# Network Standard

Document No.
NS145

Title:
Asset Inspection – Overhead Lines and Poles

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| Technical Approver | | Authorised By | | | |
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Revision

| No | Date | Description | Technical Approver | Authorised By |
|---|---|---|---|---|
| **0** | 7/07/2015 | Description. | Bill Woods | Chief Engineer |
| **1** | 24/09/2015 | Inclusion of a new section on General Health and Safety precautions as an outcome from a safety incident. New note included in Clause 6.2.7.1 clarifying the use of grey plugs. New qualification requirements for personnel applying pesticides around poles have been included in Clause 6.4.1 and 6.4.2. Minor changes in Annexure A1 to the date ranges for pole discs in Ausgrid area. Annexure M updated.ve been included in Clause 6.4.1 and 6.4.2. Minor changes in Annexure A1to the date ranges for pole discs in Ausgrid area. Annexure M updated. Inclusion of a new section on General Health and Safety precautions as an outcome from a safety incident. New note included in Clause 6.2.7.1 clarifying the use of grey plugs. New qualification requirements for personnel applying pesticides around poles ha | Jeffrey Ma | David Wilkinson |
| **2** | 23/02/2016 | Reference standard changed from AS3838.11 to AS3818.11 in Annexure A1. | Lal Gunatilleke | Bill Woods |
| **3** | 31/08/2017 | Conversion to a corrective maintenance standard. Information included on Glyptoterme Sp termites and strength loss due to test holes. Information updated to support EPA compliance. General health and safety precautions updated as an outcome from a safety incident. Alignment of termite treatment procedures to product labelling incident. Alignment of termite treatment procedures to product labelling. | Bill Woods | David Wilkinson |
| **4** | 17/03/2020 | Update to the defect prioritisation CAT ratings. | Duminda Thenuwara | Peter Gaudron |
| **5** | 5/08/2020 | Inclusion of a new clause on Defect re-prioritisation. Figure 13.2 updated. Change in manufacturers of the dust termiticide and associated equipment. | Duminda Thenuwara | Peter Gaudron |
| **6** | 7/02/2022 | Amendment to voltage detector application. | Duminda Thenuwara | Mark Ragusa |
| **7** | 12/08/2025 | Conversion to Network Standard template and revised title. Comprehensive updating of serviceability criteria and Annexures. Revised steel condition rating criteria. Added requirement to assess wall thickness of steel rag-bolt poles, internal inspection of steel poles with inspection holes and revised steel pole below ground inspection procedure. Added requirement to excavate ground anchors when corrosion is evident. Revised method for sounding of timber poles. Added information regarding new timber pole reinforcements, fire mesh, insulating spigots and aerial warning markers in Annexure B. Requirements from NS166 Routine Overhead Line Inspection consolidated into this Network Standard for combined inspection including external defect photos. Revised Pesticide Regulation Exemption Order (to the 2022 Exemption Order in Annexure O). Revised below ground inspection clearance distances for cutting of paving / concrete in Annexure U. Removed 'permissible maintenance holes' criteria. Annexure M (external annexure) is now Annexure X. | Greg Ross | Jacob Bayley |

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## List of Annexures

## Scope

This Network Standard outlines the requirements for the overhead line inspection process (previously detailed in NS166 Routine Overhead Line Inspection) and the inspection and treatment process for poles owned by Ausgrid or maintained by Ausgrid and are aligned with the 'combined' inspection requirements of Ausgrid Maintenance Standard OH0105. This Network Standard also outlines the serviceability criteria for poles. Pole types include timber poles, reinforced poles, concrete poles, steel poles, a variety of composite poles, lighting standards, lightning masts and posts supporting water crossing signs. Private poles installed under Rural Subsidy Schemes are included in the scope of this document. Relevant tasks from this Standard may be substituted by performing Non-Destructive Evaluation (NDE) of timber poles.

The primary objectives of this document are to:

- Ensure a consistent approach to the inspection of overhead lines.
- Ensure a consistent approach for the inspection and preservative treatment of poles.
- Ensure a consistent approach for the treatment of termites in timber poles or corrosion of steel poles.
- Provide the serviceability criteria for those poles.

This standard does not include requirements for overhead lines or poles which are not owned by Ausgrid (e.g. for private mains and private poles as detailed in Network Standard NS262 and common-use poles) or steel towers – these are excluded from the requirements of this document and shall not be inspected or treated, unless detailed in other Network Standards, Maintenance Standards or contract documentation.

## Reference Documents

All work covered in this document shall conform to all relevant Legislation, Standards, Codes of Practice and Network Standards.

## Ausgrid Documents

EG 210 Pesticides

Electrical Safety Rules

NS001 Glossary of Terms

NS128 Pole Installation and Removal

NS174 Environmental Procedures

NS211 Working with Asbestos

NEG_EP05 Entry to Private Property

NEG SE09 Management of CCA Impregnated Wood - Including Burning / Fire Damaged CCA Poles

T0150 Bushfire Mesh Pole Wraps

## Other Standards and Documents

ENA Doc 001-2019 National Electricity Network Safety Code

## Acts and Regulations

Electricity Supply (General) Regulation 2014 (NSW)

Electricity Supply (Safety and Network Management) Regulation 2014

Pesticides Regulation 2017

Work Health and Safety Act 2011

Work health and Safety Regulation 2017

Pesticides Regulation 2017 Electricity Pole Inspection Licence Exemption Order December 2022 ('Pesticides Regulation 2022 Exemption Order')

| Clause | Standard Requirements |
|---|---|

## 1 General

### 1.1 Network Technical Maintenance Plans

1.1.1 Ausgrid's Network Technical Maintenance Plan (NTMP) includes Maintenance Standard OH0105 for asset inspections on overhead lines and the various types of poles in operation. The NTMP and Maintenance Standard OH0105 provide a detailed description of the required maintenance activities and the frequency of these asset inspections.

1.1.2 An 'asset inspection' includes the combined routine inspection of the overhead line and the pole, the preservative treatment of timber poles, as well as corrective treatments for termites identified in timber poles or corrosion found on steel poles.

1.1.3 Notifications for asset inspections are issued from SAP according to the NTMP and identify whether an asset inspection in accordance with this Network Standard is required;

- only for the overhead line and the above ground portions of the pole, or
- for the overhead lines, the above ground portions of the pole and the below ground sections of the pole.

1.1.4 Poles which have been identified for above ground inspection only in the SAP notification shall also be inspected below ground according to the criteria in this Network Standard when the above ground inspection indicates that a defect affecting the strength of the pole extends, or may be present, below groundline.

1.1.5 Maintenance Standard OH0105 shall be implemented according to the requirements of this standard.

### 1.2 Training and authorisation

1.2.1 Asset inspections shall only be performed by persons who have successfully completed all of the following courses and are authorised by Ausgrid to undertake the inspection tasks.

- UET20621 Certificate II 'ESI – Asset Inspection and Testing' (relevant modules), and
- M1425 Asset Inspection, and
- TTDO1374 Introduction to Overhead Lines, and
- TTDO1375 Routine Overhead Lines, and
- TTDO1506 Height Measurement using Telescopic Operating and Measuring Sticks.

1.2.2 Inspections of fire damaged Copper Chrome Arsenate (CCA) poles shall only be performed by persons who have successfully completed the Ausgrid Handling of Burnt and Burning CCA Poles Course M1425 and are authorised by Ausgrid to undertake the inspection tasks. Asset Inspectors shall not inspect poles which are burning or smouldering.

