that have loose sapwood, as shown in **Figure 4** to **Figure 6**, must have the words "CCA Sapwood Failure" added to the comments of the inspection work order field in the data capture tool.



Figure 4: Loose sapwood on FPT pole



Figure 5: Loose sapwood on FPT pole

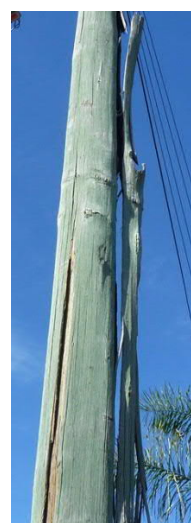


Figure 6: Loose sapwood on FPT pole

If the deteriorated condition of the sapwood indicates that the structural integrity of the pole has been compromised, a strength calculation must be performed to determine the suitability of the pole to remain inservice. The original diameter used in this calculation must include the sapwood layer and the current diameter will be the diameter of the remaining sound heartwood.

5.10.1.4 Above ground inspection of steel poles

The presence of rust holes or significant vehicle impact damage may require the replacement of the pole. Examples of steel poles that require replacement is shown in **Figure 7 to Figure 9**.



Figure 7: F
base of po
a



Figure 9: Vehicle
Impact damage



Figure 8: Vehicle
Impact damage



5.10.2 Crossarms

The crossarms must be inspected for signs of rotting, termites, splitting, distortion or burning. Alignment of the crossarm is to be observed to identify braces that are buckled or loose, or have coach screws missing. Braces, kingbolts, and other fittings must be inspected for corrosion. **Note:** Where defective crossarms are found on raiser brackets, the pole may be replaced as well to bring the construction to standard.

5.10.3 Insulators

An inspection must be carried out for broken or chipped insulators or any sign of flashover. Bent, rusted or obviously loose insulator pins are also to be noted. Particular attention is to be given to the evidence of rust stains on the insulator surface indicating the deterioration of steel conductor, tie wires, dead-ends and the like.

An example of elongation of the crossarm pin mounting holes is shown in Figure 10. This condition is more prevalent where a large conductor at high tension and some angle of deviation exists. Where possible, check if the suspension insulator bolt is slipping through the crossarm, as shown in Figure 12. It may be necessary to observe this from an adjacent pole with the aid of stabilised binoculars.

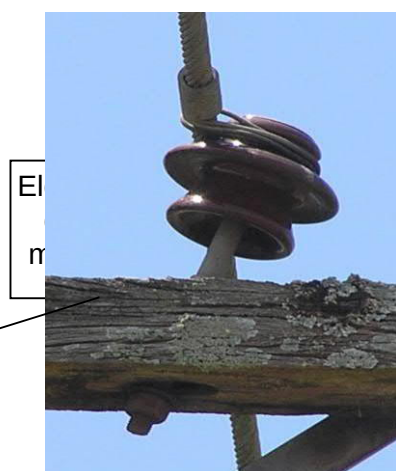


Figure 10: Loose insulator pin



Figure 11: Damaged HV pin insulator (possibly caused by firearm) and broken tie wire



Figure 12: Correct bolt and insulator construction (left) compared to a bolt which is slipping through the crossarm (right)

Polymer insulators, as shown in Figure 13, must be inspected for damaged sheds, sheath damage, exposed fibreglass rods, electrical tracking, flashover damage, loose corona rings (where fitted) and corrosion on metal end fittings.

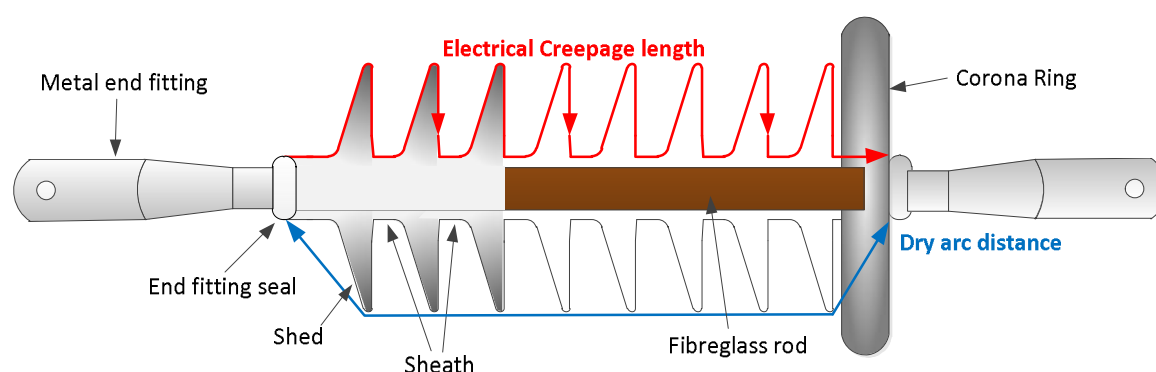


Figure 13: Polymer insulator

5.10.4 Conductor clearances

Conductor clearances must be in accordance with Drawing no's 011985, sheets 1 and 2, 086232, and 086242.

Factors that should be considered in deciding whether to have the line referred for assessment are:

- High ambient temperature.
- Low wind speed.
- High conductor load.

Depending upon span length, the above conditions will have a varying effect of *increasing* conductor sag.

If the clearances will not be maintained whilst considering these conditions, a low ground clearance defect must be raised. Defects are to be referred to the OLI/GLI Manager who will obtain an accurate measurement from the associated Regional design office.

If the clearances calculated by Regional design staff are less than regulation clearances set out in AS 7000, the line poses a safety hazard to the public and the Regional Manager is responsible for raising an appropriate defect to rectify the problem as a matter of urgency.

For specific requirements for river crossings, refer to clause 5.21.

5.10.4.1 Ground clearance

Attention must be given to the ground clearances of the various conductors, particularly in locations where the original ground level may have changed due, for example, to filling or road surfacing activities. Where doubt exists regarding ground clearances, measurement of clearances must be made by the use of a telescopic insulated height stick, or similar.

5.10.4.2 Clearance to structures

Attention is to be given to buildings, structures, signs and the like, that are erected over or adjacent to the footpath and that may interfere with any overhead mains. The location of flagpoles must be checked to confirm that a suitable allowance has been made for clearance of the flag, with an allowance for conductors to move under wind conditions.

5.10.4.3 Clearance to other services

The clearances between Endeavour Energy's mains and those of, for example, NBN, Telstra, Optus, Transgrid, Energy Australia, and the State Rail Authority, must be observed, and where doubt exists, measured and referred to the OLI/GLI Manager for action (see Annexure 7 for communication cable clearances).

5.10.4.4 Conductor separation of different circuits

Conductor separation between different circuits must be observed and where it is considered that a non-compliant separation exists, a defect is to be raised to restrain the appropriate circuit. Allowable separations are specified in AS/NZS 7000.

5.10.4.5 Clearance to vegetation

Vegetation clearances must be inspected as set out in the Vegetation Maintenance Common Requirements (VMCR) or MMI 0013 – Clearances to be maintained between network assets and vegetation, whichever is more current.

Pole top equipment

5.10.4.6 Earths

For safety reasons, no attempt is to be made to repair any broken earths. All broken earths must be reported immediately for repair by suitably authorised persons. An immediate defect is to be raised and the full pole inspection delayed until the earth conductor is repaired.

All earthing conductors must be inspected for vandalism, mechanical damage, loose connections, and that mechanical protection (earth cover batten) is installed and in good condition.

5.10.4.7 Air break switches

The general condition of air break switches is to be observed, including the operating handle, shaft, joints, pivots and insulators. The contact alignment must be inspected to verify that contacts are correctly engaged.

Stabilised binoculars must be used to check contact alignments. Any bi-metal connections must be examined for damage. Connections must be examined for discolouration or other signs of deterioration.

5.10.4.8 Load break switches

The general condition of load break switches, including operating arm, pivots and insulators, must be examined for signs of wear or damage. Corrosion or significant rust is to be reported and particular importance is placed on this in coastal environments.

The SF6 gas level indicator, where applicable, must be viewed through stabilised binoculars to check correct levels.

5.10.4.9 Isolating links and fuse links

Isolating links must be checked to confirm no looseness of the fitting in the attachment to the crossarm and that supporting insulators are not cracked and are in good order.

5.10.4.10 High voltage dropout fuses

An inspection must be carried out to confirm that the contacts are correctly engaged, that there is no sign of poor contact, and there is no distortion of the fuse carrier. Stabilised binoculars must be used to check contact alignments.

Connections must be examined for discolouration or other signs of deterioration.

Where spark arrestors are installed on the fuses, the complete fuse assembly is likely to be an older style and must be defected and recorded for replacement (refer to **Figure 14**).



Figure 14: Dropout fuse spark arrestor

5.10.4.11 Surge diverters

The general condition of all surge diverters must be observed, including the condition of the insulator and the line and earth connections.

An earth lead hanging down from the base of the surge diverter will indicate a failure of a unit that has been fitted with a *disconnecter* and is to be defected for replacement.

Porcelain surge diverters that are brown in colour, or porcelain surge diverters that have been in service prior to 1990, must be defected and recorded for replacement.

5.10.4.12 Pole mounted transformers and automatic switching devices

A visual inspection (with the aid of stabilised binoculars) must be carried out of pole mounted transformers, reclosers, sectionalisers, voltage regulators and similar automatic switching devices, with particular attention to:

- Legibility of labels/signs;
- Presence of oil/gas leaks, major tank corrosion, or poor paintwork;

- Damage/dirty bushings or insulators;
- Condition of shrouds;
- Damaged insulation or loose connections of bonds;
- Loose or damaged earth connections; and,
- Security of framework, safety chain or u-bolt connection to the unit and pole, refer to **Figure 15**.

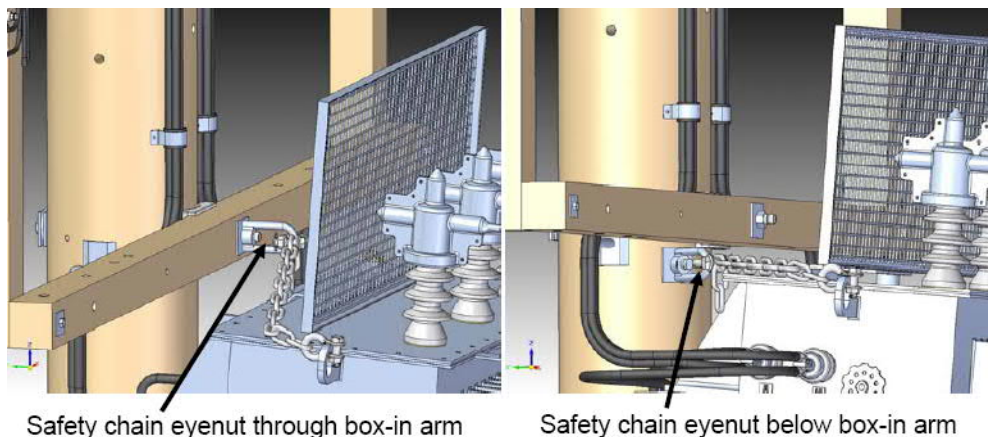


Figure 15: Pole mounted transformer safety chain eyenut location

5.10.4.13 Cable ends, down earths and pole steps

A visual inspection is required, and any mechanical deterioration, looseness of fittings or signs of heavy rust is to be reported. Underground to overhead connections must be inspected for oil leaks and the general integrity of the connections.

5.10.4.14 Streetlights

Streetlights must be checked for any sign of loose brackets, broken or loose fittings or damaged wiring, particularly where it enters conduits, brackets and similar fittings. Particular attention is to be given to the security of any visor fitted to a streetlight.

Brackets or fittings that foul mains or stay wires, and excessive vegetation interfering with the effectiveness of the streetlight, are to be reported.

5.10.5 Stay poles and ground stays

Pole stays must be inspected to verify that the stay has not slipped, slackened, or crushed the pole, or is otherwise in need of adjustment, and that stay insulators are correctly installed. Staywires must also be inspected for excessive corrosion.

Check for deteriorated, loose or missing u-bolt clamps.

The presence, position and condition of stay guards must be checked to confirm that all ground stays located in public areas are effectively guarded.

Ground stays in rural areas should be checked for cattle guards. Also check for stay condition at ground level for any deterioration.

Low voltage spreaders should be fitted where stay wires pass between low voltage or streetlight mains.

5.10.6 Conductors

Using stabilised binoculars, the conductors must be inspected throughout their length for broken, burnt or unravelled strands, or foreign objects such as kites, sneakers or fence wire. Particular attention is to be given to the evidence of rust on steel and steel cored conductors, the associated tie wires, armour rods and dead-ends. Rust stains on supporting insulators and hardware are an indication that the conductor protection (galvanising) has deteriorated to the extent that the conductor strength has been compromised and is to be reported

For overhead steel conductor inspections, particular attention should be given to the colour and pitting of the metal as well as fraying or broken strands. Other contributory factors such as the location of the overhead mains (e.g. bush fire prone area), and the criticality of the feeder may be included in a risk assessment. The risk assessment may necessitate a more immediate defect prioritisation than those given in the table below.

The following figure and table provides guidance on the prioritisation of defects for the condition of overhead steel wires:



Figure 16: Steel conductor condition/corrosion categories

Category	Description	Defect Priority
1	No corrosion, 100% galvanized	No action required
2	Light surface corrosion with negligible pitting	No action required
3	Medium surface corrosion with mild pitting	Reassess next inspection
4	- Heavy surface corrosion with mild to medium pitting - Annealing or thinning of conductor	Replace within 1 year
5	- Heavy surface corrosion with medium to heavy pitting - Heavy surface corrosion as well as a history of conductor failure	Replace within 3 months or prior to the commencement of the bushfire season, whichever is earliest
Note –This applies to overhead steel conductors with any number of strands		

The Regional Distribution Manager must verify the condition of the conductor using the photos of the defect. If the photo is not clear enough to confirm the extent of the defect, a closer inspection such as by using an EWP or climbing, and the like, must be carried out to further inspect the affected conductor section in detail.

In particular, note the following:

- Signs of corrosion at conductor / insulator interface points.
- Any excessive sagging or unravelling of the conductors.
- Any visible flaking, pitting or heavy discolouration of the conductors.

The condition of the conductor must be properly assessed with photos taken from the closer inspection by the Regional Distribution Manager, and replaced if the mechanical strength of the conductor is compromised.

The Regional Distribution Manager must notify CAT 4 and CAT 5 defects to Asset Strategy & Planning and Program Control for endorsement and inclusion in the relevant replacement programs. CAT 3 defects must also be forwarded to Asset Strategy & Planning for consideration in future replacement programs. The Regional Distribution Manager may also provide feedback to Asset Strategy & Planning for existing items on the replacement program, particularly where the condition of the conductor does not warrant urgent or short-term replacement.

Note that if any conductor strand is found to be broken due to corrosion or other deterioration mechanism, the conductor span is unsuitable for service. The mechanical damage of the conductor may be repaired using a conductor splice.

The pole must be inspected to determine whether the conductors are correctly located on the insulators and if there is any evidence of breakage, wear, burning or corrosion of the conductor ties.

Connections and bolts at the pole top must be inspected for signs of looseness, and that all bonds are securely attached to supporting pin insulators where required.



Figure 17: Missing nuts and washers on suspension clamp

Conductor terminations are to be closely inspected to verify the correct fitment of the helical termination (dead-end) such that it is free to move with any movement of the conductor.



Figure 18: Incorrectly fitted helical termination



Figure 19: Broken HV tie wire

5.10.6.1 Aerial marker balls

Aerial marker balls are installed on overhead mains to provide a visual warning to aircraft and river craft, and act as a general warning to plant and vehicles that overhead powerlines are nearby.

Aerial marker balls must be installed near aircraft landing fields, on all new and refurbished river crossings, and on property where high vehicles/plant operate. Refer to MDI 0047 – Overhead Transmission Mains Design and MDI 0031 – Overhead Distribution Design Standards Manual, for details of locations where aerial marker balls are required to be installed. They are red or orange in colour and 300mm in diameter (previous design standard), or yellow or white in colour and 600mm in diameter (current design standard).

The condition of marker balls is to be observed through stabilised binoculars. Particular attention to the mounting of the balls is required to verify they are securely fastened and the colour of the ball has not faded.

The location of the ball is to be compared with that shown on the printed maps from GIS and the data capture tool. Any marker ball that is found in the field and not shown on GIS is to be recorded on the Notification of Network Alteration Sheet, FAD 2001 and

submitted to the Network Asset Information group for inclusion in GIS.

If any marker ball is found to be not securely fastened, faded, damaged, in the wrong location, or missing, it is to be defectured for replacement within one (1) month.

5.10.6.2 Over crossing markers

In locations where overhead lines (including Endeavour Energy and private) cross (over or under) each other in bushfire prone areas, over crossing markers are to be installed on the second and third structures either side of the crossing location. If any crossing marker is found to be not securely fastened, faded, damaged, in the wrong location, or missing, it is to be defectured for replacement within one (1) month.

Over crossing markers are yellow discs, approximately 300-500mm diameter and mounted just below the HV/LV crossarm.

5.10.6.3 Vibration dampers

Vibration dampers are required to be fitted to all spans in excess of 300m. Span lengths are to be measured with the use of a rangefinder and a defect raised against each pole found supporting a span length greater than 300m not fitted with vibration damping. The two images below are typical examples of vibration dampers in use throughout the Endeavour Energy franchise area.