1.2.3 Pesticides shall only be applied by persons who have successfully completed the Pesticide Application Training according to the Pesticides Regulation 2022 Exemption Order, known as the Electricity Pole Inspection Licence Exemption Order (refer to Annexure O) and are authorised by Ausgrid to apply pesticides.

1.2.4 Asset Inspectors and all persons performing pesticide application shall carry evidence of their prescribed qualifications and its currency.

1.2.5 Only Authorised Officers with Certificates of Authority issued by Ausgrid are permitted to enter customer premises. The requirements for entering customer premises are outlined in NEG_EP05.

## 2 Costs and Recording

### 2.1 Costs

2.1.1 Costs shall be captured against each asset by asset and activity type e.g. woods poles inspection or treatment.

### 2.2 Asset Inspection Recording

2.2.1 Asset Inspectors shall use a Mobile Asset Management device (MAM device) approved by Ausgrid.

2.2.2 On the MAM device the Asset Inspector at each location shall:

- review and update the master data (refer to Clause D2.3), and
- enter all inspection details, and
- record identified defects on the overhead line and the pole, and defective poles according to Clause 2.5.

2.2.3 Synchronising of the device shall occur at the end of each working day, except when the pole is required to be immediately reported as specified in this Network Standard, in which case the device shall be synchronised from the site.

### 2.3 Recording Pole Disc or Metal ID Plate Information

2.3.1 The Asset Inspector shall ensure all the information on the pole disc or metal ID plate is recorded (refer to Annexure B).

2.3.2 The height of the pole disc or metal ID plate above groundline shall also be recorded.

### 2.4 Notification and Recording of Pesticide Use

2.4.1 Notification of the use of pesticides shall be performed according to EG 210.

2.4.2 A 'Termite Treatment Report Form' (refer to Annexure W) shall be submitted for any pole that is found to have active termites in it and/or has been treated. Data shall be entered into SAP / MAM device, by the Asset Inspection Service Provider.

2.4.3 Pesticides used for the control of fungal activity shall be recorded on the ‘Termite Treatment Report Form’. Data shall be entered into SAP / MAM device, by the Asset Inspection Service Provider.

2.4.4 The ‘Termite Treatment Report Form’ shall be attached to the SAP notification and updated on each application of the termite treatment.

2.4.5 Pesticide records shall be kept for the period of time as defined in EG210.

### 2.5 Recording Defects

2.5.1 Overhead line defects shall be recorded as notifications in the MAM device and according to the Ausgrid Defect Catalogue.

2.5.2 A 'Defective Pole Action' (DPA) sheet or a ‘Head Of Pole Action’ (HPA) sheet (refer to Annexure W) shall be submitted to the nominated Ausgrid representative for any pole that is identified as defective. All poles required to be immediately reported to Ausgrid will require the DPA or HPA sheet to be received by Ausgrid by the close of business on the same day as the defect was found.

2.5.3 The DPA or HPA sheet shall be attached to the SAP notification by the end of the next business day.

#### 2.5.4 Defect photographs

2.5.5 Overhead line and pole defects shall be recorded (photographed) according to the inspection finalisation procedures detailed in this Standard using a digital camera with optical zoom capable of resolving 800 pixels (minimum) across the head of a pole when standing at the distance and angle required to review the relevant component or defect.

2.5.6 Photographs shall be uploaded to the nominated location by the end of the next business day.

## 3 Safety and Environmental Precautions

### 3.1 Safety Precautions

3.1.1 Asset inspectors shall implement safety precautions according to Annexure A prior to commencing the asset inspection including:

- Visual examination for physical or electrical hazards and testing of the pole for the presence of hazardous voltages, and
- Visual assessment of the pole stability, or threats to pole stability.

3.1.2 Asset Inspectors shall immediately report dangerous electrical safety hazards or dangerous pole hazards to the nominated Ausgrid representative, or to Ausgrid's Emergency Line (13 13 88) when the nominated representative is unavailable.

3.1.3 Asset Inspectors shall then safeguard themselves and others against unsafe exposure to these hazards until the it has been removed or Ausgrid staff attend to remove the hazard, or as agreed with the nominated Ausgrid representative.

### 3.2 Environmental Precautions

3.2.1 Asset Inspectors shall implement environmental precautions (including those for pesticide use) according to Annexure A when performing pole treatment.

## 4 Inspection Requirements – Overhead Lines

### 4.1 General Requirements

4.1.1 Overhead line inspection shall be performed on all overhead lines to identify degraded or damaged components which currently pose hazards to people or the environment, or which may be reasonably expected to pose hazards within the period to the next inspection.

4.1.2 Overhead line inspection may be performed in conjunction with (that is, overlapping with) the implementation of safety precautions or with the above ground inspection of poles.

4.1.3 Overhead line inspection shall be performed from ground level or with other effective techniques which do not require climbing of the pole.

4.1.4 Asset details shall be verified against Ausgrid Asset Management System records according to Clause D2.3 including, but not limited to, verification of the following;

- Asset numbers / labels (for examples, pole numbers, switch numbers, feeder labels, other identifying labels) and their condition, legibility or presence where required.
- Ownership (for example, by Ausgrid, another authority or privately).

4.1.5 Corrosion of steel components shall be assessed against the Mueller steel condition rating criteria in Clause 6.5.

### 4.2 Pole access

4.2.1 Access routes (including access tracks, paths, rights of way and easements) shall be inspected enroute to the overhead line and pole to be inspected.

4.2.2 The following tasks shall be performed during the inspection of access routes and associated infrastructure while enroute to the asset to be inspected (refer to Clause D2.2):

- Inspection for defects, damage or obstructions to access.
- Check security of Ausgrid access gates, fences and locks.

### 4.3 Overhead Lines

4.3.1 Overhead lines (including conductors, service mains, overhead earth wires, crossarms, insulators, fittings, connections, bonds / tails / jumpers, accessories and terminations) shall be inspected over their entire length between all structures or terminations.

4.3.2 The following tasks shall be performed during the inspection of overhead lines (refer to Clause D2.3):

- Inspection for overhead line defects, damage, foreign objects and obsolete / redundant construction.
- Assessment for adequate clearances from each conductor to other conductors in the same span/bay and at all circuit crossings, and from each conductor to the ground, trees / vegetation, buildings, fences and other structures.

- Measurement of reduced clearances where reasonably practicable. Record the measurement for the reduced clearance.

## 4.4 Pole-mounted plant

4.4.1 All components of pole-mounted plant (including UGOH arrangements, transformers, regulators, reclosers, enclosed switches, capacitors, batteries, switchgear and streetlights) shall be inspected.

4.4.2 The following tasks shall be performed during the inspection of pole-mounted plant (refer to Clause D2.3):

- Inspection for pole-mounted plant defects, damage, foreign objects and obsolete / redundant construction.
- Inspection of operating mechanisms, control panels, indicators or relays associated with the pole-mounted plant for defects, damage, foreign objects and obsolete / redundant construction.

## 4.5 Earthing arrangements

4.5.1 All components of earthing arrangements (including downleads, earth bars, stand-off insulators, connections, battens / covers) shall be inspected. Battens or covers shall not be removed to perform the inspection.

4.5.2 The following tasks shall be performed during the inspection of earthing arrangements (refer to Clause D2.3):

- Inspection for earthing arrangements defects, damage, foreign objects and obsolete / redundant construction.
- Reporting of severed or missing earth downleads / components immediately to the nominated Ausgrid representative or Ausgrid's Emergency Line (13 13 88) when the nominated Ausgrid representative cannot be contacted.

  Note: Asset Inspectors shall not attempt to repair loose, broken or damaged earth system components as full phase to earth voltages may be present.

## 4.6 Warning signage and markers

4.6.1 All warning signage and warning markers (including aircraft warning marker balls / discs, antenna / RF warnings, 'Danger' signs and water crossing signs) shall be inspected.

4.6.2 The following tasks shall be performed during the inspection of warning signage and warning markers (refer to Clause D2.3):

- Inspection for defects, damage, foreign objects, proper alignment, obstructions restricting sighting of the warning sign, legibility and obsolete / redundant construction.
- Record water crossing signs 'as found'.
- Inspection for exposed cables in the vicinity of submarine cable water crossing signs.

## 4.7 Third-party pole attachments and climbing risks

4.7.1 All pole attachments owned by third parties (including communications cables, service UGOH's, antennas owned by communications companies, signs and banners, special small services, traffic signals, street signs, Council-operated security cameras) shall be inspected.

4.7.2 The following tasks shall be performed during the inspection of third-party pole attachments (refer to Clause D2.3):

- Inspection for defects, damage or foreign objects which may result in clearance encroachments to Ausgrid assets, or which may pose a risk to Ausgrid workers or the public.
- Assessment of whether the attachment is an unauthorised attachment. Contact the nominated Ausgrid representative where doubt exists.

  **Note:** unauthorised attachments include advertisements, political placards, basketball rings, personal security cameras, personal antennas.

- Assessment of whether any attachment, fitting, or tree / structure within the vicinity of the pole may facilitate unauthorised access to the pole or overhead line.

### 4.8 Inspection finalisation

4.8.1 Finalise the inspection according to Clause D3.

4.8.2 Report immediately dangerous risks to the nominated Ausgrid representative or Ausgrid's Emergency Line (13 13 88) when the nominated Ausgrid representative cannot be contacted.

## 5 Inspection Requirements – Timber Poles (including Reinforced and Composite Types)

### 5.1 General Requirements

5.1.1 Above ground inspections shall be performed on all timber poles.

5.1.2 Below ground inspection and treatment shall be performed on all timber poles according to Clause 1.1.3 except for the following:

- Poles which are not Copper Chrome Arsenate (CCA) treated and are less than 5 years old (based on the pole disc date), or
- Poles which are CCA treated and are less than 15 years old (based on the pole disc date); or
- Poles under termite treatment at the time of inspection, or
- Poles where active termites are identified during the above ground inspection or partial excavation, or
- Poles previously identified as defective which are attached to a replacement pole or which have active projects for 'Pole-Replace', 'Pole-Reinforce' or 'Pole-Assess' tasks.

5.1.3 Poles which are the exceptions in Clause 5.1.2 shall be inspected below ground under the following circumstances if the pole is not under termite treatment and there are no active termites:

- There is evidence of fungal decay / fruiting bodies, or
- There are open splits or checks greater than 10mm which extend through the groundline, or
- Sounding above groundline indicates a defect within 500mm of groundline, or
- The pole does not have a pole disc indicating its age (refer to Annexure B).

5.1.4 Poles which are CCA treated shall only be internally inspected when;

- The pole is more than 15 years old (based on the pole disc date), or
- The treated timber below groundline is defective, or
- An internal defect is indicated from the external inspection (for example, from sounding).

5.1.5 All unreinforced timber poles which do not meet the serviceable pole criteria according to Clause 5.5 shall be assessed for suitability for reinforcement according to Clause 5.5.4 and Clause 5.5.5.

5.1.6 The following risks shall be immediately reported to the nominated Ausgrid representative;

- Immediately dangerous electrical hazards or pole hazards identified when implementing safety precautions according to Clause 3.1, or
- CAT 1 / Severity 5 defects according to the serviceability criteria in Clause 5.5 and Clause 5.6, or
- Any pole that is potentially unsafe for excavation.

### 5.2 Above Ground Inspection

5.2.1 Above ground inspection shall be performed on all timber poles to assess the condition of the pole and to determine that the pole is safe to excavate prior to performing excavation and below ground inspection.

5.2.2 The following tasks shall be performed prior to commencing the above ground inspection of each pole:

- Visual examination and testing of the pole for the presence of physical hazards according to Annexure A, and
- Visual assessment of the pole stability, or threats to pole stability, according to Annexure A including termites (past or present – refer to Annexure G), fungal decay, damage, reduced ground level or degradation of materials (including the reinforcement and pole head) and pole lean.

5.2.3 The following tasks shall be performed during the above ground inspection of unreinforced timber poles:

- Inspection for defects and termites, and condition assessment of the pole through sounding according to Clause E2.
- Measurement of the original pole diameter $D_0$ according to Clause I2 in the groundline area of the pole. Record the measurement.
- Measurement of the reduced diameter $D_1$ according to Clause I3 at any location above ground where a defect has been detected. Record the measurement.
- Internal assessment of the thickness of sound timber according to Annexure J (if safe to do so) where defects have been identified or are suspected.

5.2.4 The following tasks shall be performed during the above ground inspection of reinforced and composite timber poles:

- Inspection of the pole and reinforcement for defects and termites, and condition assessment of the pole through sounding according to Clause F2.2 for splinted and nailed reinforced timber poles.
- Corrosion assessment of the reinforcement according to Clause 6.5.
- Inspection of the pole and sleeve / caisson for defects and termites, and condition assessment of the pole through sounding according to Clause F3.2 for composite timber poles.
- Measurement of the original pole diameter $D_0$ according to Clause I2 in the groundline area of splinted and nailed reinforced poles or above the sleeve / caisson on composite timber poles. Record the measurement.
- Measurement of the reduced diameter $D_1$ according to Clause I3 at any location where a defect has been detected above ground or above the sleeve / caisson on composite timber poles. Record the measurement.
- Internal assessment of the thickness of sound timber (if safe to do so) adjacent to the reinforced sections of the pole according to Clause F2.2 for splinted and nailed reinforced timber poles (use existing holes where they are accessible).
- Internal assessment of the thickness of sound timber according to Annexure J (if safe to do so) where defects have been identified or are suspected above the reinforcement.

5.2.5 If actives termites are located during the above ground inspection, excavation shall not proceed. Termite treatments shall be applied according to Annexure N.

5.2.6 The internal defect size, minimum wall thickness and residual strength of the pole shall be calculated according to Annexure K.

5.2.7 Assess the pole inspection results against the serviceability criteria in Clause 5.5 for unreinforced timber poles and Clause 5.6 for reinforced timber poles and composite timber poles.

5.2.8 If the pole has been nominated for above ground inspection only in the SAP notification and defects below groundline are not suspected or evident, finalise the pole inspection according to;

- Clause E4 For unreinforced timber poles.
- Clause F2.6 for splinted and nailed reinforced timber poles.

- Clause F3.3 for composite timber poles.

5.2.9 If the pole has been nominated for above ground and below ground inspection in the SAP notification, or if defects below groundline are suspected or evident following the above ground only inspection, proceed to the partial excavation.

5.2.10 The pole shall meet the following criteria before excavation and below ground inspection is performed:

- The calculated above ground residual strength is equal to or greater than 25%, and
- The wall thickness of a reinforced pole is equal to or greater than the minimum wall thickness values in Table 6 or Table 7 (depending on the reinforcement type), and
- Coptotermes species termites have not been located, and
- The pole is not considered to be loaded close to or beyond its structural capacity (indicated by excessive lean or bending of the pole), and
- The pole or reinforcement does not have damage that reduces the structural integrity or stability of the pole or reinforcement, and
- Reinforcing splints, nails and securing bands do not have any steel condition rating of less than or equal to 30% according to Clause 6.5 or folds and pole movement is not evident, and
- Any reduction in pole diameter does not exceed 20% of the original diameter, and
- Pole stability will not be affected by, or suspected to be affected by, excavation of the pole.