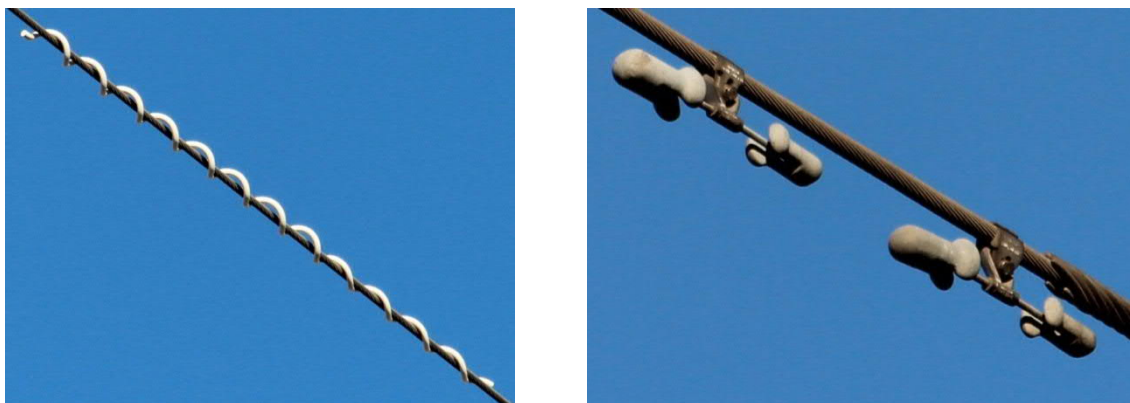


Figure 20: Vibration dampers

5.10.6.4 Low voltage spreaders

The condition of LV spreaders must be inspected. Particular attention is to be given to the security of the spreader fastening clips and the overall condition of the spreader rod.

The initial installation of LV spreaders throughout the franchise area were made of fibreglass and over time, ultra violet exposure causes splintering of the surface. Spreaders found with severe splintering, as shown in **Figure 21**, are to be reported for replacement.

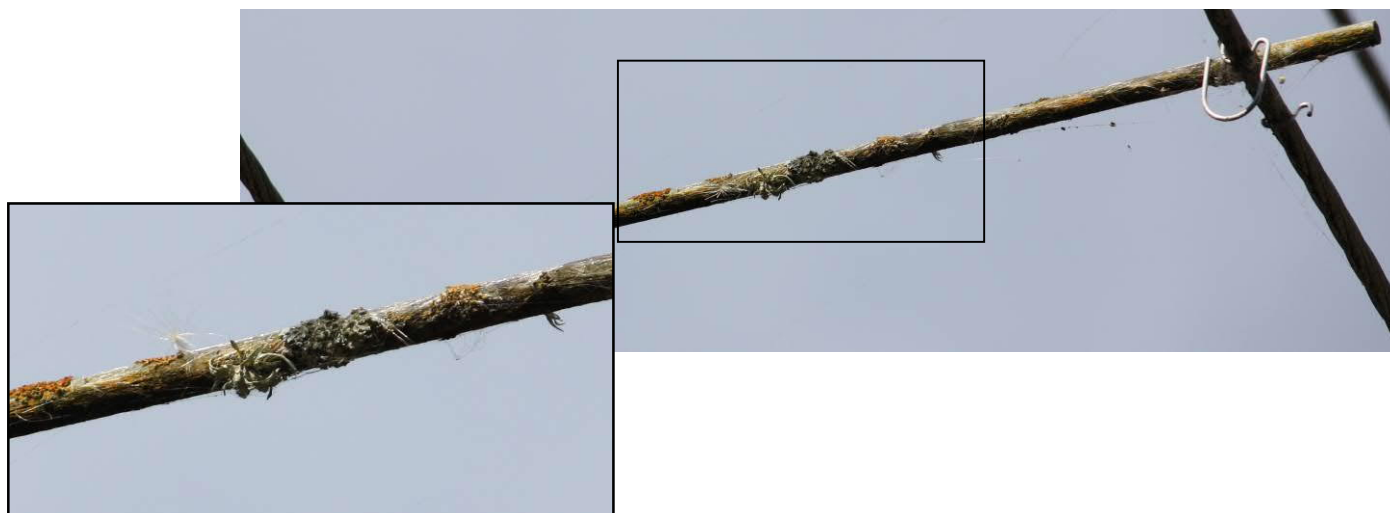


Figure 21: LV spreader with severe splintering

The inspector must also identify missing or incorrectly installed spreaders. Low voltage spreaders must be fitted to bare low voltage (230/400V) **Endeavour Energy and private customer** spans as set out below:

- In **designated bushfire prone areas**, where spans are greater than 45 metres. Spreaders in **designated bushfire prone areas** must be fitted as given in the table below:

Minimum crossarm length in span	One spreader	Two spreaders
2.1m	45 to 90m	>90m
2.4m	45 to 110m	>110m

- In **all areas** (including spans less than 45m) where any of the following conditions are met:
 - a) There is a significant difference in sag of the individual conductors within the span;
 - b) The conductors in the span are within 1.5m of vegetation; or,
 - c) The span is below overhanging trees;

Spans that fall under one of these categories must have spreaders fitted as given in the table below:

Minimum crossarm length in span	One spreader	Two spreaders
2.1m	0 to 90m	>90m
2.4m	0 to 110m	>110m

5.10.7 Overhead cable systems

Examples of cable systems include pilot cables, CCT, ABC and ADSS. Where applicable, the condition of the overhead cable system must be inspected and reported, including:

- Damage to the outer serving.

- Cracked cable insulation.
- Broken or loose mounting brackets.
- Twisting and/or bird caging on the conductors.
- Loose support on both conductor and joint box.
- Low conductor clearance.
- Rusty, corroded or broken strand on catenary wire.
- Broken conductor.

5.10.8 Low voltage aerial services

Any defect that could result in a loose neutral connection, burning, or live metallic structures must be regarded as an emergency hazardous situation. Refer to clause 5.3 for what to do in an emergency situation.

Effort must be made to contact the customer regarding any defect that could impact safety on a customer connection. The customer must be informed what they can do to minimise any potential safety risk.

Note: A customer defect must be raised (e.g. to relocate the point of attachment) if an overhead service or consumers mains is found to be crossing directly over or within three and a half (3.5) meters from the edge of a swimming pool.

5.10.8.1 Point of attachment

Points of attachment must be inspected to check that porcelain insulators and service attachment brackets, timber blocks, and other fittings, are in good condition. Adequate clearances of service tails and service attachment brackets from gutters, metallic fascias, and other objects are to be verified.

Note: If a point attachment is obstructed (cannot be accessed by via a ladder) by structures or objects such as a verandah, the customer must be notified to remove the obstruction or relocate the point of attachment so that it complies with AS/NZ3000.

5.10.8.2 Connection points

Low voltage service connections must be checked for any visible sign of a defect and, if any are found, recorded for replacement.

Typical defects experienced with particular types of connectors are listed below.

- **Insulinks**



Figure 22: Faulty insulink

Points to observe in the identification of faulty or potentially faulty insulinks are:

- Insulink and/or cable insulation burnt or melted.
- Bare conductor observable at the point of entry into the insulink.
- Ultra-violet affected insulation resulting in fading, cracking, or holes in the insulation between the end caps.
- Insulinks not crimped or crimped incorrectly, for example, inadequate indentation marks, incorrect number of crimps – two (2) crimps on either side of the insulink – or not crimped in the correct location.
- Check the insulinks are orientated vertically, with the aluminium service cable on top and the customer's copper consumer mains below.

- **Blue point connectors**



Figure 23: Blue point connector

In some locations throughout the Blue Mountains and outer western areas, Blue point connectors are in use.

These connectors are to be examined for deterioration and cracking of the outer insulation covering along with evidence of any bare conductor at the entry to the connector. Such conditions will require the connectors to be reported for replacement.

- **Bare aluminium sleeves**

On some installations, the use of bare aluminium sleeves insulated with various coloured PVC insulation tape have been installed.

These installations must be recorded for replacement, irrespective of their condition.

- **Mains connection boxes (MCBs)**

Mains connection boxes are to be examined for evidence of the following and recorded for follow-up as appropriate:

- Any sign of physical damage.
- Burn marks on or around the MCB.
- Bare conductor observable at the point of entry into the MCB.
- Cable insulation melted
- Loose conductor at terminal connection point – report to OLIGLI Manager immediately.

Care is required when inspecting MCB's to prevent equipment such as an insulated height stick/mirror from coming into contact with the box or the associated service mains.

- **Copper line taps**

Line taps are to be examined for evidence of the following and recorded for follow-up as appropriate:

- External pitch and bitumastic (P and B) tape used to protect the insulation tape from the elements is loose, unravelled, missing or deteriorated.
- Internal insulation tape, where observable, is loose, unravelled, missing or deteriorated.
- Burn marks on the insulation of the line tap.
- Bare conductor observable at the point of entry into the line tap.
- Cable insulation melted.

5.10.8.3 Consumer mains

Any visible sections of the insulation of consumers' mains are to be carefully observed. Wherever practical, the top of all consumer mains must be examined for their entire length, using a magnifying mirror, or similar.

Where deterioration of the insulation is detected, the mains must be recorded for repair or replacement.

5.10.8.4 Overhead insulated service cable

- **Earthing**

Conductive supports (for example, poles, posts, struts, brackets and stay wires) do not need to be earthed when they are effectively and permanently separated from all conductors by double insulation. This would be the case following an upgrade to double insulated mains, such as LVABC, on a steel customer service pole.

- **Bare copper cable**

These types of cables are to be recorded as a defect, regardless of their condition.

- **Other insulated service cable types**

The condition of the insulation of service cables should be carefully observed.

Where possible, the top of the service cable must be examined for UV degradation at the point of attachment and for at least two (2) metres immediately before the point of attachment, using a magnifying mirror on an insulated link stick. Insulated mains that have deteriorated to the extent that bare conductor is exposed are to be repaired within a month (the customer must be notified of the defect immediately).

5.10.8.5 Distribution connection point

The distribution connection points must be inspected for damage and loose fittings.

5.10.9 Prevention of unauthorised climbing

The pole or structure and adjacent area must be assessed to verify that effective measures have been employed to prevent, as far as reasonably practicable, access (other than access obtained by the use of a ladder or other device) by any member of the public to a position near any line aerial conductor or apparatus, where injury from electric shock may be possible.

Basically, this requires that all live parts must be inaccessible without the use of a ladder.

Note: Pole steps and pole plates for portable steps, up to a height of three (3) metres, are considered to afford access and are to be recorded for removal within one (1) month.

5.10.10 Waterway crossing warning signs

Waterway crossing warning signs must be checked in accordance with clause 5.21.

5.11 Procedures for groundline inspection of steel poles (GLI)

The above ground inspection in clause 5.10 must be completed before proceeding with the groundline inspection.

5.11.1 Fail test

The following table indicates whether a full groundline inspection should be performed based on defects found during the visual inspection in 5.10.1. All defects identified must be reported as indicated in clause 5.20.

Pole defect	Information	Groundline inspection to be performed
Rust holes	One (1) hole only- smaller than 10mm	Yes
	Multiple holes – in a ring at ground level	No
	One (1) hole only – greater than 10mm but less than 75mm	Yes
	One (1) or more holes greater than 75 mm	No
Distortion	Pole folds or has impact impressions deeper than 25% of the pole diameter	No
Leaning	Pole leans more than 10 degrees in any direction	No
Loose	Pole is loose in ground	No
Pole live	According to voltage check in 5.4.9	No

Note: A full groundline inspection must be performed if no defects are found above ground.

5.11.2 Excavation of steel poles

Start excavation in one quadrant of the pole in the neutral axis. This is to allow examination of the pole below ground and determine whether it is safe to carry out the full excavation. Check for significant rust before continuing around the rest of the pole. Caution must be taken when excavating around the pole, particularly if there are cables attached to the pole.

Excavate the pole to a depth sufficient to reveal the extent of any existing rust (minimum of 200mm – continue excavating if there is pitting or there is evidence that the rust is more severe beyond this point); to the depth of any existing concrete footing; or, to a maximum depth of 350mm, whichever is the least of these three scenarios.

The pole must then be checked for the full extent of rust degradation.

Redo the fail test in 5.11.1 to verify whether the pole is stable in the ground.



Figure 24: Rusted and flaked below groundline section of a steel pole

Where steel poles have concrete footings, the concrete must finish:

- **For private steel poles:** not less than 300mm below ground and at 100 mm above ground level for a steel pole and shaped to shed water (Australian Standard AS 3000).
- **For Endeavour Energy's steel poles:** Not less than 450mm from the groundline (Industry Standard).

5.11.3 Strength assessment of steel poles

The inspection must include a strength assessment by direct wall thickness measurement using an ultra sonic thickness gauge that is fitted with a 6mm diameter (or less) dual element probe. Ultrasonic testing must be carried out in accordance with the testing procedures in AS 2452.3 (Non-destructive testing – Determination of thickness – Part 3: Use of ultrasonic testing).

The area with the worst damage in the above ground region and again in the below ground region, is to be assessed by comparing its remaining wall thickness value with an original condition above ground sample reading. This test cannot be performed on steel poles which have a spray-on polyurethane/polyuria protective coating (Polco) and thus these poles do not require this test. Under no circumstances should this coating be removed or damaged.

Any variation in wall thickness is expressed as a percentage and related directly as a remaining strength value.

The nominal (original) wall thickness of the pole must be measured 300mm above groundline, (this measurement is also to be used as the reference for the below groundline inspection).

Where visible above ground corrosion is present, it must be completely removed and a wall thickness measurement taken. A smooth, level surface is required to obtain an accurate reading with an ultrasonic meter.

A wire brush, an angle grinder with a sanding disc or metal grinding disc will typically be required to clean the surface to a suitable state. Only the minimum amount of material should be removed in order to achieve a contact patch for the meter. Use of any brushing or grinding attachment must be confined to spot cleaning the localised areas for measurement. General grinding of the pole face is not acceptable. Pole treatment as described in section 5.14 will be necessary following any surface grinding or sanding.



Figure 25: Test surface preparation



Figure 26: Testing the wall thickness

When measuring the nominal wall thickness, the area on, or immediately around the access cover if fitted, must not be used because the steel wall in this area is reinforced and may be thicker than normal.

A minimum of four (4) measurements must be taken, evenly spaced (approximately 90°

apart) around the pole at 300mm above groundline to establish the nominal wall thickness and the minimum of these four measurements used as the nominal wall thickness.

Any individual measurement of wall thickness greater than 5.5mm must be ignored. If all measurements taken are greater than 5.5mm, the average of these readings must be recorded as the nominal wall thickness.

A further four (4) measurements must be taken 200mm below groundline.

Perform a strength calculation and determine defect priority (if required) in accordance with Annexure 6.

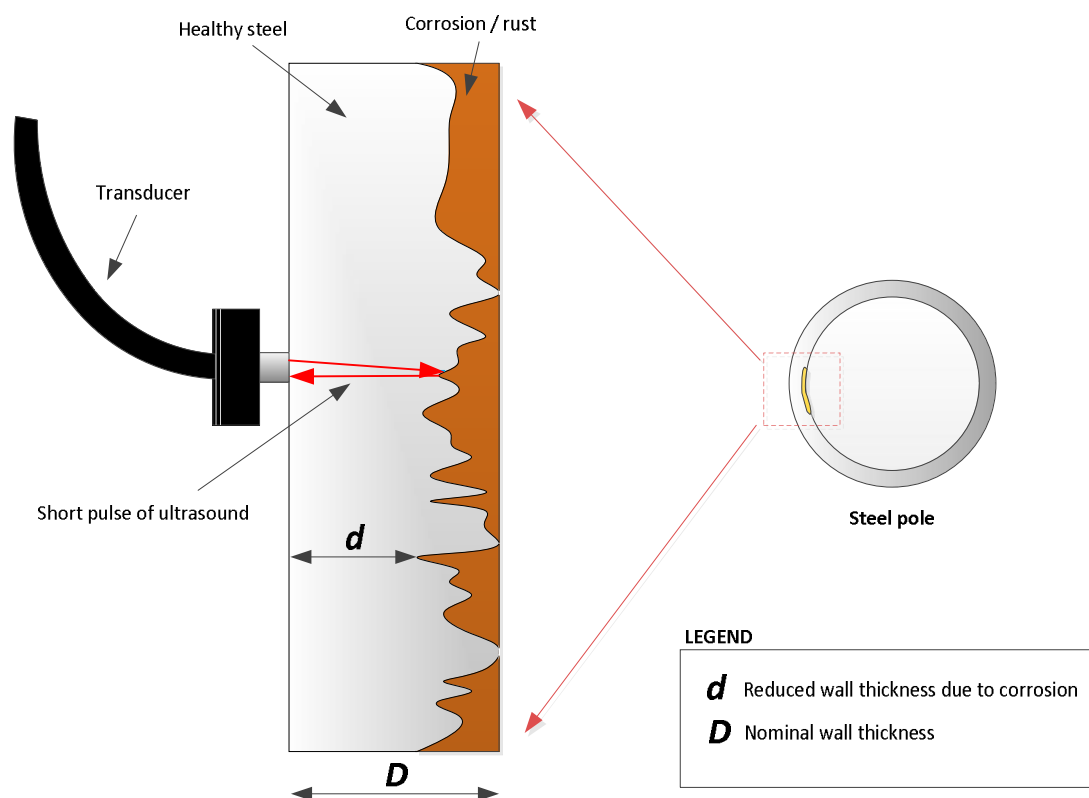


Figure 27: Internal corrosion detection using ultrasonic meter

5.11.4 Groundline Inspection of Sureline and Ingal steel mains poles

Sureline and *Ingal* steel mains poles do not require below groundline inspection until nine (9) years after installation.

These poles were first installed in 2005 and Asset Standards & Design will convene a working group to sample both types of poles. They will be excavated to 350mm and have their external mechanical protection removed to allow for any evidence of rust to be observed, together with the condition of the inner epoxy paint anti-corrosion layer.

5.12 Procedures for groundline inspection of timber poles (GLI)

The above ground inspection in clause 5.10 must be completed before proceeding with the groundline inspection.

All poles are to be sounded as described in section 5.6. If doubt exists as to the pole condition below ground an internal inspection at the location of possible decay must also be carried out, in addition to the normal groundline internal inspection.

5.12.1 General inspection procedures for all timber poles

The requirements of this section of the instruction apply to **all** wooden poles. Additional sections set out extra inspection procedures to be followed for square sawn, NR/DD, FPT and reinstated poles.