5.2.11 If a pole is identified as potentially unsafe to excavate:

- Do not excavate the pole – finalise the pole inspection according to Clause E4, Clause F2.6 or Clause F3.3, and
- Report the potentially unsafe pole immediately to the nominated Ausgrid representative, or to Ausgrid's Emergency Line (13 13 88) when the nominated representative is unavailable.

## 5.3 Partial Excavation

5.3.1 Partial excavation and initial below ground inspection shall only be performed when the above ground inspection indicates that it is safe to proceed (refer to Clause 5.2.10).

5.3.2 Partial excavation and initial below ground inspection shall be performed on unreinforced timber poles and Ausmose Oz C splinted reinforced timber poles prior to performing the full below ground inspection to determine that the pole is safe to fully excavate.

5.3.3 Partial excavation and below ground inspection shall only be performed on other splinted or nailed reinforced timber poles to determine the condition of the reinforcement. Full excavation and below ground inspection is not required.

5.3.4 Partial or full excavation and below ground inspection shall not be performed on composite timber poles.

5.3.5 If actives termites are located during the partial excavation and initial below ground inspection, further excavation shall not proceed. Termite treatments shall be applied according to Annexure N.

5.3.6 The following tasks shall be performed during the partial excavation and initial below ground inspection of unreinforced timber poles:

- Excavation to a depth of 100mm below groundline on one non-load bearing face of the pole (neutral axis – refer to Annexure C), or as close as possible to the neutral axis if drill holes already exist in all suitable areas in the neutral axis or the preferred areas are covered by attachments and / or obstacles.
- Inspection for defects and termites, and condition assessment of the pole through sounding and internal inspection according to Clause E3.2.
- Where identified external defects appear to extend around the circumference beyond the exposed section of the pole, excavate to a depth of 100mm below groundline in the neutral

axis on the opposite side of the pole and repeat the inspection and condition assessment tasks according to Clause E3.2.

- Measurement of the assumed reduced diameter of the pole if one side is excavated, or actual reduced diameter of the pole if both sides are excavated, according to Clause I3 at locations where a diameter reduction has been detected. Record the measurement.
- Internal assessment of the thickness of sound timber according to Annexure J (if safe to do so) at the preferred location or where internal defects have been identified or are suspected.
- Calculate the internal defect size, minimum wall thickness and residual strength of the pole according to Annexure K using the assumed reduced diameter (multiplied by 2) or actual reduced diameter of the pole when it has been measured.

5.3.7 The following tasks shall be performed during the partial excavation and initial below ground inspection of splinted or nailed reinforced timber poles:

- Excavation to a depth of 100mm below groundline in the area adjacent to the splint or nail.
- Inspection for termites and reinforcement defects according to Clause F2.4 for splinted and nailed reinforced poles.
- If corrosion of the splint or nail (excluding Ausmose Oz C splints) extends beyond 100mm below groundline, excavate further in the ground area adjacent to the reinforcement to determine the extent of the defect. The pole shall not be excavated beyond a depth of 350mm below groundline.

5.3.8 Assess the pole inspection results against the serviceability criteria in Clause 5.5 for unreinforced timber poles and Clause 5.6 for splinted or nailed reinforced timber poles.

5.3.9 If a pole is identified as potentially unsafe for full excavation;

- Do not excavate the pole – finalise the pole inspection; and
- Report the potentially unsafe pole immediately to the nominated Ausgrid representative, or to Ausgrid's Emergency Line (13 13 88) when the nominated representative is unavailable.

## 5.4 Full Excavation and Below Ground Inspection

5.4.1 Full excavation and below ground inspection shall only be performed on unreinforced poles and Ausmose Oz C splinted poles when the partial excavation and initial below ground inspection indicates that it is safe to proceed (refer to Clause 5.2.10).

5.4.2 Full excavation and below ground inspection shall not be performed on other reinforced poles or composite timber poles.

5.4.3 If actives termites are located while excavating or during the below ground inspection the inspection shall continue because subterranean galleries have likely been disturbed. Termite treatments shall be applied according to Annexure N.

5.4.4 The following tasks shall be performed during the full excavation and below ground inspection of unreinforced timber poles and Ausmose Oz C splinted poles:

- Excavation to a depth of 350mm below groundline around the full circumference of the pole.
- Inspection for defects and termites, and condition assessment of the pole through sounding and internal inspection according to Clause E3.3 for unreinforced poles, or Clause F2.5 for Ausmose Oz C splinted poles.
- If fungal decay or corrosion extends beyond 350mm below groundline, excavation to a depth of 400mm below groundline to determine the extent of the defect. The pole shall not be excavated beyond a depth of 400mm below groundline.
- Measurement of the reduced diameter $D_1$ according to Clause I3 at locations where a defect has been located. Record the measurement:
- Internal assessment of the thickness of sound timber according to Annexure J (if safe to do so) where defects have been identified or are suspected.

5.4.5 Finalise the pole inspection according to;

- Clause E4 For unreinforced timber poles.
- Clause F2.6 for splinted and nailed reinforced timber poles.
- Clause F3.3 for composite timber poles.

## 5.5 Serviceability Criteria - Unreinforced Timber Poles

5.5.1 Pole inspection results for unreinforced timber poles shall be assessed against the serviceability criteria in Table 1, Table 2 and Table 3 to determine whether the pole remains serviceable or corrective action is required.

5.5.2 Reinforcement or replacement of a 'dimensionally' serviceable pole may be justified following a subjective assessment by the nominated Ausgrid representative that a pole is incapable of lasting another inspection cycle. Details of the assessment and reason(s) for reinforcement or replacement and revised priority shall be included in both the pole assess and pole replacement notifications.

**Table 1 – Serviceability Criteria for All Timber Poles**

| Inspection outcome | Required Action | Priority / Severity |
|---|---|---|
| **Leaning or bending more than 10°, is an immediate risk to people or the environment and is either:**<br>• **leaning over the carriageway of a road,**<br>• **supporting a transformer or voltage regulators,**<br>• **causing low mains clearances to ground or vehicles,**<br>• **causing reduced mains clearances to buildings or structures,**<br>• **moving significantly within the ground.** | Remediate through repair, reinforcing or replacement. | CAT 1<br>Severity 5<br>(48 hrs) |
| **Leaning or bending more than 10° but does not meet the criteria above for Severity 5.** | Remediate through repair, reinforcing or replacement. | CAT 4<br>Severity 1<br>(< 2 years) |
| **Pole head split greater than 10mm wide at any point which extends through the full diameter of (or near) the centre of the pole in line with attachment bolts and extends to attachment bolts and bolts are loose or pulling through the pole.** | Replace pole. | CAT 2<br>Severity 4<br>(< 1 month) |
| **Pole head split greater than 10mm wide at any point which extends through the full diameter of (or near) the centre of the pole in line with attachment bolts and extends to attachment bolts but bolts are not loose or pulling through the pole.** | Replace pole. | CAT 4<br>Severity 1<br>(< 2 years) |
| **Pole head split greater than 10mm wide at any point which extends through the full diameter of (or near) the centre of the pole at approximately right angle to attachment bolts and extends more than 300mm past attachment bolts** | Replace pole. | CAT 3<br>Severity 2<br>(< 12 mths) |