Note: All poles must be inspected in accordance with the details for that specific type of pole, as set out in the following sections (refer to clauses 5.12.2 to 5.12.6)

5.12.1.1 Excavation of timber poles

Start excavation in one quadrant of the pole in the neutral axis. This is to allow examination of the pole below ground and determine whether it is safe to carry out the full excavation. Check for significant rot or decay before continuing around the rest of the pole. Caution must be taken when excavating around the pole, particularly if there are cables attached.

Excavation of the pole is to be carried out to a **depth of 350mm** below groundline. Should there be significant degradation at the 350mm depth, a more searching inspection is required, and excavation is to be conducted to a depth of 450mm.

Where timber poles have concrete footings, the concrete must finish:

- **For private timber poles:** Not less than **300mm** from the groundline (Service and Installation Rules NSW).
- **For Endeavour Energy's timber poles:** Not less than **450mm** from the groundline (Industry Standard).

Check for rot or decay by applying a screwdriver between the wood pole and concrete. Additionally, an internal inspection by drilling at groundline (50mm above ground at an angle of 45 degrees) is to be carried out. If the above checks do not indicate that the pole must be condemned, the customer must be notified that Endeavour Energy's normal pole condition assessment could not be carried out due to the presence of the concrete footing. The customer must be given indication on the condition of the pole (at groundline) upon notifying the customer.

Note that the above is not applicable to square sawn poles with concrete footings as an internal inspection is not required (refer to 5.12.2). However, test for the presence of rot by applying a screwdriver in between the wood pole and concrete.

5.12.1.2 Removal of decayed timber

After excavating around the pole, any soil adhering to the pole must be scraped off and any old preservative bandages or paper removed. Carefully examine and probe the outer surface of the wood for degradation at and below groundline.

When examining the pole, any fungus or termite attack, particularly Glyptotermes attack, is to be carefully observed and reported.

Any rotted or degraded timber, from 300mm above groundline to the bottom of the excavation, must be removed to expose the sound surface of the pole. This must be done without removing excessive amounts of sound timber.

5.12.1.3 Sterilisation of tools

Before using an auger bit to bore any pole during its inspection, the auger tip is to be cleared of any shavings to prevent transfer of active fungus into sound wood. **The auger bit must be sterilised using methylated spirit as a dip or spray.**

5.12.1.4 Below ground internal inspection of wood poles

All poles are to have their first drill hole in the neutral axis at groundline. The drilling pattern is shown in **Figure 28**. The below ground internal inspection is **not** required for square sawn or rebuttled poles. There are additional drilling requirements for reinstated poles, which is described in clause 5.12.5.

The auger should be directed downwards at an angle of 45° to the horizontal and the drilling continued until the hole extends to the pole centre and, if necessary, beyond it to the sound wood on the opposite side of any pipe or rot pocket. If a pocket/hole is found that extends beyond the centre of the pole, a second drill hole will be required. Otherwise, a single drill hole only is required.

The wall thickness must be determined from the holes drilled. Where only one (1) hole is drilled, consider both walls, and where two (2) holes are drilled, consider the four (4) walls (see example drilling sketches).

As set out earlier for poles having significant internal decay, a second hole **must** be drilled. The second hole must be drilled at 90° to the first drill hole and at approximately 200mm below groundline.

The pole may also be drilled a third time in the area of the worst degradation, or at the inspector's discretion, and the smallest wall thickness obtained is to be entered into the data capture tool.

Where possible, successive inspection bore holes should be positioned vertically above or below the existing holes. However, it is acceptable to drill holes alongside each other provided this is restricted to four (4) holes in the load axis, two (2) on either side of the pole in any one horizontal plane (refer to the example drilling pattern drawing below).

Note: For private timber poles, existing inspection holes must be used for measuring the wall thickness to minimise further damage to the pole. However, if the pole is suspected to be more degraded in other areas of the inspection zone, the pole must be drilled to assess the the pole at the location of the worst degradation.

Generally, a 12mm auger bit should be used with an electric power drill. For inaccessible areas, a suitable battery drill may be used. A petrol powered drill must **not** be used under any circumstances.

Note: Where doubt exists as to a pole's **internal condition**, a carpenter's hand brace or a suitable battery drill must always be used.

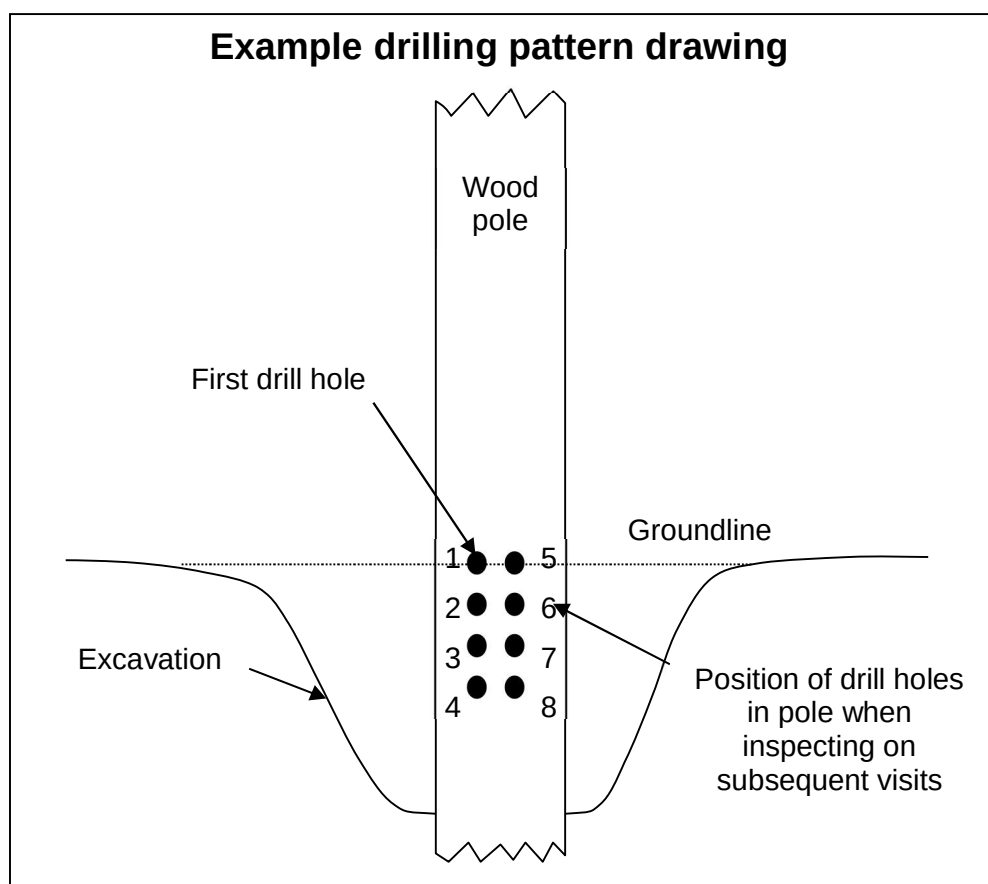


Figure 28: Below groundline drilling pattern of wood pole

The boring technique described below must be used to measure the thickness of sound timber and generally gives a reliable and accurate indication of when timber condition changes:

- The sound of the bit cutting into the timber is much reduced as soon as degraded timber is reached.
- As soon as a reduction in sound is heard, the bit is to be withdrawn from the hole to assess the condition of borings.
- Similar action is to be taken if the resistance to rotation of the drill bit changes.
- Whilst boring, the appearance of borings must be constantly watched for colour change, breaking up, or other differences. A colour change may indicate fungal decay has been encountered and close examination of the shavings is required. The auger is to be periodically withdrawn from the hole to allow clean cutting and to check the condition of borings.

Note: Small sap veins or growth rings, where colour change or breaking up occurs, should be ignored for the purposes of wall thickness if the drill continues into sound timber.

- A piece of white paper or other suitable material must be placed under the hole being bored to catch the borings. The paper should be moved periodically so that later borings are separated from earlier ones.
- Measurements must be taken with a suitable gauge (as approved by Endeavour Energy) of the depth at which cutting sound, colour or rotation resistance changes occur before recommencing boring.

- To confirm the results of boring, and to measure directly the depth of sound timber, probing must be carried out in every case where a hole is drilled. This must be done with the hooked end of the depth gauge.
- Where doubt exists with boring results, a second opinion must be sought before determining the serviceability or otherwise of the pole.

5.12.1.5 Disposal of wood shavings and decayed sapwood

Any shavings, wood chips or decayed sapwood are to be **removed from the site** and must not be buried in the pole backfill. This is an important precaution for preventing further fungal attack on poles that have been inspected and maintained.

5.12.1.6 Sterilisation of inspection holes

Methylated spirit is to be used to sterilise any inspection holes drilled in a pole and such holes are to be plugged with a tapered coloured plastic plug. Methylated spirit must also be applied to holes bored in private poles.

Note: Pole saver rods are **not** to be used as a method to sterilise bore holes.

5.12.1.7 Preservative treatment

Having completed the inspection procedures described above, all Endeavour Energy and F category poles must be treated with preservative in accordance with clause 5.13.

Note: Records of pesticide use must be kept in accordance with Company Procedure GPE 0004 – Pesticide Use and Company Form FPE 0004 - Record of Pesticide Application.

5.12.1.8 Date tape

Following the inspection, assessment and preservative treatment of all poles, polymeric date tape, marked with the year of inspection, must be placed at the bottom of the excavation, directly below the current inspection hole.

This tape serves a two-fold purpose, indicating:

- The year of inspection.
- The depth of excavation.

Remove any previously installed date tape from the excavation around the pole.

5.12.1.9 Footpath restoration

Where pole excavation involves disturbing footpath surfaces, restoration must be made by means of a 50mm layer of cold mix bitumen to a distance of 400mm around the pole, unless other reinstatement methods are agreed to by Endeavour Energy and the local council.

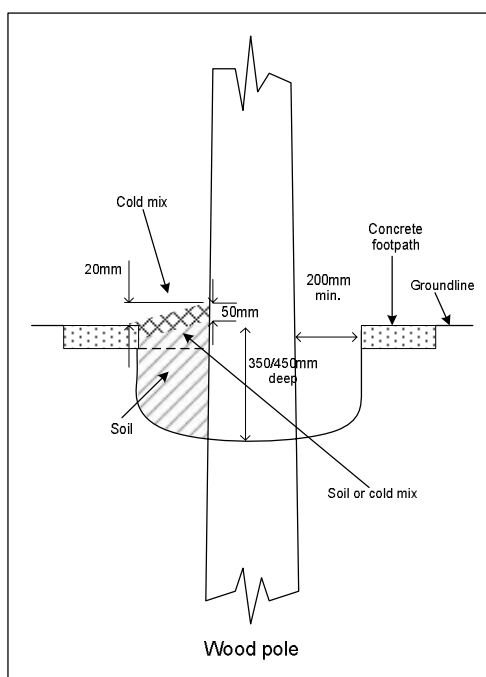


Figure 29: Footpath restoration diagram

5.12.1.10 Backfilling

Following assessment and preservative treatment, poles will usually be backfilled to a point approximately 50mm above normal groundline; backfill should be slightly tapered away from the pole base.

Backfill material must be clean fill (no concrete, wood chips, shavings or decayed sapwood).

5.12.1.11 Site restoration

All areas adjacent to pole sites are to be swept clean on completion of the pole inspection and treatment work. Adjacent areas, such as lawns, must be restored as close as possible to original condition.

5.12.1.12 Trial poles

Poles that are being used in various chemical trials are marked according to clause 5.15.5 and still require OLI and data collection to be performed.

5.12.1.13 Collection of data for strength calculation

Every timber pole must have the following data collected and used in the pole strength calculation program.

The diameter readings may be taken with a vernier calliper or a tape as it is an approximate measure:

- Pole outside diameter original – for NR poles, this is the diameter excluding sapwood, but for FPT poles, it is the diameter including sapwood. This measurement must be taken at approximately 100mm above groundline in the neutral axis.
- Pole outside diameter current – this is the smallest diameter of the pole where wood has been removed for any reason. If no wood has been removed, for NR only the diameter would be less the sapwood. This measurement must generally be taken at or below groundline.
- Pole minimum wall thickness – for NR poles, this is the wood thickness excluding sapwood, but for FPT poles it is the thickness of wood including sapwood.

- Size of rot pocket – this is the pole internal void/rot or pipe diameter.
- Safety factor – this calculation is based on the assumption that the pole was designed and installed with an initial safety factor of four (4) or greater.
- **If it is considered that the conductor loading is in excess to the poles rated load, the pole may need to be reassessed and is to be referred to the OLI/GLI Manager.**

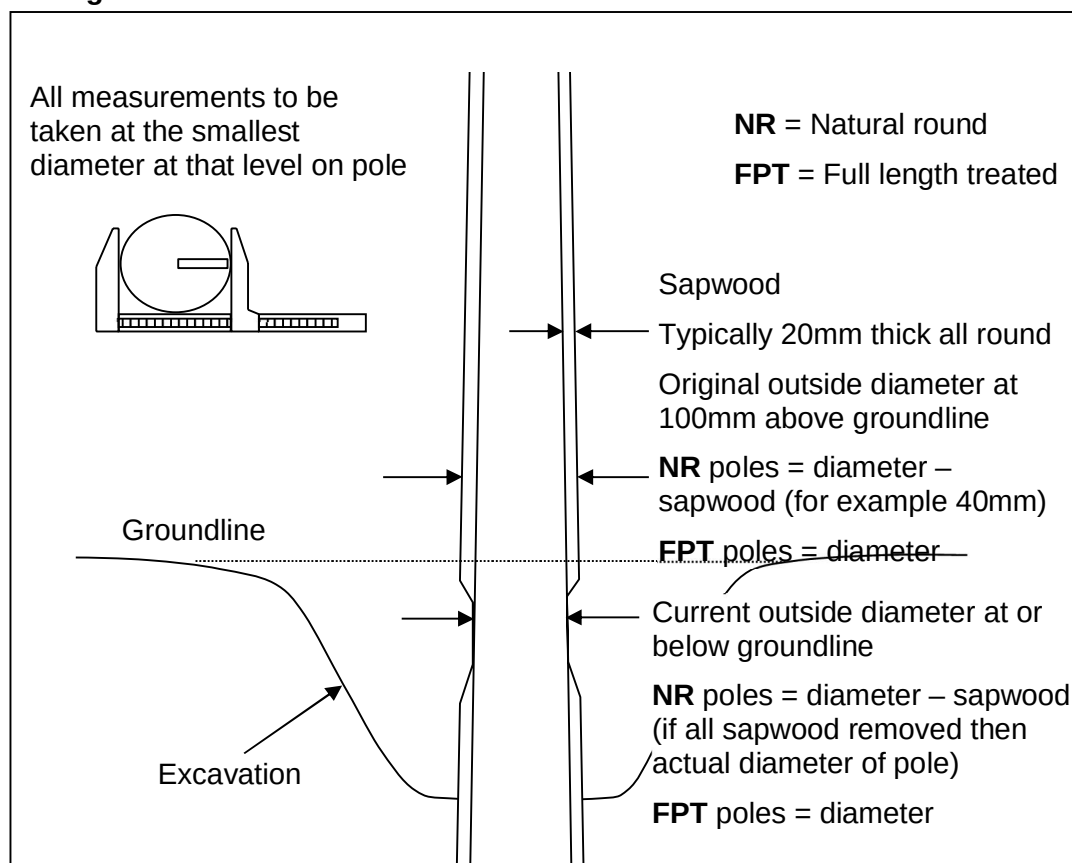


Figure 30: Pole outside diameter measurement

5.12.2 Additional procedures for square sawn property poles

After excavation to the correct depth, the pole must be thoroughly examined for external rot attack. **Do not bore or push the pole.**

Any rot that is found must be closely examined using a screwdriver to determine the extent and depth of the rot and a determination must be made as to the serviceability of the pole. Poles with no, or minor rot must be held and hand pressure applied to gauge the security of the pole and to confirm that it is not broken further in ground.

If the pole is in danger of failing (or fails), it must be reported immediately to Endeavour Energy on the number indicated in clause 5.3.

Note: These poles do not need to be measured or bored for strength analysis.

5.12.3 Additional procedures for NR only

5.12.3.1 Measurement of natural round poles

Natural round (NR) pole strength is calculated as the outside diameter of the pole minus the sapwood (sapwood is generally considered to be about 20mm thick). This means for a 340mm diameter NR pole, the real wood diameter is about 300mm.

5.12.4 Additional procedures for FPT poles only

5.12.4.1 Creosote FPT poles

Where the pole disc identifies a creosote FPT pole as a PI POLE, it must be checked for decayed sapwood (white rot under the surface layer of treated sapwood) by taking particular note of the condition of the shavings from the first 50mm of the drilling.

If degraded sapwood is found under a sound outer skin, remove all the sapwood at the affected section, in the area from 300mm above groundline to 350/450mm below the groundline with a sharp tomahawk. The pole must then be inspected for its full length. If the rot extends up the pole, a further above ground inspection must be organised with the OLI/GLI Manager. The pole must then be treated with preservatives in accordance with the requirements of clause 5.13.

5.12.4.2 Checking for soft rot

A carrot fracture of sapwood fibres indicates the presence of this type of fungal attack. All FPT (but particularly CCA treated) poles are to be checked for soft rot by the use of a screwdriver.

The screwdriver should be 150mm long with a 5mm wide blade. The inspector should attempt to force the screwdriver into the pole surface, by hand, using moderate pressure. This is to be done in at least four (4) directions around the pole, at groundline and at a depth of 100mm above the bottom of the excavation.

Soft rot is to be recorded as a defect as follows:

Depth of penetration	Defect comment
1 - 5mm	Light attack
6 – 15mm	Medium attack
16 – 25mm	Heavy attack

Remove any rot affected sapwood with a de-sapping bar (see below) and treat with preservative as described in clause 5.13.



Figure 31: De-sapping bar

5.12.4.3 Soft rot affected pole

Where removal of an area of the full thickness of treated sapwood on the FPT poles is necessary below ground, the pole must be treated with preservatives in accordance with the requirements of clause 5.13.

5.12.4.4 Internal collapse pole

Certain species of timber (for example Blackbutt) exhibit internal collapse, that is, star shakes or cup shakes. Inspectors are not required to drill such poles as a follow-up to a

dead or hollow sounding. Drilling below the groundline is still required, and when such poles are drilled, the inspector is to select an area of the pole clear of such collapse, even if it is contrary to the normal drilling directions.

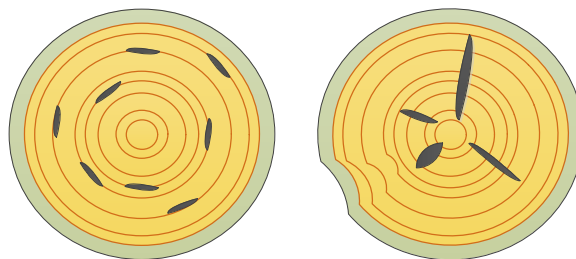


Figure 32: Cup shakes (left) and star shakes (right)

5.12.5 Additional procedures for reinstated poles (UAM nailed, Eltek nailed, OZ-C splinted, Pole Foundations MultiTube and MultiRib)

5.12.5.1 Nail/splint condition – above and below ground

Poles must be checked visually from the top of the nails to the bottom of the excavation below groundline. The inspector is to look for the following:

- Heavy rusting on the steel nails/splints. If heavy rust is found, knock it off with a hammer and check if there is visible loss of metal, or holes appear on the metal surface. If rust extends beyond the bottom of the hole, the excavation should be extended to a maximum 450mm. Rust is to be treated as in clause 5.14.

If heavy rust or pitting is to a level that holes are evident, or significant metal loss has occurred, the pole must be marked for reinstatement, provided the minimum requirements set out in the *Assessment of serviceability flowchart* (clause 5.9.3) have been met.
- Evidence of rust on the ferrules of *Eltek* nails, the banding strips of the *OZ-C* splint system or bolts, nuts and washers of the *UAM* or *Pole Foundations MultiTube/MultiRib* nails. Light surface rust on the bands is to be removed using a wire brush and the area treated as in section 5.14. If heavily rusted nail components are found (holes or significant metal loss) the pole must be marked for reinstatement provided the minimum requirements detailed in the *Assessment of serviceability flowchart* (clause 5.9.3) have been met.
- Whether bolts or banding straps are pulling the nails/splints tightly against the pole. If not, they should be entered in the computer as a defect. It is not a requirement for *MultiTube* and *MultiRib* nails to have the web or body of the nail against the pole in all bolt positions. Inspectors must check that all bolts and nuts are tight.

5.12.5.2 Sounding of poles

All nailed and splinted poles are to be sounded as described in section 5.6. Special attention is to be paid to the area of the upper 600-1200mm of the nail/splint.

5.12.5.3 Assessment of pole condition

Carefully examine and probe the outer surface of the wood, starting from the bottom of the excavation to the top of the nails/splints, for evidence of degradation.

UAM nailed poles

Poles reinstated by UAM must be assessed for serviceability by measuring the wall thickness (with an approved measuring gauge) within the top 700mm of the nail. The wall thickness must be greater or equal to 30mm to remain in service.

To minimise further damage to the pole, existing drilled hole(s) in this area must be utilised (for example, holes that were previously drilled at the time that the pole was determined to be suitable for reinstatement). However, the pole must also be sounded along the top 700mm of the nail; any areas that are identified to be significantly unsound (compared to where the existing hole(s) are located) must be drilled for further assessment. The smallest set of wall thickness measurements must be entered into the data capture tool.

Note: If there are no existing drill holes present, the pole must be drilled at the most unsound area in the top 700mm of the nail, or between the bolts if no significantly unsound areas can be identified.

All other nail/splinted poles

Where possible, all the above ground bore holes should be angled slightly upwards (10°) to prevent further ingress of water to the holes, sterilised (as set out in clause 5.12.1.6) and sealed with plastic plugs. Subsequent bore holes should be bored 50mm above or below previous inspection holes. To assess the integrity of the inspection holes, they should be drilled a minimum of 100mm from nail bands and bolts.

The first hole is to be drilled directly opposite the nail/splint and the second, if required, at 90° to the first. The pole must be drilled in three (3) different locations:

- At ground level, or 50mm-100mm below ground level, drill up to two (2) holes with a 12mm auger. The thickness of sound timber must be measured with an approved measuring gauge suitable for 45° drilled holes.
- Above ground level, in the bottom area of the nail band (typically 300 mm), drill up to two (2) holes and with a 12mm auger. The thickness of sound timber must be measured with an approved measuring gauge suitable for 10°-15° drilled holes.
- Above ground level, in the top area of the nail band (typically 1200 mm), drill up to two (2) holes and with a 12mm auger. The thickness of sound timber must be measured with an approved measuring gauge suitable for 10°-15° drilled holes.

Figure 33 shows an example of the drilling pattern for a nailed/splinted (excluding UAM) pole. The minimum wall thickness for each location must be as indicated in the flowchart in section 5.9.

5.12.5.4 Example of drilling a nailed/splinted (excluding UAM) pole

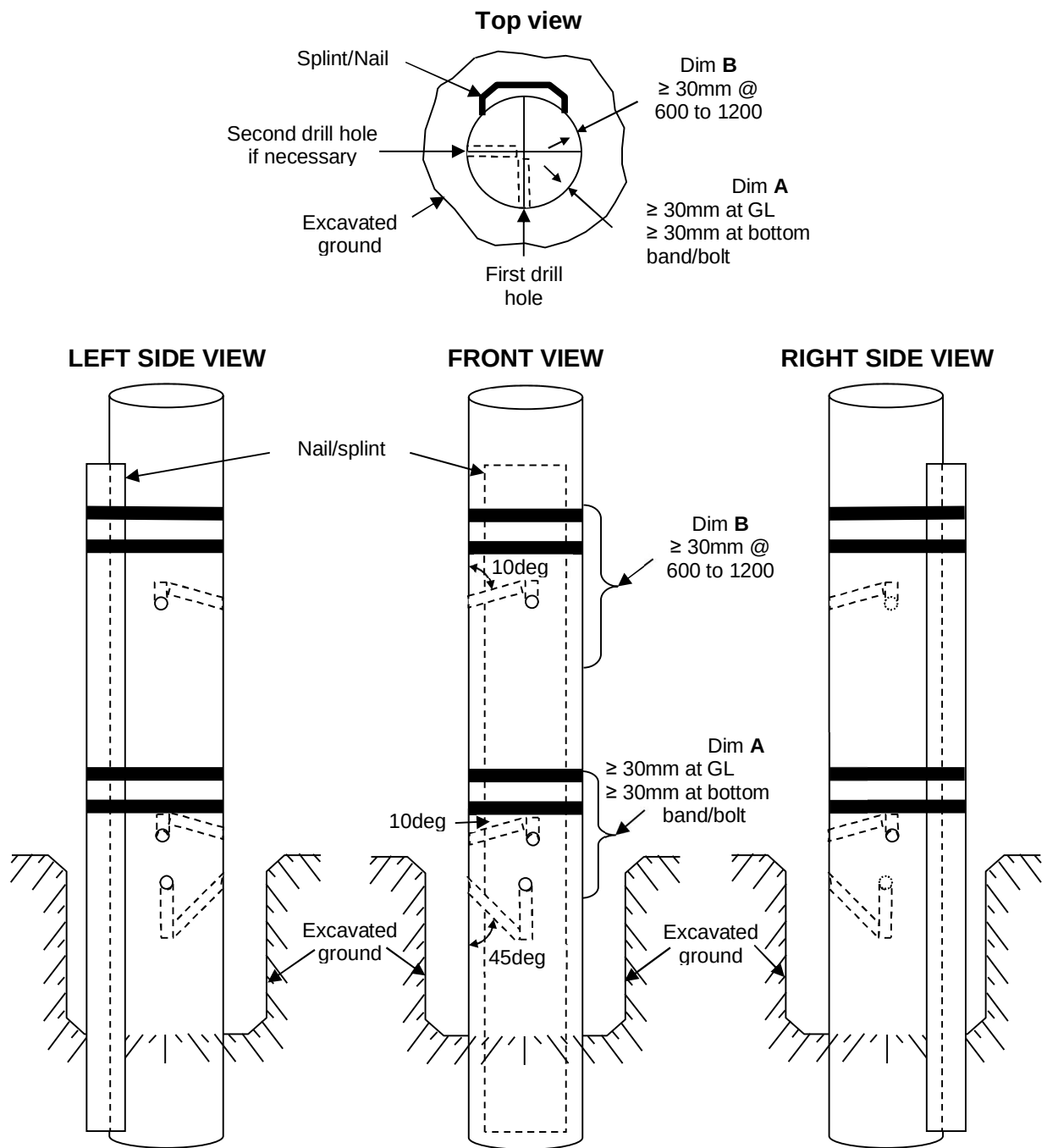


Figure 33: Drilling pattern of nailed/splinted pole

Notes

- 1) Dimensions indicated are a minimum, as in flowchart.
- 2) Dimensions indicated are for poles with nails already installed.
- 3) Dimension A to be $\geq 30\text{mm}$ to stay in service.
- 4) Dimension B to be $\geq 30\text{mm}$ to stay in service.

5.12.6 Additional procedures for reinstated poles (rebutted)

5.12.6.1 Caisson/sliding sleeve condition – above and below ground

Poles must be checked visually from the top of the steel caisson/sliding sleeve to the bottom of the excavation below groundline. The inspector should look for the following:

- Heavy rusting on the caisson/sliding sleeve. If heavy rust is found, knock off the rust with a hammer and check if there is visible loss of metal, or holes appear on the metal surface. If rust extends beyond the bottom of the hole, the excavation should be extended to a maximum of 450mm. Rust is to be treated as set out in section 5.14.
- Evidence of termites and fungal activities. If termites are noted as active, carry out inspection as detailed previously in section 5.5.
- Condition of supporting coach screws on sliding sleeve.

5.12.6.2 Assessment of pole condition

Carefully examine and probe the outer surface of the wood in the area 150mm above the top of the caisson/sliding sleeve for evidence of degradation. Remove any decayed wood from the surface of the pole.

To assess the internal decay of the pole, the following drill holes are required:

- Bore into the test hole provided in the caisson, located at **450mm** below the top.
- If evidence of advanced internal deterioration is found, further drills are required to be carried out at the levels of 650mm below the top of the caisson, where the test holes are located, and/or at the top of the caisson, dependant upon pole condition.
- For sliding sleeves, it may be necessary to drill the pole at 45° from the top of sleeve.

To be considered acceptable, the good wood layer internal to the caisson must be equal to or greater than 70mm.

Where possible, all the bore holes should be angled slightly upwards to prevent the ingress of water, sterilised with preservative, and sealed with plastic plugs. After completing each drilling, the wall thickness is to be measured and recorded.

If there is any doubt of the condition of the pole, contact the OLI/GLI Manager.

5.13 Methods of wood pole preservative treatment

5.13.1 Preservative treatments to be used

Having completed the pole inspection as described previously, the poles must be treated with an approved preservative, as nominated by Endeavour Energy:

- All heart rot affected and nailed poles must be treated internally with pole saver rods. Pole saver rods are to be recharged at subsequent inspections.
- In general, there is no chemical treatment required for a rebutted pole.
- For *Eltek* nailed, *OZ-C* splinted poles and *Pole Foundation* nails, external preservative treatment is required on exposed timber. The use of pole saver rods is also required, as set out above.
- All exposed metal surfaces affected by rust must be cleaned with a wire brush and treated as in section 5.14.

5.13.2 Ausplast preservative timber treatment

5.13.2.1 Application method

With the pole excavated to the required depth (as set out previously), remove any soil, loose splinters, surface decay, old preservative bandages or paper adhering to the pole.

Ausplast comes on a roll and can be cut to any shape to suit the installation.

Where the treatment is cut into multiple sheets, an overlap of at least 25mm is required between each sheet.

The following steps are to be used when applying the treatment:

Step 1: Preferably, leave the *Ausplast* in original box. Cut to a manageable length (two [2] pieces recommended) to correspond to the girth and any obstructions. – Photo 21



Step 2: Remove plastic film backing prior to installation. Photo 22



Step 3: Place each piece of *Ausplast* 50mm below surface and cover entire circumference. Photo 23



Step 4: *Ausplast* must not wrap around obstructions. Butt against edges or underneath conduits. Photo 24



Step 5: Total coverage is to be achieved. Photo 25



Step 6: Waste to be collected in plastic bag provided. Photo 26



Step 7: Backfill hole in the normal manner. Photo 27



Figure 34: Application method for Ausplast

Ausplast wrap is **not** to extend above ground level.

Backfill must be heaped around the pole to totally cover the preservative to a level of at least 50mm above groundline. Some allowance must be made for settling of backfill.

Note: Ausplast is classified as a poisonous and hazardous material. It must be handled with the correct safe working procedures (SWM 6.026) and disposed of in accordance with the requirements set by the Environmental Protection Authority (EPA).

5.13.3 Pole saver rod treatment

For pole saver rod treatment, the following procedures are to be followed.

5.13.3.1 Number and location of holes

For poles with a circumference measuring up to 960mm (diameter 300mm), drill three (3) holes at 250mm above groundline.

The first of these holes should be bored above the bore hole used to assess the pole's internal condition, as described previously.

The additional holes will be drilled at intervals of approximately 320mm apart from the first in a clockwise direction, and will need to be approximately 450mm in length to accommodate the 3 x 125mm rods plus the tapered plastic plug.

For poles of larger than 960mm circumference, additional holes will be required.

These should be at about 320mm intervals. For example, a pole with about 1600mm circumference (diameter 510mm) would need five (5) pole saver rod holes.

Where heart rot is found at less than 450mm – **STOP** – and insert enough rods to fill the hole and allow 75mm for the plug and expansion.

5.13.3.2 Angle of holes

Holes should be drilled steeply downwards and directed slightly off centre (20° off the vertical) to give a better protection to the pole wall area and not just the centre of the pole.

5.13.3.3 Insertion of pole saver rods

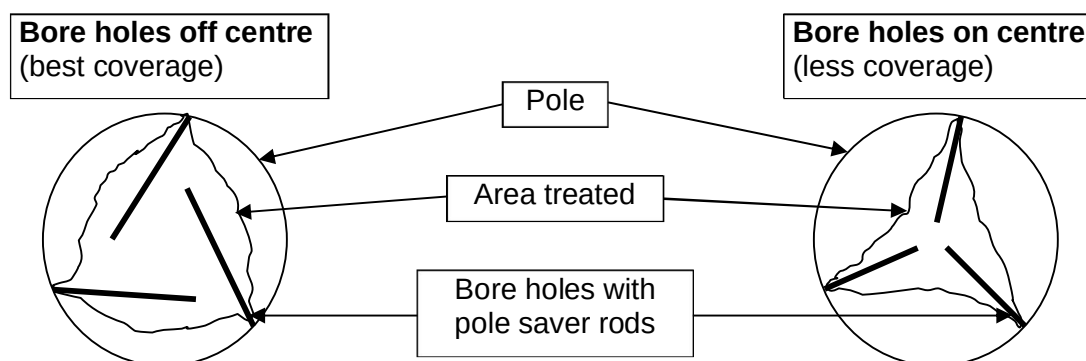


Figure 35: Pole saver rods inserted correctly (left) and incorrectly (right)

Having completed the drilling, three (3) pole saver rods are to be inserted into each of the holes and all the holes sealed with a tapered coloured plastic plug fully inserted.

5.13.3.4 Eltek nailed, OZ-C splinted or Pole Foundations MultiTube and MultiRib poles

If heart rot is found in nailed or splinted pole, pole saver rods are to be used as the standard treatment. The drilling pattern and the location of the holes should, in general, agree with the above number and location details.

However, due to the presence of the steel nails/splints, in most cases, some of the proposed drill holes may be obstructed. In these cases, inspectors must use their discretion to position the hole as close as possible to the nails/splints.

Poles that are suitable for reinstatement must be treated with both *Ausplast* and pole saver rods at the time of inspection.

5.13.3.5 Special situations

Where the internal condition of the pole cannot be ascertained due to the presence of electrical cables and cable guards, or substation poles with multiple earth wires, or poles that have been positioned hard against the kerb and gutter, they should be treated by the pole saver rod method. Where doubt exists, refer to the OLIGLI Manager.

Notes:

- No attempt must be made to remove any electrical cables or earth wires.
- Any broken or damaged earth or cable wires must be reported immediately to Endeavour Energy on the number indicated in clause 5.3. Do not attempt to join broken earth conductors, as this may be hazardous.

5.13.3.6 Poles not suitable for pole saver rod treatment

Rebutted poles and hollow poles with voids are not suitable for pole saver rod treatment.

5.13.4 Safety and precautions

Note: Records of pesticide use must be kept in accordance with Company Procedure GPE 0004 – Pesticide Use and Company Form FPE 0004 - Record of Pesticide Application.

5.13.4.1 Protective clothing and equipment

When applying any of the approved preservatives, inspectors must always wear and use the protective clothing and equipment as described in the relevant Safety Data Sheet (SDS), published by the preservative manufacturer. Inspectors must use the latest issued SDS.

5.13.4.2 Mixing of chemicals

Precautions must be taken to not mix chemicals that have not been approved by the manufacturer as compatible. Pumps and related equipment are to be also flushed before being used with different chemicals.

5.13.4.3 Disposal of chemicals

It is the inspector's responsibility to properly dispose of all waste affected material and chemicals, in accordance with current DECCW guidelines.