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| **Pole head has multiple splits greater than 5mm wide which extend through the full diameter of the pole and which extend to attachment bolts** | Replace pole. | CAT 3<br>Severity 2<br>(< 12 mths) |
| **Pole head split less than 10mm wide which does not extend through the full diameter of (or near) the centre of the pole and does not extend past attachment bolts.** | Complete required maintenance. | Not defective |
| **Fire or vehicle damage to any pole has reduced the pole diameter by 20% or greater.** | Immediately remediate burnt CCA poles through wrapping. Replace pole. | CAT 1<br>Severity 5<br>(48 hrs) |
| **Fire damage to a CCA pole has charred the pole but not penetrated the sap wood.** | Immediately remediate burnt CCA poles through wrapping. Pressure clean pole. | CAT 2<br>Severity 3<br>(< 3 month) |
| **Fire or vehicle damage to any pole has penetrated sap wood but has not reduced the pole diameter by 20% or greater.** | Immediately remediate burnt CCA poles through wrapping. Assess for suitability to reinforce if required (Table 4) or replace pole. | CAT 4<br>Severity 1<br>(< 2 years) |
| **Asbestos paint** | Replace pole using asbestos removal procedures. | CAT 2<br>Severity 4<br>(< 1 month) |

**Table 2 – Serviceability Criteria for Unreinforced Timber Poles**

| Inspection outcome | Required Action | Priority / Severity |
|---|---|---|
| **Residual strength is less than or equal to 25%.** | Assess immediately for suitability to reinforce (Table 4). Replace if unsuitable to reinforce. | CAT 1<br>Severity 5<br>(48 hrs) |
| **Residual strength is greater than 25% and less than or equal to 40%.** | Assess immediately for suitability to reinforce (Table 4). Replace if unsuitable to reinforce. | CAT 2<br>Severity 3<br>(< 3 month) |
| **Residual strength is greater than 40% and less than 50%.** | Assess immediately for suitability to reinforce (Table 4). Replace if unsuitable to reinforce. | CAT 3<br>Severity 2<br>(< 12 mths) |
| **Minimum wall thickness is less than the criteria in Table 3.** | Assess immediately for suitability to reinforce (Table 4). Replace if unsuitable to reinforce. | CAT 2<br>Severity 3<br>(< 3 month) |
| **None of the criteria above are met.** | Complete required maintenance. | Not defective |

5.5.3 The criteria for the minimum wall thickness for unreinforced timber poles is shown in Table 3.

**Table 3 – Minimum Wall Thickness for Unreinforced Timber poles**

| Pole Diameter (mm) | Minimum Wall Thickness (mm) |
|---|---|
| **$D_0 \leq 350$** | 35 |
| **$D_0 > 350$ and $\leq 550$** | 45 |
| **$D_0 > 550$** | 60 |

Where $D_0$ is the original pole diameter measured according to Clause I2.

5.5.4 Timber poles which do not meet the serviceable pole criteria in Table 1, Table 2 and Table 3 shall have their minimum wall thickness assessed against the criteria in Table 4 to determine their suitability for reinforcing. Timber poles shall only be reinforced if the minimum wall thickness of the pole in the vicinity of reinforcement securing bolts or bands (typically at 200mm, 800mm and 1 metre above groundline, or at 200mm above groundline and 50mm above and below the top securing bands for longer reinforcements) meets or exceeds these values, except in emergency situations where it is necessary to manage immediate risks.

**Table 4 – Minimum Wall Thickness Above Groundline for Reinforcing Timber Poles Using a PFA Genus Powerbeam**

| Powerbeam Type | Pole Diameter (mm) | Minimum Wall Thickness (mm) for Bolting | Minimum Wall Thickness (mm) for Strapping |
|---|---|---|---|
| **Micro** | 180 - 300 | Cannot be bolted | 35 |
| **Mini** | 240 - 400 | 45 | 40 |
| **Small** | 260 - 500 | 55 | 55 |
| **Large** | 280 - 600 | 80 | 65 |

5.5.5 Timber poles being assessed for their suitability for reinforcing shall also meet all of the following criteria, except in emergency situations where it is necessary to manage immediate risks:

- The size of the internal defect shall not increase further up the pole, and
- Any active termites in the pole at the time of reinforcement shall be treated[1], and
- The portion of the pole above the reinforcement shall not have immediately dangerous defects reported, and
- The installation of the reinforcement shall not create electrical safety risks (including the anti-climbing measures detailed in NS128), and
- A pole that would normally be climbed for switching purposes shall be readily accessible from an Elevated Work Platform, and
- The pole shall not have below ground baulks, and
- The pole shall not be located in swamp or tidal areas, and
- For burnt CCA poles, all burnt material shall be removed and the minimum wall thickness in the vicinity of reinforcement securing bolts or bands shall meet or exceed the values in Table 4 (refer to Annexure L for further information on fire-damaged or burning CCA poles).

5.5.6 Timber poles which do not meet the criteria for reinforcing in Clause 5.5.4 and Clause 5.5.5 shall be replaced.

[1] A re-assessment of the pole serviceability according to Table 4 must be validated after a successful termite treatment.

## 5.6 Serviceability Criteria - Reinforced and Composite Timber Poles

5.6.1 Pole inspection results for reinforced and composite timber poles shall be assessed against the serviceability criteria in Table 1 in Clause 5.5, Table 5, Table 6 and Table 7 to determine whether the pole remains serviceable or corrective action is required.

**Table 5 – Serviceability Criteria for Reinforced Timber Poles**

| Inspection outcome | Required Action | Priority / Severity |
|---|---|---|
| **Residual strength above the reinforcement is less than or equal to 25%.** | Replace pole. | CAT 1<br>Severity 5<br>(48 hrs) |
| **Residual strength above the reinforcement is greater than 25% and less than or equal to 40%.** | Replace pole. | CAT 3<br>Severity 3<br>(< 3 month) |
| **Residual strength above the reinforcement is greater than 40% and less than or equal to 50%.** | Replace pole. | CAT 3<br>Severity 2<br>(< 12 mths) |
| **Minimum wall thickness above the reinforcement is less than that specified in Table 3.** | Replace pole. | CAT 2<br>Severity 3<br>(< 3 month) |
| **Ausmose Oz C splinted pole residual strength below ground is less than 25% and either of the following situations will be created if pole head movement occurs because of below ground timber failure;**<br>• **pole leaning over the carriageway of a road,**<br>• **low mains clearances to ground or vehicles,**<br>• **reduced mains clearances to buildings or structures.** | Replace pole. | CAT 1<br>Severity 5<br>(48 hrs) |
| **Minimum wall thickness adjacent to the reinforcement is less than 30mm (less than 20mm for a double C-Truss).** | Replace pole. | CAT 1<br>Severity 5<br>(48 hrs) |
| **Minimum wall thickness adjacent to the reinforcement is greater than 30mm (20 mm for double C-truss) but less than that specified in Table 6 or Table 7.** | Replace pole. | CAT 2<br>Severity 3<br>(< 3 month) |
| **Reinforcement steel condition rating of less than or equal to 30% according to Clause 6.5 over more than 25% of the steel cross-section at any height.** | Replace pole. | CAT 2<br>Severity 4<br>(< 1 month) |
| **Reinforcement steel condition rating of 30% to 60% according to Clause 6.5 over more than 25% of the steel cross-section at any height.** | Replace pole. | CAT 3<br>Severity 2<br>(< 12 mths) |

| | | |
|---|---|---|
| **Any securing band or bolt steel condition rating less than or equal to 70% according to Clause 6.5 or securing band is missing or loose.** | Repair bands or bolts where feasible or replace pole. | CAT 3<br>Severity 2<br>(< 12 mths) |
| **Composite timber pole internal defect greater than half the diameter of the pole inside or immediately above the caisson and the wall thickness is less than 40mm.** | Replace pole. | CAT 1<br>Severity 5<br>(48 hrs) |
| **Evidence of fungal decay or active termites inside or immediately above the caisson of a composite timber pole.** | Replace pole. | CAT 1<br>Severity 5<br>(48 hrs) |
| **Internal defect greater than half the diameter of the pole inside or immediately above the caisson of a composite timber pole.** | Replace pole. | CAT 2<br>Severity 3<br>(< 3 month) |
| **None of the criteria above are met.** | Complete required maintenance. Replace Oz C splinted poles and composite timber poles. | CAT 4<br>Severity 1<br>(< 2 years) |