5.14 Steel poles, splints/nails, and cable guard rust treatment

The exposed surfaces of the steel pole, splint/nail, and cable guard must be thoroughly cleaned of all dirt. Where any loose rust is evident, and to retard the formation of corrosion, it must be removed using a wire brush and the surfaces treated with a polymeric rust converter (Chelade) or other approved product. Particular attention should be given to the exposed section below ground level to 100mm above ground level.

After treating the pole, wait 20 minutes before refilling the dirt around the pole.

This will allow the converter to cure in accordance with the manufacturer's specifications.

5.15 Marking of poles

5.15.1 Numbering of new poles found in field

Endeavour Energy will issue a block of permanent numbers to inspectors.

When the inspector finds new or unnumbered poles, they are to first check if the pole is on the map. If the pole is on the map and has a permanent number issued, this number is to be applied to the pole in accordance with MCI 0005 section 3.4 **(above 2 metres from groundline and fixed to the pole with two [2] nails at the top, two [2] at the bottom and one [1] in the centre of the slide)**. Note that for concrete poles, the slide must be fixed to the pole using silicon or permanent adhesive.

If the pole is not on the map, a permanent number should be issued using the next available number from the block of permanent numbers. The details of the pole are to be recorded and the pole map marked up in accordance with this document. This number must be applied to the pole in accordance with MCI 0005, section 3.4.

On completion of the map, the inspector will return the marked-up map to the contractor. The contractor will forward the marked-up map to Endeavour Energy for amendment, and retain copies for record purposes.

Endeavour Energy will amend the maps and advise the contractor when amendments on a pole map have been completed. It is the responsibility of the OLI/GLI manager to retain the original inspector's working pole map in records for seven (7) years, as indicated in clause 6.0.

5.15.2 Poles to be replaced (condemned poles)

5.15.2.1 Immediate – within 4 days (notify depot immediately)

These poles must be marked with an **X**, cut into the pole at 1.5m to 2.0m above ground level. The mark must then be sprayed with high visibility red paint. Concrete, composite or steel poles are to have an **X** sprayed with high visibility paint only.



Figure 36: Marking of immediate priority condemned poles

5.15.2.2 Within six (6) months (private pole 3 months)

These poles must have a high visibility self-adhesive tape attached at least two (2) meters above ground (see clause 5.15.6). Concrete, composite or steel poles are to have an **X** sprayed with high visibility paint only.

5.15.2.3 Private steel poles

These poles must have a high visibility self-adhesive tape attached at least two (2) meters above ground (see clause 5.15.6).

5.15.3 Poles to be reinstated

These poles must have a suitable for nailing pole disc (**N**) attached to the pole in a prominent position facing the roadside, 2m above ground level (see clause 5.15.6).

The disc must be removed immediately after the pole has been successfully reinstated.

Note: No stay pole or termite damaged pole, either high or low voltage, are to be marked for reinstatement.

5.15.4 Termite poles

Poles that have been identified as having termites must be marked with a tag (see Figure 37) as indicated in clause 5.5.

	Termite tag description details		
	T	Toxic butt	Toxic butt tag to be left on pole.
	T2	Second inspection	Second tag to be broken off and the OLI/GLI Manager advised in writing on form FAE 3034 when follow up inspection has been completed and is satisfactory. If termites are found to be still active after this second treatment, the pole is to be condemned.
	T1	First inspection	First tag to be broken off when pole has had first termite treatment done and date of treatment noted on form FAE 3034

Figure 37: Typical termite tag

5.15.5 Chemical trial poles

Poles that are currently being used in chemical treatment trials are marked as shown in **Figure 38**. The trial for poles marked with a 50mm aluminium disc marked **OS** (attached 1.5m above ground) has finished and the poles are to be inspected normally.



Figure 38: Trial pole marking

5.15.6 Condemned pole tape and suitable for nailing pole disc

Condemned poles must have a high visibility self-adhesive tape attached at least two (2) meters above ground. The tape must be wrapped around at least two (2) times the full circumference of the pole to reduce the possibility of becoming loose. Details of the tape are shown below.

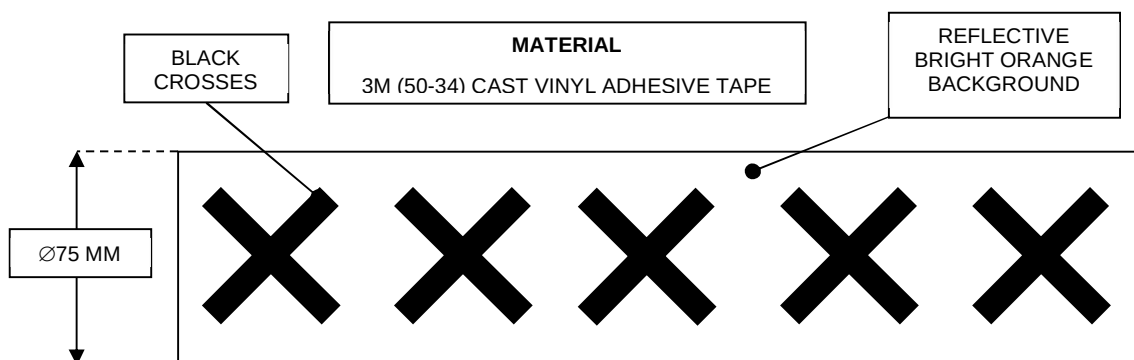


Figure 39: Condemned pole tape

The suitable for nailing pole disc identification must be an **N** as set out below.

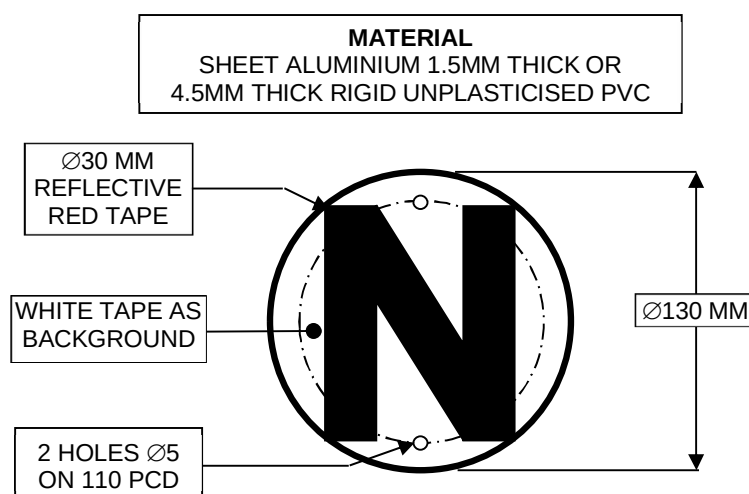


Figure 40: Suitable for nailing pole disc

5.15.6.1 Nails for fixing of pole disc

Due to the importance of these discs, they must be securely fixed to the pole. Nails used must be long enough to provide at least 15mm of penetration into solid wood. Sapwood is about 25mm thick and therefore a minimum 40mm long x 4.5mm thick nail is required.

5.15.7 Telstra joint use poles

A practice used throughout Endeavour Energy to identify those poles that were classified as joint use (poles used to support Telstra communication cables) involved the attachment of **JU** signs to the particular poles.

This practice is no longer a requirement and all existing JU signs are to be removed from Endeavour Energy poles.

5.16 Replacement of condemned poles

Condemned poles can have varying priorities, depending on the type of defect and defect severity, which are defined in 5.9.3 and Annexure 8.

Where an Endeavour Energy pole is to have a priority of 'up to 4 days', this is based on the following controls:

- The condemned pole does not present any imminent safety/failure (including bushfire) risk (for example, only being held up by the wires);

- The Bureau of Meteorology (BOM) website is checked and no high wind (>100km/h) wind events are forecast for the area;
 - o If a high wind event is forecasted, the pole is to be replaced/held in place prior to the wind event occurring;
 - o If a high wind event is not forecasted, the rectification period shall be 'up to four days' from the time of inspection;
- In the event that the BOM issue a 'Severe Weather Event' and the pole has yet to be replaced, the pole shall be held/replaced prior to the event occurring.

Condemned private poles are to be replaced by the customer within a maximum period of three (3) months. Action is to be taken to manage replacement within the required period.

Any condemned pole on which Telstra, Optus, State Rail or other authority assets exist is to be reported to the OLI/GLI Manager, who will advise the asset owners. The period in which the pole must be replaced is to be indicated and a statement included advising the deadline for the removal of the assets owned by the other authority.

5.17 Reinstatement of poles

All poles identified for reinstatement will be reinstated by a method approved by Endeavour Energy.

Any poles identified as having a low safety factor, or wall thickness must be firstly considered for pole nailing before replacement as detailed in Clause 5.9. This applies to all defect priority categories including 48 hours/4days, 2 months and 6 months.

To assess a pole for reinstatement, a single inspection hole must be drilled into the neutral axis at 900mm above ground level as per the Assessment of Serviceability flowchart in 5.9.3. If the thicknesses of the two wall measurements are equal to or greater than 45mm, then the pole's above ground condition must be evaluated.

The general above ground condition of the pole must be closely inspected however, and only those poles in good order marked for reinstatement. An excessive number of knot holes, open knot holes and severe pole head degrade would normally require the pole to be replaced. Also, poles must not be reinstated if there is evidence of termites.

The example below is a pole that although it may have passed the safety factor requirement for nailing, it should be considered for replacement due to the above ground condition.



Figure 41: Example of poles considered for replacement due to the above ground condition

The method of reinstatement must be in accordance with an Endeavour Energy specification. All methods will need to be substantiated with documentation from the NSW Office of Fair Trading indicating that the method of pole reinstatement is approved for use in NSW.

5.18 Coring of poles

Poles identified as needing coring must be reported to Endeavour Energy immediately. Coring is required in some situations to determine or verify the species and strength of timber poles.

Coring must be carried out by Endeavour Energy. The sample must be analysed by a registered laboratory. Once a pole has been cored and tested, a new identification disc must be applied to the pole with the following information:

- Species
- Strength
- Test date
- Laboratory number

5.19 Auditing and grading of inspectors

Branch procedure PAE 1027 – Initial and Ongoing Training of Pole Inspectors for Compliance to Maintenance Standards.

5.19.1 Auditing by the OLI/GLI Manager

The OLI/GLI Manager is required to audit each inspector. The audit period will depend on the inspector's current grading level, as follows:

- A grade 1 in 300 poles
- B grade 1 in 100 poles
- C grade 1 in 50 poles

On completion of each 80 poles, the inspector must submit documentation indicating the inspection maps and pole numbers covered for the 80 poles inspected.

The OLI/GLI Manager must audit the inspector's work to verify compliance with this and all related instructions. The results of these audits, and the inspector's documentation, must be retained by the OLI/GLI Manager and submitted for review by Endeavour Energy as required.

5.19.2 Initial grading of inspectors

Each inspector will be graded by Endeavour Energy. All new inspectors not previously graded by Endeavour Energy must undergo the following before they can work on Endeavour Energy's network:

- Completion of the appropriate registered inspector's course for OLI and GLI tasks.
- Completion of Endeavour Energy's classroom assessment.
- Completion of Endeavour Energy's field assessment.

On completion of these tasks, and if the inspector passes the required assessment, the inspector must be initially graded as a C inspector. Endeavour Energy also reserves the right to grade an inspector higher than C where satisfactory evidence of previous experience can be provided.

5.19.3 Re-grading of inspectors

A pass for re-grading will always be greater than 85% on assessment.

5.19.4 Initial grading path

- Re-grading of a C grade inspector to a higher level will be reviewed after the initial 150 poles.
- Re-grading of a B grade inspector to a higher level will be reviewed after the initial 300 poles as a B grade inspector.

5.19.5 Downgrading criteria

Where an inspector has been assessed and does not meet the required 85% pass level in the audits indicated above, re-grading/down grading to a lower level will occur.

Once downgraded, an inspector will remain at that level for a minimum of three (3) months or a suitable period, as determined by Endeavour Energy.

If a C graded inspector fails to meet the 85% pass level, Endeavour Energy will ask to show why the inspector should continue to be engaged.

5.19.6 Grading after a pole failure

An inspector will be asked to show cause for continued engagement by Endeavour Energy in the event of a pole failure within 12 months of inspection, determined as an inspection failure.

5.20 Reporting

5.20.1 General

MMI 0002 must be used as a guide to determine defect priority for rectification. If doubt exists regarding a defect condition; the OLI/GLI Manager must be contacted for further assessment.

5.20.2 Ellipse database

Reporting and recording of all the details of the pole inspection, treatment and defects are to be entered into ELLIPSE. When the new system is implemented that automatically links photos to the defect workorder, pole inspectors must upload data into Ellipse within 48 hours of the inspection to allow prompter visibility of more urgent defects so that they can be attended to as soon as possible.

Details of how to enter maintenance-related activities are given in SMI 112 – Distribution data entry - maintenance and defect prioritisation, while the entry of asset structure details is documented in SMI 113 – Distribution data entry - asset structure and details. For each pole inspected, records must include:

- All pole disc details, - such as strength, height, year of treatment.
- Physical and calculated details of pole – such as diameters, rot pocket details, safety factor. All defects found and the priority (as detailed in SMI 112) for rectification, as determined by the inspector.
- Cancellation of defects which no longer exist on the structure. The inspector must also include reasons for the cancellation in the defect comments. For example:
 - o No longer identified as a defect as per this standard;
 - o Defect has already been repaired but has not been closed.

Note: Open Endeavour Energy network defects that still exist (including those from previous OLI/GLI inspections) must not be cancelled and re-raised. Only the priority of the defect must be reset where applicable. If an existing defect has progressed to

an immediate risk at the time of the inspection, OLI/GLI must be notified. Further instructions for reassessing open defects will be given in the future. Existing **open customer defects** must be cancelled and re-raised with a new defect notice issued to the customer.

- Details of reasons for condemning poles including the area of the pole that is unacceptable (e.g. rot below ground, large cracks above ground, etc...). In cases where the pole is condemned due to its poor condition below ground, reasons for not reinstating the pole must also be included (e.g. insufficient wall thickness above ground, excessive splitting in the pole head, etc...).
- Details of all hardware and circuits on the pole. This also includes identifying telecommunications components as detailed in Annexure 11.
- Details of any alterations to the pole map that may be required to improve its accuracy.
- **Backup paper forms** – FAE 3032, FAE 3033, FAE 3034, FAE 3035, FAE 3036, FAE 3037 and FAE 3042.
- Records of pesticide use must be kept in accordance with Company Procedure GPE 0004 - Pesticide Use and Company Form FPE 0004 – Record of Pesticide Application.

5.20.3 Defect recording

Each identified defect must be recorded along with three digital photographs. In order for the inspector to accurately identify the photos when transferring the images to computer and then portable hard drive, a photo is to be first taken of the associated pole number eg PL502402. Two photographic images of each defect are then to be taken from two directions. The photos submitted must accurately depict the defect such that it is clearly identifiable and its severity can be assessed. Refer to MMI 0002 for further guidance.

Note: When the new work order linking system is implemented, photos must be captured and stored in a manner that they can be easily associated with the relevant defect workorder. If the defect work order is linked to the photo automatically, a photo of the pole number is no longer required.

The photographic images related to each defect are to be saved to a separate directory on a personal computer and titled by the pole number eg PL502402. On the completion of the inspection map all images are to be then stored on a portable hard drive and must accompany the submitted final inspection map to the OL/GLI Manager. All photos must be transferred into an Endeavour Energy server which can be accessed via the following link/directory: <\\148.195.214.241\\OLIGLI>

To capture suitable images, a 5 megapixel digital camera with a 20 times optical zoom is the minimum acceptable standard.

The photographic images will provide depot maintenance staff with a better understanding on the deterioration of the asset and provide a clear picture of the defective asset to facilitate the prioritisation of repairs.

5.20.4 Pole failures

All **UNASSISTED POLE FAILURES** must be notified, reported, and have a full investigation (post mortem) performed in accordance with Company Procedure GAM 0006 – Notifying, Reporting and Conducting a Post Mortem on Failed Poles.

Any functional failure of the pole itself or where only conductors or stays are supporting the pole will be classified as an unassisted failure unless it can be shown that the pole was:

1. Subject to sufficient force to exceed the design strength requirements set out by the relevant Utility's standards at the time of construction;
2. Burned by a fire ignited by any source;
3. Compromised by vandalism;
4. Struck by lightning; or
5. Otherwise subjected to a failure mechanism demonstrated by evidence to be outside the control of the Utility.

5.20.5 *Map irregularities*

The inspector is responsible for reporting any map discrepancies found during inspections by marking up the respective pole map in accordance with clause 5.20.6.1, and section 5.15.

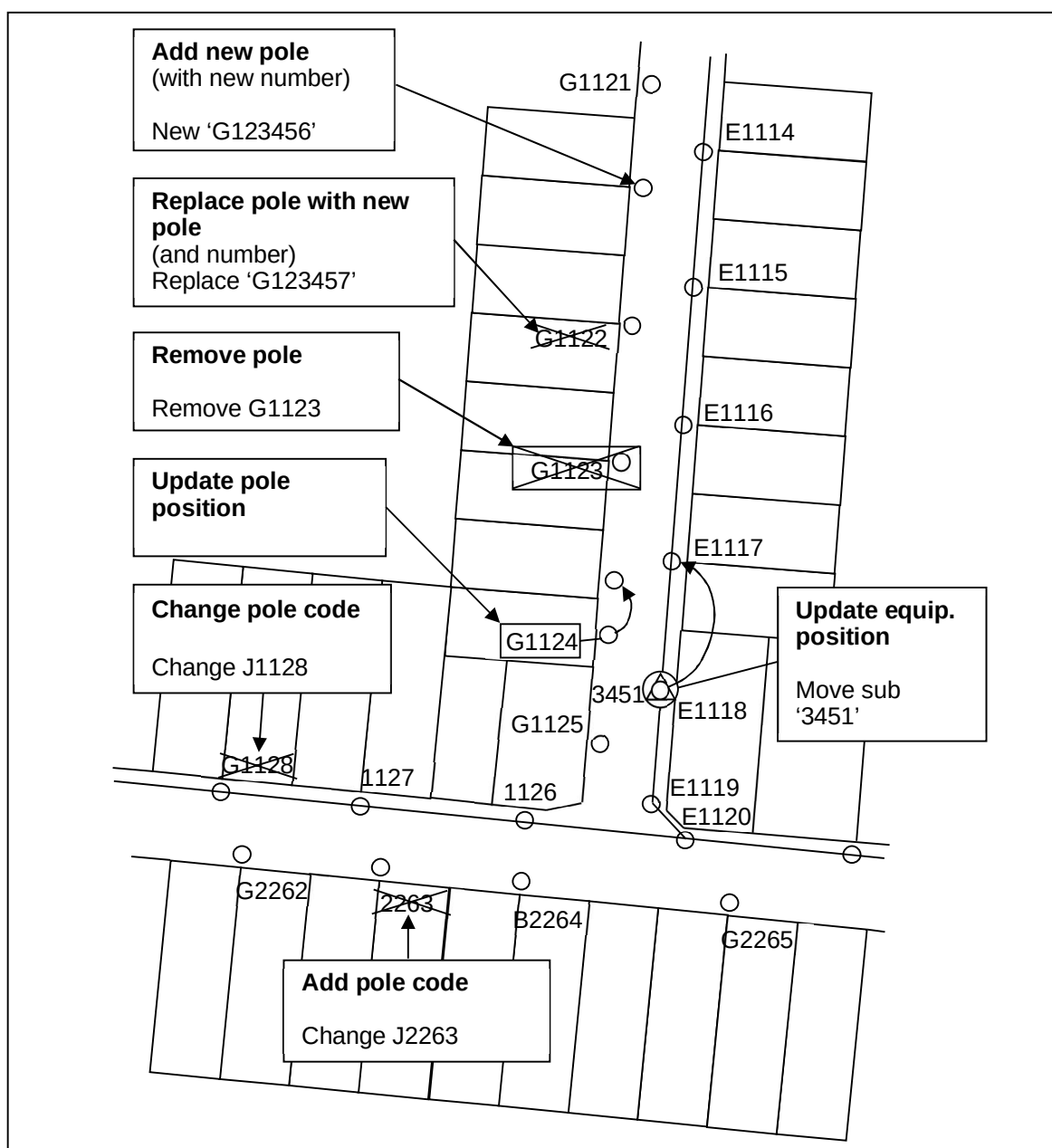
The inspector is responsible for the correct marking of poles with pole numbers as shown on the respective pole map (refer to MCI 0005 – Overhead distribution construction standards manual).

5.20.6 *Customer defect reporting*

The inspector is to inform the customer of the defect in writing and a copy of the written defect is to be forwarded to the OLI/GLI Manager.

The OLI/GLI Manager must close the defect in Ellipse with a defect resolution of *customer informed*.

5.20.6.1 Sample of map amendment requirements

**Notes:**

- Use red ink, with clear letters, numbers and notes.
- Use arrows and enlargements, where possible.
- Information on features and notes can be added to assist inspectors, for example, access tracks, locked gates.
- New numbers must be taken from the official allocation list.

5.21 Requirements for the inspection of waterway crossings

An OLI inspection of the crossing span and supporting poles and a GLI inspection and treatment of the supporting poles must be carried out every 4.5 years (refer to clause 5.2.1). All other inspections of waterway crossing are covered in MMI 0012.

5.22 Fire-prone areas

For all fire-prone areas, a pre-summer patrol and defect rectification must be completed each year, prior to the onset of the bushfire season.

The general purpose of the pre-summer patrol is to identify any factors associated with the overhead mains that could lead to the initiation of a bush fire. These may include inadequate tree clearances, impact damage, lightning damage, or any other defect.

The minimum requirements of this pre-summer patrol are set out in MMI0034 Pre-summer Bushfire Inspection.

5.23 Drawings

Drawings appropriate to this instruction are listed below:

Drawing no.	Am. no.	Title
011985S1	J	Sheet 1 – Overhead construction insulated aerial service mains minimum clearances near structures
011985S2	E	Sheet 2 – Overhead construction insulated aerial service mains minimum clearances near structures
086232	K	Endeavour Energy overhead lines minimum clearances near structures
086242	G	Overhead construction aerial consumer mains minimum clearances
060592	B	Inspectors pole probe type 1 & 2, fabrication detail
064521	E	Condemned pole tape and Nailed pole identification disc detail
053999	K	Overhead construction identification plate for concrete and steel poles

6.0 AUTHORITIES AND RESPONSIBILITIES

General Manager Asset Management has the authority and responsibility for approving this instruction.

Manager Asset Standards & Design has the delegated authority and responsibility for approving this instruction.

Mains Assets Manager, Asset Standards & Design has the authority and responsibility for keeping the content of this instruction up to date.

Regional Managers have the authority and responsibility for checking the conductor clearance for river crossings.

Manager Asset & Metering Data has the authority and responsibility for capturing the locations of assets (including marker balls) in GIS.

OLI/GLI Manager has the authority and responsibility for:

- confirming that the inspectors are aware of their responsibilities under this instruction;
- achieving copies of signed maps for a period of seven (7) years;

- verifying that all inspectors have been suitably trained;
- maintaining an effective quality auditing system;
- implementing this instruction keeping the Mains Assets Manager, Asset Standards & Design, informed of any factors that may prevent the acceptance of responsibility for its full implementation;
- managing the pre-summer bushfire inspection in accordance with this instruction;
- initiating the process to update the data capture tool in accordance with any changes specified in this standard;
- verifying that the inspection details are entered into Ellipse, as set out in the contract; and
- conducting and recording the results of full inspections of any failed poles.

IC&T Program Delivery Manager has the authority and responsibility for:

- updating the data capture tool in accordance with with any changes specified in this standard; and
- keeping the training documentation associated with the data capture tool up to date.

The **Inspector** has the authority and responsibility for:

- carrying out all of the procedures of this instruction, appropriate to each pole examined;
- seeking clarification of this instruction, as required, from the OLI/GLI Manager;
- confirming that all poles covered by each map are fully inspected in accordance with this instruction. Upon commencement and on completion, each map must be signed and dated by the responsible inspector and forwarded to the OLI/GLI Manager; and
- referring poles to the OLI/GLI Manager for a second opinion in the event of uncertainty about serviceability.

All **Endeavour Energy employees and contractors** have the authority and responsibility for:

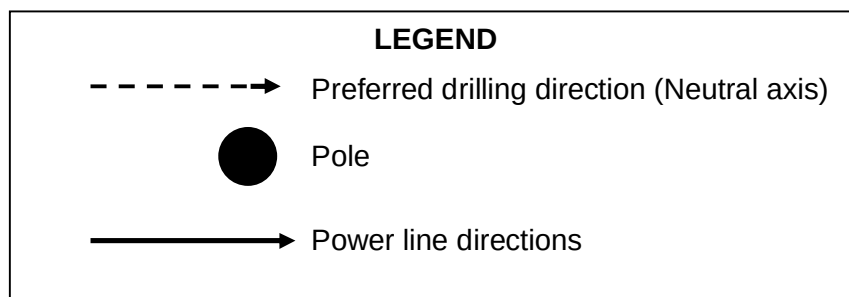
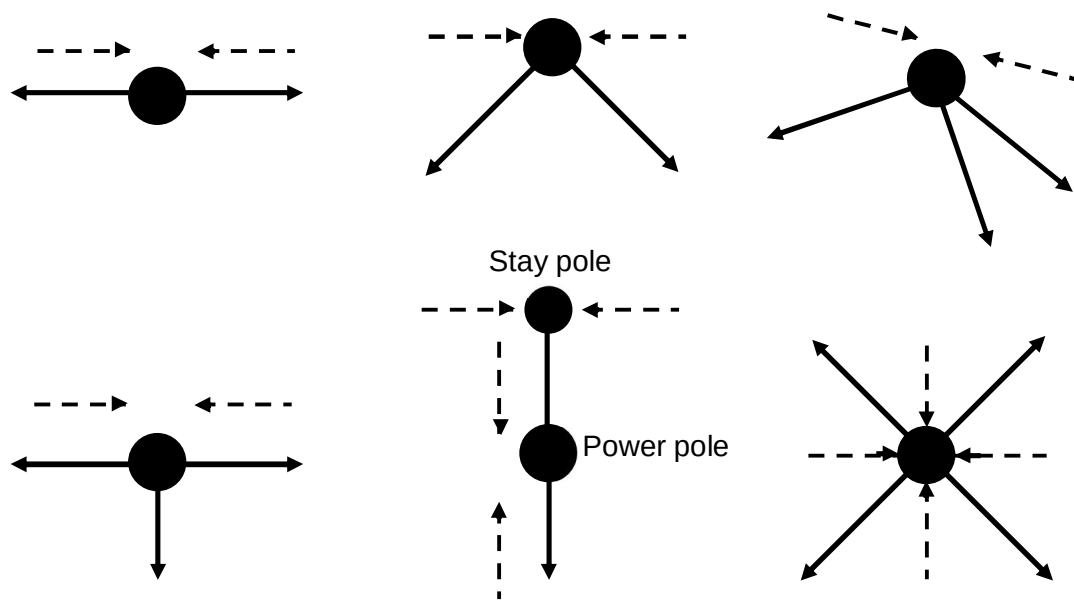
- working in accordance with local and statutory requirements;
- upholding a high level of public safety;
- working in accordance with Endeavour Energy's Electrical Safety Rules;
- recording maintenance and test data in Endeavour Energy's electronic databases;

7.0 DOCUMENT CONTROL

Documentation content coordinator: Mains Assets Manager

Documentation process coordinator: Branch Process Coordinator

Annexure 1: Neutral axis examples



Annexure 2: Typical termite pictures



Soldier of the ringant termite
Neotermes insularis



Soldier of the native drywood termite
Cryptotermes primus



Soldier of the giant northern termite
Mastotermes darwiniensis



Soldier of Heterotermes sp.



Soldier of Coptotermes acinaciformis



Alate of Coptotermes lacteus



Major soldier of Schedorhinotermes sp.



Minor soldier of Schedorhinotermes sp.



Soldier of Microcerotermes turneri



Soldier of Nasutitermes walkeri



Glyptotermes



Glyptotermes bore holes

Annexure 3: Pole strength conversion table

Imperial	Original metric	Current metric	Depth in ground
25L	7.6L	8/4	1.4
25H	7.6H	8/15	2.4
25X	7.6X	8/30	2.4
30L	9L	9.5/4	1.55
30M	9M	9.5/8	1.55
30H	9H	9.5/12	1.55
35L	11L	11/4	1.7
35M	11M	11/8	1.7
35H	11H	11/12	1.7
40L	13L	12.5/4	1.85
40M	13M	12.5/8	1.85
40H	13H	12.5/12	1.85
40S	13S	12.5/S	1.85
40X	13X	12.5/18	2.0
45M	-	14/8	2.0
45H	-	14/12	2.0
45X	-	-	2.0
50L	15L	15.5/4	2.15
50H	15H	15.5/12	2.15
55L	17L	17/4	2.3
55H	17H	17/12	2.3
60L	19L	18.5/4	2.35
60M	19M	18.5/8	2.35
60H	19H	18.5/12	2.35
65L	-	20/4	2.5
65H	-	20/12	2.5
-	21L	21.5/4	2.65
-	21M	21.5/8	2.65
70H	21H	21.5/12	2.8

All imperial figures are in feet. All metric figures are in metres. Depth in the ground is in metres.

Strength in kilo Newtons.

Pole suffixes: L – light, M – medium, H – heavy, X – extra heavy, S – substation.

Annexure 4: Pole supplier table

Company name	Plant location	Location symbol	Company symbol	Company registration no.	State location
Koppers	Grafton	G	KAP	185	NSW
	Lidsdale	L	KAP	N/A	NSW
	Mogo	M	KAP	N/A	NSW
	Thornton	TH	KAP	187	NSW
	Uralla	U	KAP	N/A	NSW
	Hume	N/A	KAP	963	ACT
	Wauchope	W	KAP	N/A	NSW
Hicksons Timber Industries	Lidsdale	L	HTI	N/A	NSW
	Grafton	G	HTI	N/A	NSW
	Thornton	TH	HTI	N/A	NSW
	Mogo	M	HTI	N/A	NSW
	Quean-Beyan	Q	HTI	N/A	NSW
Allen Taylors	Armidale	N/A	AT	N/A	NSW
	Uralla	U	AT	N/A	NSW
Robb & Brown	Casino	C	KAL-RT	252	NSW
	Namoonna	C	RT	285	NSW
Boral Timbers	Namoonna	N	RT	255	NSW
	Casino	C	RT	N/A	NSW
Duncan Holdings	Casino	C	RT	N/A	NSW
Mitchell & Fernance	Warnervale	W	PIP	N/A	NSW
Arthur Hassel	Armidale	A	AH	N/A	NSW
Coffs Harbour Hardwood	Glenreagh	N/A	CHH	126	NSW
L.J. Williams	Central Bucca	N/A	LJW	115	NSW
Yates Bros.	Stroud Road	N/A	YB	N/A	NSW
Burnside & Coleman	Taree	N/A	BC	N/A	NSW

Annexure 5: Timber species durability classifications and identification brands

Standard trade common name	Softwood (S) or hardwood (H)	Durability class	Species brand
ash, alpine	H	4	AA
ash, Crow's	H	2*	CR
ash, hickory	H	2*	HA
ash, mountain	H	4	MA
ash, silvertop	H	3	ST
Blackbutt	H	2	BB
blackbutt, New England	H	2	NA
blackbutt, WA	H	2	BA
bloodwood, brown	H	2*	BD
bloodwood, red	H	1*	RW
box, black	H	1*	BX
box, brush	H	3	BH
box, coast grey	H	1	CB
box, grey	H	1*	GB
box, red	H	2*	RX
box, white	H	2*	WX
box, white topped	H	2*	WT
box, yellow	H	1	YB
brownbarrel	H	4	BL
cadaga	H	3*	CG
candlebark	H	3	CD
fir, Douglas (oregon)	S	4	DF
gidgee	H	1*	G
gum, blue, Tasmanian or southern	H	3	BG
gum, forest red	H	2	FR
gum, grey	H	1	GG
gum, lemon-scented	H	2*	LG
gum, Maiden's	H	3*	MG
gum, manna	H	4	MN
gum, mountain	H	4	MO
gum, mountain grey	H	3	MT
gum, poplar	H	3*	PG
gum, river red	H	2	RR
gum, rose	H	3	RO
gum, salmon	H	3*	SA
gum, spotted	H	2	SG
gum, Sydney blue	H	3*	SY

Standard trade common name	Softwood (S) or hardwood (H)	Durability class	Species brand
ironbark, broad-leaved red	H	1	BI
ironbark, grey	H	1	GI
ironbark, narrow-leaved red	H	1	NI
ironbark, red	H	1	RI
ironwood, Cooktown	H	1	IW
Jarrah	H	2	J
Karri	H	3	K
mahogany, red	H	2	RM
mahogany, southern	H	2	SM
mahogany, white	H	1	WM
marri	H	3	MR
messmate	H	3	MD
messmate, Gympie	H	3*	GM
penda, brown	H	2	PN
penda, red	H	2	PD
peppermint, black	H	3*	BP
peppermint, narrow-leaved	H	3	NL
pine, bunya	H	4*	YP
pine, Canary Island	S	4*	PI
pine, Caribbean	S	4	PB
pine, celery-top	S	3*	CT
pine, Corsican	S	4*	PC
pine, cypress, black	S	2*	BC
pine, cypress, white	S	1*	WC
pine, hoop	S	4	HP
pine, kauri	S	4*	KN
pine, loblolly	S	4	PL
pine, long-leaf	S	4*	PF
pine, maritime	S	4	PM
pine, patula	S	4*	PP
pine, radiata	S	4	PR
pine, slash	S	4	PS
pine, ponderosa	S	4*	PW
pine, western white	S	4*	PO
satinay	H	1	S
satinbox	H	2*	SN
stringybark, blue-leaved	H	3*	SL
stringybark, brown	H	3	BS
stringybark, red	H	3	RS

Standard trade common name	Softwood (S) or hardwood (H)	Durability class	Species brand
stringybark, silvertop	H	3	SS
stringybark, white	H	2	WS
stringybark, yellow	H	2	YS
tallowwood	H	1	TW
tingle, red	H	3*	RT
turpentine	H	1	TP
wandoo	H	1	WG
wandoo, powder bark	H	1*	PW

Notes:

- 1) See AS 1720.2 for definition of durability class.
- 2) The durability classes in this table are as given in AS 1720.2, except for those species marked with an asterisk (*). These are as listed in the previous edition of AS 2209.
- 3) For information on species not listed, refer to CSIRO, Division of Forest Products, or to State forestry services.

Annexure 6: Steel pole remaining strength calculation and defect prioritisation

The residual above ground wall thickness shall be measured and the percentage remaining strength calculated using the following formulae:

$$\frac{T1a + T2a + T3a + T4a}{4} \div \frac{T1n + T2n + T3n + T4n}{4} \times 100 = \%$$

Where:

T1n – is the first wall thickness reading taken 300mm above groundline for determining nominal wall thickness (section of column unaffected by rust degradation).

T2n – T4n – are the remaining three wall thickness readings taken in the same horizontal plane as *T1n*, but spaced around the pole approximately 90° apart.

T1a – is the first wall thickness reading taken at or below groundline directly below *T1n*.

T2a – T4a – are the remaining three wall thickness readings taken in the same horizontal plane as *T1a*, but spaced around the pole approximately 90° apart.

Note: In using the above formulae, the addition of measurements above groundline must never be less than the addition of measurements at or below groundline.

Insufficient wall thickness may require the replacement of the pole. The percentage of original wall thickness remaining will determine the time frame in which this shall be done (refer to defect prioritisation in Annexure 9).

Annexure 7: Communication cable separation

A summary of required separations between communication infrastructure and Endeavour Energy's infrastructure measured at the pole is set out below.