**Table 6 – Minimum Wall Thickness Above Groundline for Splinted Reinforced Timber Poles**

| Splint Type | Pole Diameter (mm) | Height Above Groundline | | |
|---|---|---|---|---|
| | | 200mm | 800mm or 50mm below top bands | 1000mm or 50mm above top bands |
| **C-Truss (single)** | Any | 50mm (at G/L) | 50mm | 50mm |
| **C-Truss (double)** | Any | 25mm (at G/L) | 25mm | 25mm |
| **Powerbeam Micro** | 180 - 300 | 30mm | 30mm | 30mm |
| **Powerbeam Mini** | 240 - 400 | 35mm | 35mm | 35mm |
| **Powerbeam Small** | 260 - 500 | 50mm | 50mm | 50mm |
| **Powerbeam Large** | 280 - 600 | 60mm | 60mm | 60mm |
| **Oz C** | < 300 | 28mm | 40mm | 40mm |
| **Oz C** | 300 - < 400 | 34mm | 50mm | 50mm |
| **Oz C** | 400 - < 500 | 40mm | 60mm | 60mm |
| **Oz C** | 500 - < 600 | 46mm | 70mm | 70mm |
| **Oz C** | => 600 | 52mm | 80mm | 80mm |

**Table 7 – Minimum Wall Thickness Above Groundline for Nailed Reinforced Timber Poles**

| Nail Type | Pole Diameter (mm) | Height Above Groundline | | |
|---|---|---|---|---|
| | | 200mm | 800mm | 1000mm |
| **RFD Nail** | Any | 30mm | 60mm | 60mm |
| **Powerbeam Micro** | 180 - 300 | N/A | N/A | N/A |

| | | | | |
|---|---|---|---|---|
| **Powerbeam Mini** | 240 - 400 | 40mm | 40mm | 40mm |
| **Powerbeam Small** | 260 - 500 | 50mm | 50mm | 50mm |
| **Powerbeam Large** | 280 - 600 | 75mm | 75mm | 75mm |

# 6 Inspection Requirements – Steel Poles, Standards and Columns

## 6.1 General Requirements

6.1.1 Above ground inspections shall be performed on all steel poles, standards and columns.

6.1.2 Below ground inspections shall be performed on all steel poles, standards and columns according to Clause 1.1 except for the following:

- Direct buried steel poles or standards which comply with the Ausgrid steel pole specification and are less than 15 years old (based on commissioning date), or
- Rag-bolt or pile mounted steel poles and standards where the mounting bolts have not been buried below groundline; or
- Any poles with perforations or folds evident above groundline, or
- Poles previously identified as defective which have active projects for 'Pole-Replace', 'Pole-Reinforce' or 'Pole-Assess' tasks.

6.1.3 Steel lightning masts and lighting poles, standards or columns in substation yards shall be inspected in a similar manner to other direct buried or rag bolt / pile mounted steel poles, standards or columns.

6.1.4 Steel poles, standards and columns shall not be reinforced, except for direct buried 6.5m ‘water pipe’ columns.

6.1.5 Direct buried 6.5m ‘water pipe’ columns shall be assessed for suitability for reinforcement (sleeving) according to the serviceability criteria in Table 10 and shall not be reinforced if the portion of the pole above the sleeve has immediately dangerous defects, except for emergency situations where it is necessary to manage immediate risks.

6.1.1 The following risks shall be immediately reported to the nominated Ausgrid representative, or to Ausgrid’s Emergency Line (13 13 88) when the nominated representative is unavailable;

- Immediately dangerous electrical hazards or pole hazards identified when implementing safety precautions according to Clause 3.1, or
- Poles, standards or columns assessed as possessing CAT 1 / Severity 5 defects according to the serviceability criteria in Clause 6.6, or
- The pole, standard or column is potentially unsafe for excavation.

## 6.2 Above Ground Inspection

6.2.1 Above ground inspection shall be performed on all steel poles, standards and columns to assess their condition and to determine that the pole, standard or column is safe to excavate prior to performing excavation and below ground inspection.

6.2.2 The following tasks shall be performed prior to commencing the above ground inspection of each pole, standard or column:

- Visual examination and testing for the presence of physical hazards according to Annexure A, and
- Visual assessment of its stability, or threats to pole stability, according to Annexure A including damage, corrosion (particularly perforations), dents or folds, reduced ground level, and pole lean.

6.2.3 The following tasks shall be performed during the above ground inspection of direct buried steel poles or standards (excluding 6.5m ‘water pipe’ columns):

- Inspection for defects and condition assessment of the pole or standard through sounding according to Clause Q2.2.
- Corrosion assessment according to Clause 6.5.
- Measurement of the nominal (original) wall thickness 300mm above groundline and at any other location above ground where a defect has been detected. Record the measurements.
- Calculation of the average nominal wall thickness and residual strength of direct buried poles or standards according to Clause Q5.

6.2.4 The following tasks shall be performed during the above ground inspection of direct buried 6.5m 'water pipe' columns:

- Inspection for column defects and sleeve defects (where installed), and condition assessment of the column through sounding according to Clause Q3.2.
- Corrosion assessment according to Clause 6.5.

6.2.5 The following tasks shall be performed during the above ground inspection of rag-bolt or pile mounted steel poles and standards:

- Inspection for pole or standard defects and rag-bolt or pile mounting defects, and condition assessment of the pole or standard through sounding according to Clause Q4.2.
- Corrosion assessment according to Clause 6.5.
- Check of securing nut tightness and replacement of missing nuts.
- Removal of surrounding materials covering the base plate or rag-bolt components (where required).
- Re-grouting of the baseplate (where required).

6.2.6 If the pole, standard or column has been nominated for above ground inspection only in the SAP notification and defects below groundline are not suspected or evident, finalise the pole inspection according to;

- Clause Q2.6 for direct buried poles and standards.
- Clause Q3.6 for 6.5m waterpipe columns.
- Clause Q4.3 for rag-bolt or pile mounted steel poles and standards.

6.2.7 If the pole, standard or column has been nominated for above ground and below ground inspection in the SAP notification, or if defects below groundline are suspected or evident following the above ground only inspection, proceed to the partial excavation.