Table 1: Separations between BCC and Endeavour Energy equipment

On joint use poles - bracketed figures are mid-span between poles								
Endeavour Energy equipment		Bare conductor	Insulated SL conductor	HV and LV ABC const and Insulated SL conductor	Insulated drop leads, brackets, fittings, conduits and down earths	Insulated aerial service cables, down leads; pole-mounted electrical switches/fuses/connection boxes	Conductors	
		SL or LV	SL	22kV, 11kV, LV and SL	Mechanically protected and earths	Non-mechanically protected	Bare/covered	Bare
		Note, the lowest conductor on the pole determines the clearance to comms equipment			Misc.	Misc.	11/22k/33kV	66kV and above
BCC equipment	Conductive comm's cable sets	1.5m (1m)	1.5m (1m)	1.5m (1m)	50mm	600mm	3.0m (2.7m)	On application
	Non-conductive comm's cable sets	0.5m (0.3m)	0.3 (0.3m)	0.3m (0.3m)	50mm	300mm	2.0m (0.3m)	On application
Telstra	Twisted telephone cable	1.2m	0.55m	1.2m	50mm	600mm	3.0m (2.7m)	On application

Annexure 8: Pole-top Inspection Procedure of Wood Poles

A pole-top inspection may be requested if there is uncertainty about the condition of the wood pole above two (2) metres, for example, where there is the presence of open knot holes, cracking, splitting, or external decay. This procedure details the processes for assessing the serviceability of the pole through visually inspecting, sounding, and drilling the pole as required (with the use of an elevated work platform).

Training and qualifications

This procedure must only be carried out by **electrically qualified a staff who has received the appropriate training and demonstrated competency**. This will include demonstrated competency at using a drill to internally inspect a wood pole.

Live Work Practices

If 500mm clearance cannot be maintained from live low voltage, energised work practices must apply.

Preliminary visual inspection

Before any sounding or boring of a pole takes place, the pole inspector must commence each inspection by visually checking the above ground portion of the pole for any serious defects. Defects may include the condition of all high voltage conductors and fittings on the pole, extensive splitting, sapwood decay, lightning damage, vehicle impact damage, and evidence of termites or their flight holes.

If *Glyptotermes* are detected, the pole must be marked and condemned with no treatment carried out. Regardless of the previous statement not to disturb the soil, the inspector should look for flight holes at the area 300mm below groundline (most cases) and up to two (2) metres above groundline (extreme cases). The flight holes should be cut with a sharp axe to disclose cross grain galleries. Poles with evidence of brown rot fungus infection can be prone to these termites.

Nasutitermes detected in the pole can generally be eradicated by destroying the nest and spreading it across the ground. An effort is to be made to locate and kill the queen. Termite affected sapwood must be removed to 300mm above ground to discourage further attack.

Subterranean termites are generally the most destructive of Australian termites. If, when checking a pole, the inspector is unsure of a species, advice should be sought from a specialist.

Visual inspection – head of pole

If there is a suspected defect at the head of the pole, the pole must be visually inspected closely to assess its serviceability. If any of the following conditions are met, then the pole must be condemned.

- (a) Where a split exists in the head that
- extends across the full diameter,
 - and passes through the centre of the pole
 - and is in line with the axis of the attaching bolts
 - and extends to any attachment bolt with which it aligns,
 - and is at least 10 mm wide at some point (you will generally be able to see daylight through such a split)
- (see Fig 1)

- (b) Where a split or defect exists in the head that is caused by degradation – termite damage and / or fungal decay (this clause does not refer to a simple split in the timber)
- and extends across the full diameter,
 - and passes approximately through the centre of the pole,
 - and is roughly at right angle to the axis of the attaching bolts,
 - and extends a minimum of 300 mm beyond any attachment bolt,
 - and is at least 10 mm wide at some point (you will generally be able to see daylight through such a split)
- (see Fig 2)
- (c) Where there is a pipe in the head of the pole with a diameter half the diameter of the pole or greater, and
- there are multiple splits that extend through the full width of the sound timber wall (not just checks in the pole), and
 - these splits extend from the head to or beyond any attaching bolts.

In the above situations where conductor clearances allow and lowering of the crossarm/conductors and cropping and capping of the pole is a practical alternative, then this is preferable to pole replacement.

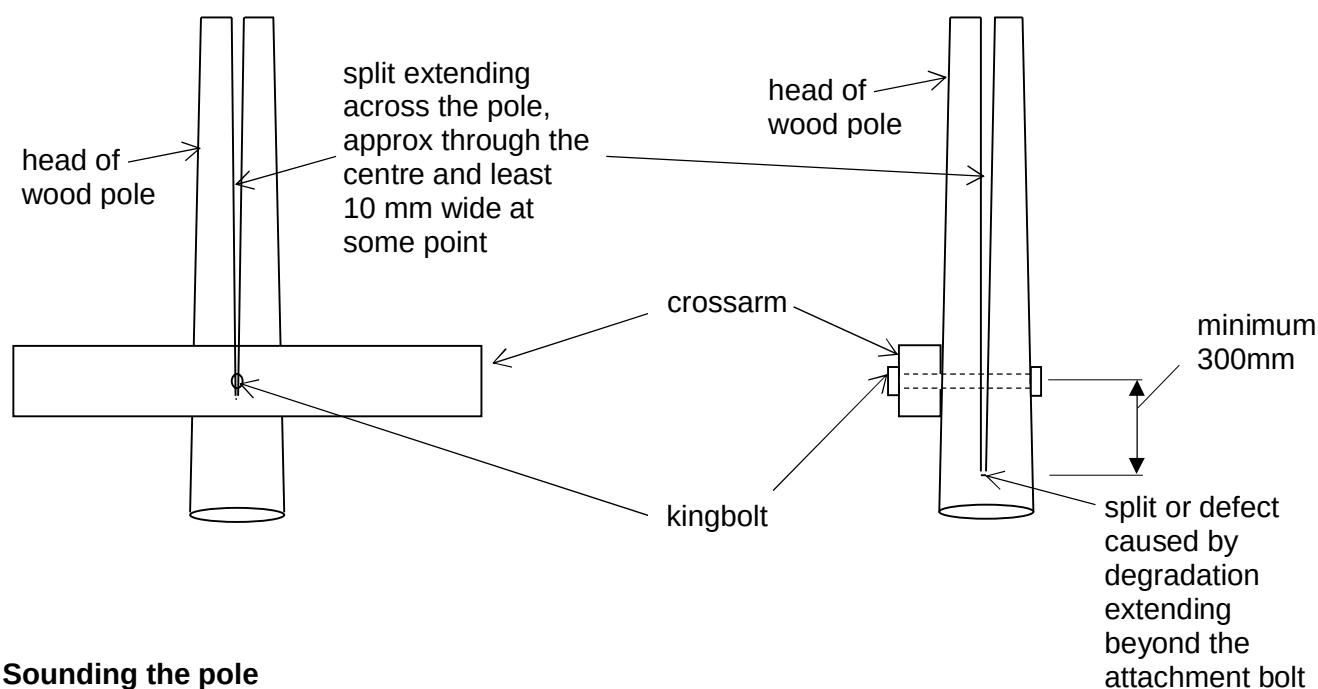


Figure 2

Sounding the pole

The inspector must sound the pole in order to get a general indication of the pole's internal condition. For **wood poles**, use the flat side of a hammer. Sufficient force should be used to give an indication of the pole condition, but not enough to affect a timber pole's sapwood layer. Sounding must be done by striking the pole with the hammer from several directions. A sound pole should produce a ringing sound, while an unsound or decaying pole will give a dead/dull sound.

Drilling the pole

The pole is to be drilled to further assess the internal condition of the pole as described in

the table below. The pole must be drilled in the area of greatest concern as indicated by sounding the pole. All holes must be drilled using a battery drill with a 12mm auger bit, at an angle slight upwards (10°) to prevent ingress of water into the hole. Additionally, the hole must extend beyond half the diameter of the pole.

Note: Before using an auger bit to bore any pole during its inspection, the auger tip is to be cleared of any shavings to prevent transfer of active fungus into sound wood. **The auger bit is to be sterilised using methylated spirit as a dip or spray. This must be done away from live mains (e.g. on the ground) as products can be flammable.**

Pole issue	Drilling procedure
Open knot hole	1. Drill a hole slightly underneath (50mm) the knot hole. 2. Cut a V into the bottom of the knot hole with a tomahawk (and apply a coat of copper naphthenate [CN] paint) to facilitate water drainage.
Cracking / splitting	1. Drill a hole 90 degrees (perpendicular) to the crack/split
External rot	1. Using a tomahawk, chip away the external rot until sound wood is reached. 2. Sound the pole in this area. 3. Drill a hole directly into the area of concern. 4. Apply a coat of copper naphthenate (CN) paint to where external rot has been removed (in step 1).
Fungal spore / fruiting body	1. Scrape off the fungal spore. 2. Sound the pole in this area. 3. Drill a hole directly into the area of concern. 4. Apply a coat of copper naphthenate (CN) paint to where fungal spore has been removed (in step 1).

- If there is less than 40mm of sound timber, the pole must be condemned and replaced within six (6) months.
- If there is evidence of white rot (usually indicated by a powdery substance) in the drill shavings, the pole must be condemned.

Holes are to be plugged with a tapered coloured plastic plug.

Note: Any subsequent bore holes should be bored 50mm above or below previous inspection holes.

Guidelines for prioritisation of pole-top condemned poles

The following criteria can be used for prioritising pole-top-condemned poles.

Inspection	Condemn Criteria	Replacement Priority
Drilling	Presence of white rot	48hour/4days – 3 months ¹
	² Wall thickness less than 20mm	48hour/4days
	² Wall thickness less than 40mm	6 months ³
Pole head visual inspection	Pole head condition is unacceptable (refer to Visual Inspection section of the manual for further details)	6 months ³

Notes:

1. If there is insufficient good wood remaining (i.e. the wall thickness is less than 40mm) then replace within 4 days. Otherwise, replace within 3 months.
2. Wall thickness measurement should exclude any sapwood present.
3. A priority less than 6 months may be given if it is believed that the risk warrants greater urgency.

Reporting

Form FAE3057 must be filled out when a pole-top inspection of a wood pole is carried out. This form must be scanned and stored in the following network location:

G:\Share\FAE3057 Pole-top Inspection of Wood Pole

Annexure 9: Defect prioritisation

IMPORTANT

Any emergency situation or imminent failure that impacts on: safety; the environment; loss of supply to customers; or, imposing unacceptable operational constraints on the network, must be raised with a **48 hour priority**. These defects must be reported immediately to OLI/GLI. OLI/GLI must in turn notify the relevant work group or depot. Note that a condemned pole with a priority of 48hr/4day must be reported directly to the local Depot Operations Manager.

If the inspector considers the defect requires a more urgent priority than stated in this document, the inspector must photograph the defect and the information must be forwarded to the local operations manager.

In the event of uncertainty over the prioritisation of a defect, clarification must be sought from the **OLI/GLI support staff** and the **Mains Assets Manager**.

Note: the corresponding defect categorisation has been included with each defect priority, as set out in SMI124 - Maintenance Data Entry and Defect Prioritisation.

Refer to MMI0034 – Pre-summer Bushfire Inspection for details regarding bushfire defect identification and prioritisation for the PSBI.

Note in the table below, a priority of “48hr/4days” refers to a defect which can be rectified within 4 days (provided the controls stated in Clause 5.16 are met), however, if a failure is imminent, this shall be replaced within 48hrs.

The defect tables have now been removed - refer to MMI 0002 for defect requirements.

k. Clearance defects

The following tables provide guidance for the prioritisation of low mains for various types of conductors. Refer to SMI124 for further guidance in prioritising defects within defect categories.

Note: With the exception of immediate defects (which are to be rung in), the inspector must assign the clearance defect with a R2 priority (reassess within 2 months) for regional staff to confirm and/or reprioritise the defect.

Also note that where clearance defects are identified for conductors that were constructed prior to 1976 (which may be in compliance with the standard of the day), an additional risk assessment may be carried out to determine if the conductor clearance is acceptable at the present time and environment.

Clearance defects that are prioritised as “MA to reassess” shall be sent to the Mains Assets Manager for review.

LV Bare / Insulated / Covered & HV ABC

Conductor Clearance	Over the carriageway of designated 4.6 m roads	Over the carriageway of all other roads	Over land other than the carriageway of roads	Over land which due to its steepness or swampiness is not traversable by vehicles
≤ 3.2 m	<i>Immediate</i>	<i>Immediate</i>	<i>Immediate</i>	<i>Immediate</i>
> 3.2 m and ≤ 4.7 m	<i>Immediate</i>	<i>Immediate</i>	<i>3 Months</i>	<i>MA to reassess</i> (Min. Clearance 4.5 m)
> 4.7 m and ≤ 5.0 m	<i>Immediate</i>	<i>Before next inspection</i>	<i>Before next inspection</i>	<i>MA to reassess</i> (Min. Clearance 4.5 m)
> 5.0 m and < 5.5 m	<i>3 Months</i>	<i>Before next inspection</i>	<i>Before next inspection</i>	N/A

Service Cables

Conductor Clearance	Over the carriageway of arterial road or freeways or the centre of a public road	Any other part of a public carriageway / road	Vehicular Crossing of a road verge (other than an urban residential dwelling)	All Other Vehicular Crossing or Land likely to be used by a vehicle	Land not likely to be used by a vehicle
≤ 2.7 m	<i>Immediate</i>	<i>Immediate</i>	<i>Immediate</i>	<i>Immediate</i>	<i>Immediate</i>
> 2.7 m and ≤ 3.0 m	<i>Immediate</i>	<i>3 Months</i>	<i>3 Months</i>	<i>Before next inspection</i>	<i>N/A</i>
> 3.0 m and ≤ 4.5 m	<i>Immediate</i>	<i>3 Months</i>	<i>Before next inspection</i>	<i>N/A</i>	<i>N/A</i>
> 4.5 m and ≤ 4.9 m	<i>3 Months</i>	<i>Before next inspection</i>	<i>N/A</i>	<i>N/A</i>	<i>N/A</i>
> 4.9 m and ≤ 5.5 m	<i>Before next inspection</i>	<i>N/A</i>	<i>N/A</i>	<i>N/A</i>	<i>N/A</i>

11, 22 or 33 kV Bare Conductor or CCT

Conductor Clearance	Over the carriageway of designated 4.6 m roads	Over the carriageway of all other roads	Over land other than the carriageway of roads	Over land which due to its steepness or swampiness is not traversable by vehicles
≤ 3.3 m	<i>Immediate</i>	<i>Immediate</i>	<i>Immediate</i>	<i>Immediate</i>
> 3.3 m and ≤ 5.1 m	<i>Immediate</i>	<i>Immediate</i>	3 Months	MA to reassess (Min. Clearance 4.5 m)
> 5.1 m and ≤ 5.4 m	<i>Immediate</i>	<i>Before next inspection</i>	<i>Before next inspection</i>	MA to reassess (Min. Clearance 4.5 m)
> 5.4 m and < 6.7 m	3 Months	<i>Before next inspection</i>	<i>Before next inspection</i> (Min. Clearance 5.5 m)	N/A

66 or 132 kV Bare Conductor

Conductor Clearance	Over the carriageway of designated 4.6 m roads	Over the carriageway of all other roads	Over land other than the carriageway of roads	Over land which due to its steepness or swampiness is not traversable by vehicles
≤ 3.6 m	<i>Immediate</i>	<i>Immediate</i>	<i>Immediate</i>	<i>Immediate</i>
> 3.6 m and ≤ 5.7 m	<i>Immediate</i>	<i>Immediate</i>	3 Months	MA to reassess (Min. Clearance 5.5 m)
> 5.7 m and ≤ 6.0 m	<i>Immediate</i>	<i>Before next inspection</i>	<i>Before next inspection</i>	MA to reassess (Min. Clearance 5.5 m)
> 6.0 m and < 6.7 m	3 Months	<i>Before next inspection</i>	<i>Before next inspection</i>	N/A

Annexure 10 is no longer applicable. Refer to MMI 0002.

Telecommunications Asset Identification Requirements

Annexure 11 of MMI0001 – Pole and Line Inspection and Treatment

Version 1 (November 2016)

1.0 TELCO ASSET CAPTURE REQUIREMENTS

The following telecommunication assets that are supported by Endeavour Energy's overhead electricity network must be reported during the OLI/GLI inspection (at each applicable pole):

Telco Assets	Telco Name			
	Optus	Telstra	NBN Co	Other
Steel Strand supporting Coax Cable	Y / N	Y / N	Y / N	Y/N
Steel Strand supporting Fibre Cable	Y / N	Y / N	Y / N	Y/N
Steel Strand supporting PSTN Cable	Y / N	Y / N	Y / N	Y/N
Steel Strand with no cable being supported	Y / N	Y / N	Y / N	Y/N
Self-Supporting Cable Coax	Y / N	Y / N	Y / N	Y/N
Self-Supporting Cable Fibre	Y / N	Y / N	Y / N	Y/N
Self-Supporting Cable PSTN	Y / N	Y / N	Y / N	Y/N
Riser Conduit	1 / 2 / 3 / 4 / 5	1 / 2 / 3 / 4 / 5	1 / 2 / 3 / 4 / 5	1 / 2 / 3 / 4 / 5
Riser Cable	Y / N	Y / N	Y / N	Y/N
Power Supplies	Y / N	Y / N	Y / N	Y/N
TELCO Earthing	Y / N	Y / N	Y / N	Y / N

2.0 TELCO ASSET PHOTO GUIDE

This following section provides photographic guidance for identifying various Telco assets.

OPTUS NETWORK



OPTUS NETWORK



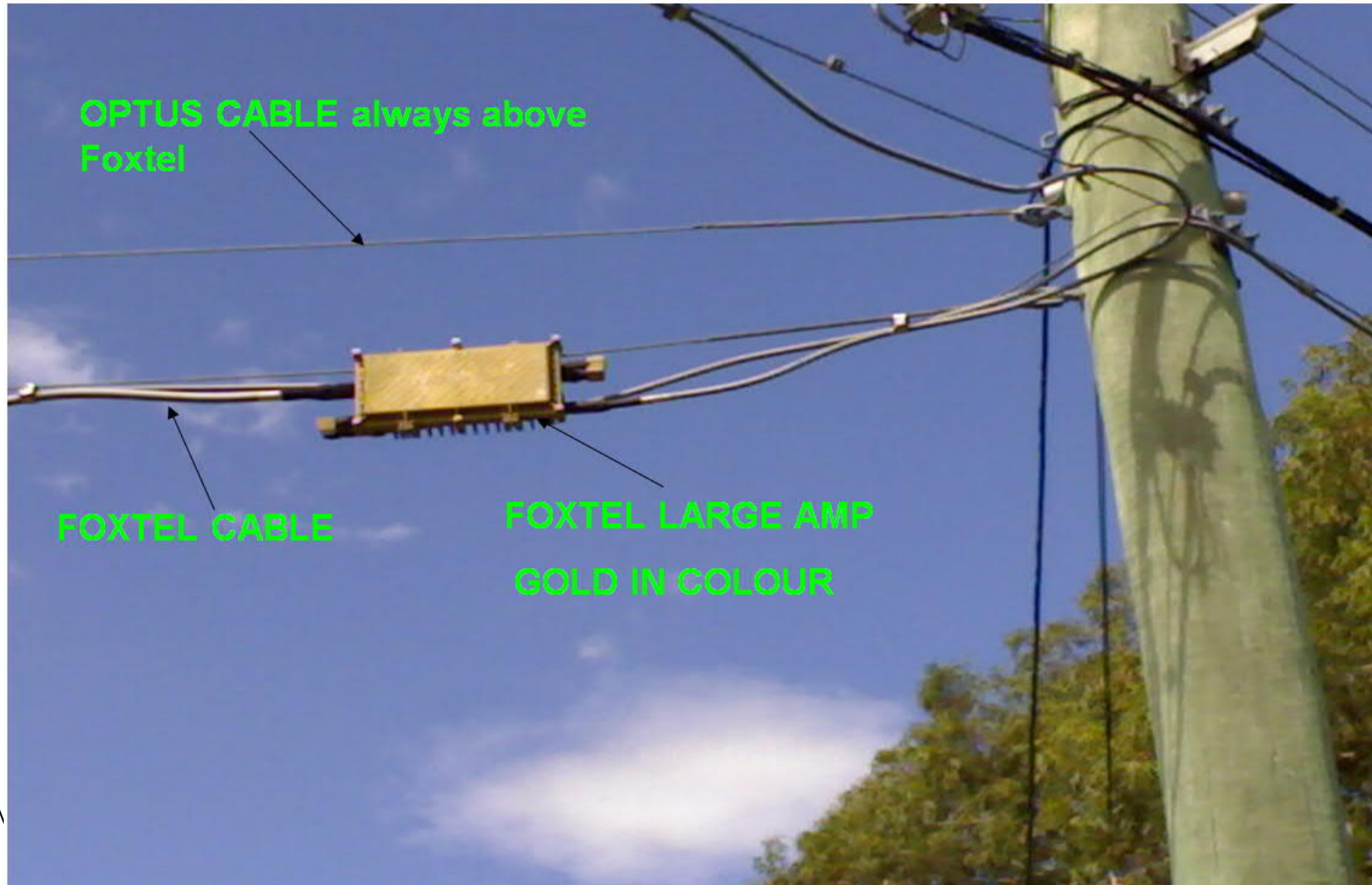
Optus cable and tap device



OPTUS CABLE AND TAP

EQUIPMENT - LIGHT SILVER GREY IN COLOUR

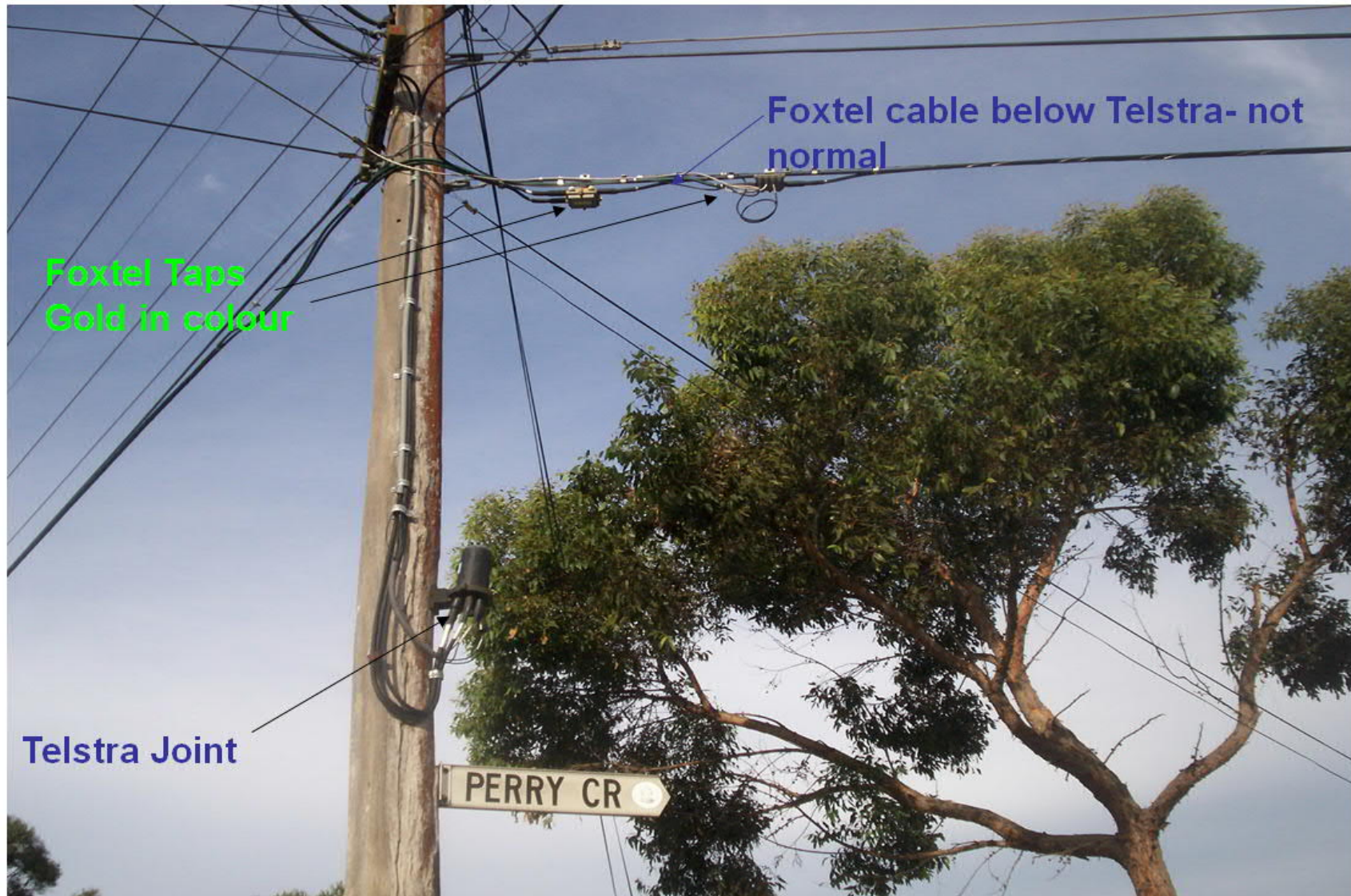
FOXTEL AND OPTUS



Foxtel and Optus



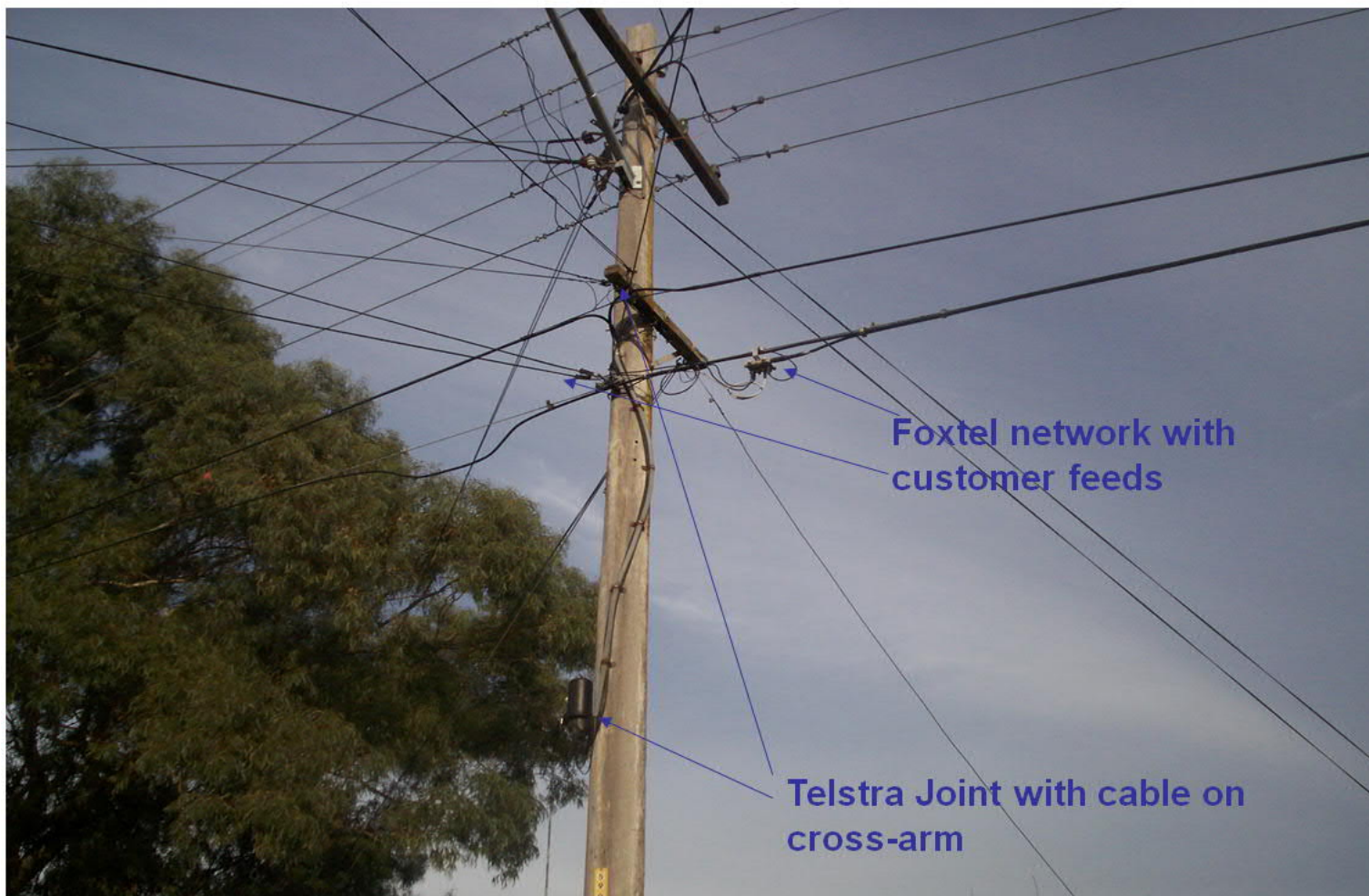
Telstra Phone network



Telstra network



Telstra network and Foxtel



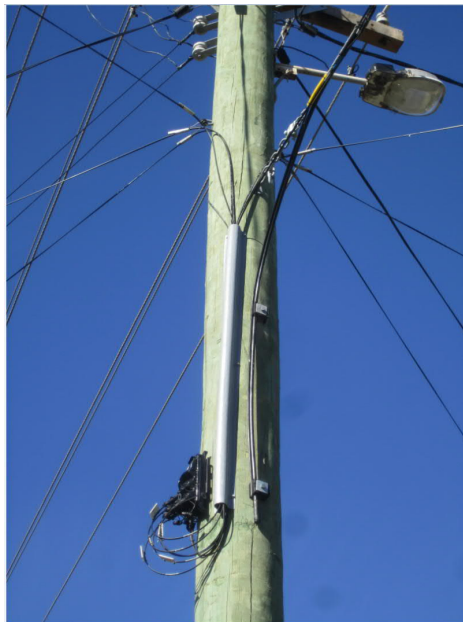
NBN Co Fibre Cable

NBN Co self supporting Fibre to the Premise network yellow cable marker. Smaller markers may be used on most attachment points to poles



NBN Co LSS 144 Fibre cable above an Optus Coaxial Cable.

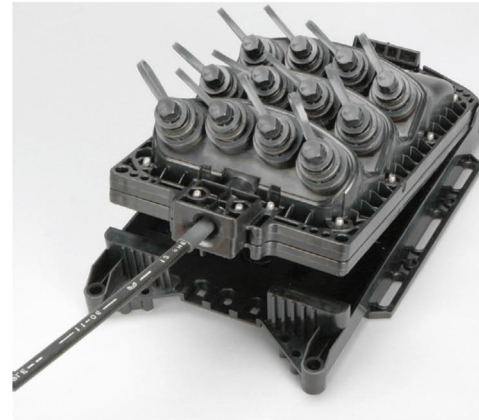
Trace the cable back to a mains pole to determine ownership at a road crossing pole.



NBN Co Multiport, MSS 12 Fibre cable and several 1 Fibre drop cables.

The Multiport is attached lower on the pole for test and connect / disconnect.

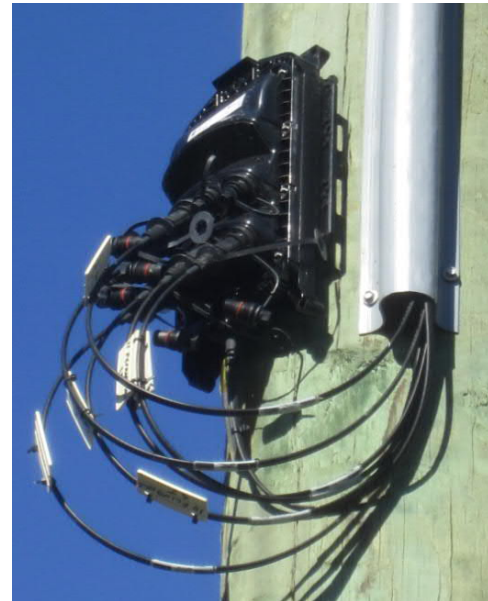
The 144 Fibre MSS cable ends at this pole



NBN Co 12 port Multiport, (Termination box).

2, 4 and 8 ports are available.

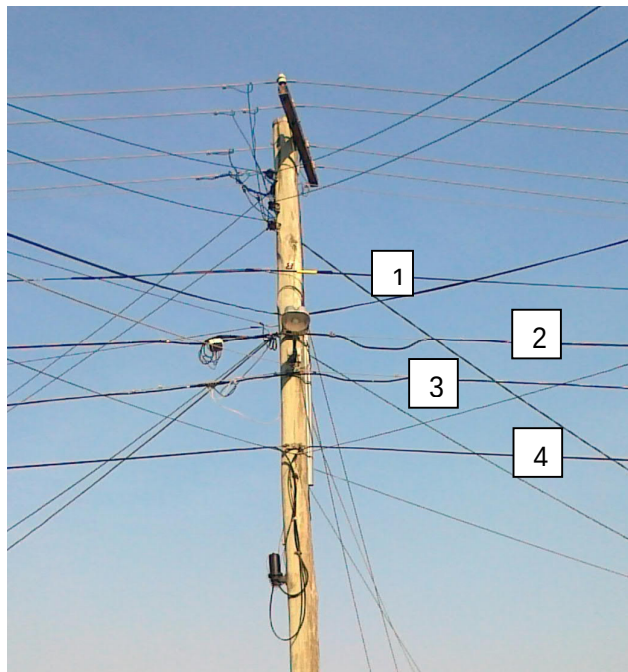
Spare MSS Fibre cable may be wrapped closely around the multiport.



NBN Co Multiport, MSS 12 Fibre cable and drop several 1 Fibre cables.

NBN Co Multiports (Termination box) are mounted on most poles of the NBN Co's Fibre to the Premise network.

All Major Telco Cables



In order from Top to bottom under Endeavour Energy's Conductors are: (Not all are attached at every pole).

1. NBN Co Fibre cable self supporting. It can be as close as 500mm below the LV.
2. Optus Coax cable (sometimes Fibre also) lashed to steel strand;
3. Telstra Coax cable lashed to steel strand; and
4. Telstra Telephone cable (PSTN) self supporting.

Fibre cable does not have sharp bends.

Coax cable often has bends (down and up) as shown on either side of the pole, (to allow for cable expansion and contraction).

Telstra PSTN cable is multiple pair copper cable with various numbers of pairs and different types of internal catenary.

Our records must also include steel strand without other cables lashed to it.

Different types of installation are used:

1. Isolated where the cable is on one pole and or a road crossing pole to connect to customers:
This applies to NBN Fibre to home; Telstra and NBN PSTN and Telstra, Optus and NBN Coax.
2. Under our mains where a main cable is run along the street and tees off to road crossing poles. It connects to customers from most poles. This applies to NBN & Optus fibre; Telstra, and NBN PSTN and Telstra, Optus & NBN Coax.
3. Under our mains where the main cable is a Transit link or trunk cable run along the street with nil or few connections to customers

Definitions:

- Drop means a service to a customer.
- LSS means an NBN 144 fibre Local Service Cable.
- MSS means NBN 12 Multiport Service Cable.
- PSTN means Public Switched telephone Network.
- Riser means UG/OH. All Telco risers must be recorded.

Notes:

Telstra assets will be transferred to NBN Co or removed, except for riser conduits which Telstra may continue to own.

Telstra assets transferred to NBN Co may not be marked to indicate the change of ownership.