6.2.8 The pole, standard or column shall meet the following criteria before excavation and below ground inspection is performed:

- The calculated residual strength of a pole or standard is equal to or greater than 50%, and
- The pole, standard or column is not considered to be loaded close to or beyond its structural capacity (indicated by excessive lean or bending of the pole), and
- The pole, standard or column does not have any steel with a condition rating of less than or equal to 30% according to Clause 6.5 or folds or perforations above groundline, and
- The reinforcing sleeve (where fitted) does not have a steel condition rating of less than or equal to 30% according to Clause 6.5 or thinning of the cross-section, and
- The base plate or mounting components of rag-bolt or pile mounted steel poles or standards does not have any steel with a condition rating of less than or equal to 30% according to Clause 6.5 or cracked welds, and
- The base plate of a rag-bolt mounting does not have two or more missing nuts, and
- The pole, standard or column stability will not be affected by, or suspected to be affected by, excavation of the pole, standard or column.

6.2.9 If a pole, standard or column is identified as potentially unsafe to excavate:

- Do not excavate the pole, standard or column – finalise the pole inspection according to Clause Q2.6 for direct buried poles and standards or Clause Q3.6 for 6.5m waterpipe columns, and
- Report the potentially unsafe pole, standard or column immediately to the nominated Ausgrid representative, or to Ausgrid's Emergency Line (13 13 88) when the nominated representative is unavailable.

## 6.3 Partial Excavation

6.3.1 Partial excavation and initial below ground inspection shall only be performed when the above ground inspection indicates that it is safe to proceed (refer to Clause 6.2.8).

6.3.2 Partial excavation and initial below ground inspection shall be performed on direct buried steel poles or standards and unreinforced direct buried 6.5m 'water pipe' columns prior to performing the full below ground inspection to determine that the pole or standard is safe to fully excavate.

6.3.3 Partial excavation and below ground inspection shall be performed on direct buried 6.5m 'water pipe' columns reinforced with a steel sleeve to determine the condition of the sleeve. Full excavation shall not be performed on direct buried 6.5m 'water pipe' columns reinforced with a steel sleeve.

6.3.4 Partial excavation or full excavation shall not be performed on rag-bolt or pile mounted steel poles and standards other than minor excavation required to allow removal of surrounding material that has covered the base plate or rag-bolt components, or to allow re-grouting of the rag-bolt mounting.

6.3.5 If any steel with a condition rating of less than or equal to 30% according to Clause 6.5, folds or perforations are located during the partial excavation and initial below ground inspection, further excavation shall not proceed.

6.3.6 The following tasks shall be performed during the partial excavation and initial below ground inspection of direct buried steel poles or standards (excluding 6.5m 'water pipe' columns):

- For steel poles supporting overhead mains, excavation to a depth of 100mm below groundline on one non-load bearing face of the pole (neutral axis – refer to Annexure C), except where the preferred areas are covered by attachments and / or obstacles.
- For steel standards, excavation to a depth of 100mm below groundline in an area on one side of the standard or directly below rust located above ground or near the groundline.
- Inspection for defects according to Clause Q2.4;

6.3.7 The following tasks shall be performed during the partial excavation and initial below ground inspection of direct buried 6.5m 'water pipe' columns:

- Excavation to a depth of 100mm below groundline in an area on one side of the column or directly below rust detected above ground or near the groundline.
- Inspection for column defects and reinforcing sleeve defects (where fitted) according to Clause Q3.4.

6.3.8 If a pole, standard or column is identified as potentially unsafe for full excavation:

- Do not excavate the pole, standard or column – finalise the pole inspection according to Clause Q2.6 for direct buried poles and standards or Clause Q3.6 for 6.5m waterpipe columns, and
- Report the potentially unsafe pole, standard or column immediately to the nominated Ausgrid representative, or to Ausgrid's Emergency Line (13 13 88) when the nominated representative is unavailable.

## 6.4 Full Excavation and Below Ground Inspection

6.4.1 Full excavation and below ground inspection shall only be performed when the partial excavation and initial below ground inspection indicates that it is safe to proceed (refer to Clause 6.2.8).

6.4.2 If any steel with a condition rating of less than or equal to 30% according to Clause 6.5 (including on sleeves), folds or perforations are located at any stage while excavating, further excavation shall not proceed.

6.4.3 The following tasks shall be performed during the full excavation and below ground inspection of direct buried steel poles or standards (excluding 6.5m 'water pipe' columns):

- Excavation to a depth of 350mm below groundline around the full circumference of the pole or standard.
- Inspection of the pole or standard for defects, and condition assessment of the pole or standard through sounding according to Clause Q2.5.
- Measurement of the wall thickness in a horizontal plane at the below ground location that displays the deepest corrosion. Record the measurements.

6.4.4 The following tasks shall be performed during the full excavation and below ground inspection of direct buried 6.5m 'water pipe' columns (excluding columns reinforced with a sleeve):

- Excavate to a depth of 350mm below groundline around the full circumference of the column.
- Inspection for column defects, and condition assessment of the column through sounding according to Clause Q3.5.

6.4.5 Finalise the pole, standard or column inspection according to;

- Clause Q2.6 for direct buried poles and standards.
- Clause Q3.6 for 6.5m waterpipe columns.
- Clause Q4.3 for rag-bolt or pile mounted steel poles and standards.

## 6.5 Steel condition assessment criteria

6.5.1 Corrosion of all steel components (including poles, standards, columns, reinforcements, rag-bolt or pile mountings, attachments and fittings) shall be assessed against the Mueller steel condition rating criteria in Table 8.

**Table 8 – Mueller steel condition rating criteria**

| Condition Rating | Description of steel surface condition |
|---|---|
| **95.0%** | Galvanizing in as-new condition |
| **92.5%** | Galvanizing dull compared to new |
| **90.0%** | Galvanizing very dull compared to new |
| **87.5%** | Pin-point rust spots |
| **85.0%** | Galvanizing entirely gone |
| **80.0%** | Light rust film |
| **70.0%** | Shallow pitting |
| **60.0%** | Scaly rust or pitting with < 50% penetration of the steel |
| **45.0%** | Heavy rust or pitting with ≥ 50% penetration of the steel |
| **30.0%** | Heavy rust or pitting with ≥ 75% penetration of the steel |
| **15.0%** | Localised complete perforation of the steel |
| **0.0%** | General complete perforation of the steel |

## 6.6 Serviceability Criteria - Steel Poles, Standards and Columns

6.6.1 Pole inspection results shall be assessed against the serviceability criteria in Table 9 or Table 10 to determine whether the pole, standard or column remains serviceable or corrective action is required.

6.6.2 Reinforcement or replacement of a 'dimensionally' serviceable pole, standard or column may be justified following a subjective assessment by a nominated Ausgrid representative that a pole, standard or column is incapable of lasting another inspection cycle. Details of the assessment and reason(s) for reinforcement or replacement and revised priority must be included in both the pole assess and pole replacement notifications.

**Table 9: Serviceability Criteria for Steel Poles and Standards (excluding 6.5m 'water pipe' columns)**

| Inspection outcome | Required Action | Priority / Severity |
|---|---|---|
| **Residual strength is less than 50%.** | Replace pole. | CAT 1<br>Severity 5<br>(48 hrs) |
| **Dents, folds or perforations (before or after sounding) at any location.** | Site is to be made safe and reported immediately. Replace pole. | CAT 1<br>Severity 5<br>(48 hrs) |
| **Any flattened section of the pole or standards is 50% or more of the diameter at that height and either of the following situations are created:**<br>• **pole leaning over the carriageway of a road,**<br>• **low mains clearances to ground or vehicles,**<br>• **reduced mains clearances to buildings or structures.** | Replace pole. | CAT 2<br>Severity 4<br>(< 1 month) |
| **Bending at the site of a flattened section and either of the following situations are created:**<br>• **pole leaning over the carriageway of a road,**<br>• **low mains clearances to ground or vehicles,**<br>• **reduced mains clearances to buildings or structures.** | Replace pole. | CAT 2<br>Severity 4<br>(< 1 month) |
| **Steel condition rating of less than or equal to 30% according to Clause 6.5 or internal rust falls when sounded and Ausgrid specifies no remedial treatment.** | Replace pole. | CAT 3<br>Severity 2<br>(< 12 mths) |
| **Steel condition rating of less than or equal to 30% according to Clause 6.5 that extends more than 350mm below groundline.** | Replace pole. | CAT 2<br>Severity 3<br>(< 3 month) |
| **Missing or severely damaged access covers, or loose or damaged attachment to pole, such as luminaires or earthing connections.** | Site is to be made safe and reported immediately. Repair pole where feasible or replace pole. | CAT 1<br>Severity 5<br>(48 hrs) |
| **Rag-bolt or pile mountings have steel condition rating of less than or equal to 30% according to Clause 6.5 on the bolts, nuts or base plate and the pole or standard is leaning due to this degradation.** | Replace pole. | CAT 1<br>Severity 5<br>(48 hrs) |

| | | |
|---|---|---|
| **Rag-bolt mounting has 2 or more missing nuts or pile mounting has 10% or more missing nuts which cannot be replaced at the time of inspection.** | Repair pole where feasible or replace pole. | CAT 1<br>Severity 5<br>(48 hrs) |
| **Rag-bolt or pile mountings have steel condition rating of less than or equal to 30% according to Clause 6.5 on the bolts, nuts or base plate, but the pole or standard is not leaning due to this degradation.** | Replace pole. | CAT 2<br>Severity 4<br>(< 1 month) |
| **Welds on the rag-bolt mounting base plate are cracked but steel condition rating of less than or equal to 30% according to Clause 6.5 is not evident on the base plate, bolts or nuts.** | Repair pole where feasible or replace pole. | CAT 3<br>Severity 2<br>(< 12 mths) |
| **Leaning or bending more than 10°, is an immediate risk to people or the environment and either of the following situations are created:**<br>• **pole leaning over the carriageway of a road,**<br>• **low mains clearances to ground or vehicles,**<br>• **reduced mains clearances to buildings or structures.** | Repair pole where feasible or replace pole. | CAT 1<br>Severity 5<br>(48 hrs) |
| **Leaning or bending more than 10° but does not meet the criteria above for Severity 5.** | Repair pole where feasible or replace pole. | CAT 4<br>Severity 1<br>(< 2 years) |
| **Pole is free of above ground defects and has a residual strength greater than 50%.** | Complete required maintenance. | Not defective |

**Table 10: Serviceability Criteria for Steel 6.5m Water Pipe Columns**

| Inspection outcome | Required Action | Priority / Severity |
|---|---|---|
| **Dents, folds or perforations (before or after sounding) above or below the area that a sleeve can be attached, or above an existing sleeve.** | Replace pole. Ausgrid representative to determine if emergency replacement is required. | CAT 1<br>Severity 5<br>(48 hrs) |
| **Dents, folds or perforations (before or after sounding) in the area that a sleeve can be attached.** | Where sleeving is feasible, immediately attach a sleeve and replace pole. | CAT 4<br>Severity 1<br>(< 2 years) |
| **Dents, folds or perforations (before or after sounding) in the area that a sleeve can be attached.** | Where sleeving is not feasible, replace pole. Ausgrid representative to determine if emergency replacement is required. | CAT 1<br>Severity 5<br>(48 hrs) |
| **Steel condition rating of less than or equal to 30% according to Clause 6.5 above or below the area that a sleeve can be attached, or above an existing sleeve.** | Replace pole. | CAT 3<br>Severity 2<br>(< 12 mths) |
| **Steel condition rating of less than or equal to 30% according to Clause 6.5 in the area that a sleeve can be attached.** | Where sleeving is feasible, immediately attach a sleeve and replace pole. | CAT 4<br>Severity 0 |

| | | |
|---|---|---|
| | | (> 2 years / Max.5 years) |
| **Steel condition rating of less than or equal to 30% according to Clause 6.5 in the area that a sleeve can be attached.** | Where sleeving is not feasible, replace pole. | CAT 3<br>Severity 2<br>(< 12 mths) |
| **Steel condition rating of less than or equal to 30% according to Clause 6.5 that extends more than 350mm below groundline.** | Replace pole. | CAT 2<br>Severity 3<br>(< 3 month) |
| **Internal rust falls when the column is sounded above or below groundline.** | Replace pole. | CAT 3<br>Severity 2<br>(< 12 mths) |
| **Existing sleeve steel condition rating of less than or equal to 30% according to Clause 6.5 or loss of surface area (thinning of the cross-section).** | Replace pole. | CAT 3<br>Severity 2<br>(< 12 mths) |
| **Existing sleeve steel condition rating of greater than 30% according to Clause 6.5 or does not have loss of surface area (thinning of the cross-section).** | Replace pole. | CAT 4<br>Severity 1<br>(< 2 years) |
| **Leaning more than 10°, is an immediate risk to people or is leaning over the carriageway of a road,** | Replace pole. Ausgrid representative to determine if emergency replacement is required. | CAT 1<br>Severity 5<br>(48 hrs) |
| **Leaning more than 10° but does not meet the criteria above for Severity 5.** | Replace pole. | CAT 4<br>Severity 1<br>(< 2 years) |
| **None of the criteria above are met.** | Clean rust off the pole. Complete required maintenance. | Not defective |

# 7 Inspection Requirements – Concrete Poles and Columns

## 7.1 General Requirements

7.1.1 Above ground inspections shall be performed on all concrete poles and columns.

7.1.2 Below ground inspections shall only be performed on concrete poles and columns where there is evidence of concrete cracking or spalling at groundline or which extends below groundline.

7.1.3 Concrete poles and columns shall not be assessed for reinforcement.

7.1.4 Concrete lightning masts and lighting poles or columns in substation yards shall be inspected in a similar manner to other concrete poles or columns.

7.1.5 The following risks shall be immediately reported to the nominated Ausgrid representative, or to Ausgrid's Emergency Line (13 13 88) when the nominated representative is unavailable;

- Immediately dangerous electrical hazards or pole hazards identified when implementing safety precautions according to Clause 3.1, or
- Poles or columns assessed as possessing CAT 1 / Severity 5 defects according to the serviceability criteria in Clause 7.4, or
- The pole is potentially unsafe for excavation.

## 7.2 Above Ground Inspection

7.2.1 Above ground inspection shall be performed on all concrete poles and columns to assess the condition of the pole or column and to determine that the pole or column is safe to excavate prior to performing excavation and below ground inspection where it is required.

7.2.2 The following tasks shall be performed prior to commencing the above ground inspection of each pole or column:

- Visual examination and testing of the pole or column for the presence of physical hazards according to Annexure A, and
- Visual assessment of the pole or column stability, or threats to pole or column stability, according to Annexure A including damage, concrete spalling (particularly exposed reinforcing) or corrosion stains, reduced ground level, and pole lean.

7.2.3 The following tasks shall be performed during the above ground inspection of direct buried concrete poles or columns:

- Inspection for pole or column defects according to Clause S2.2.

7.2.4 The following tasks shall be performed during the above ground inspection of rag-bolt or pile mounted concrete poles and columns:

- Inspection for pole or column defects and rag-bolt or pile mounting defects according to Clause S2.2.
- Corrosion assessment according to Clause 6.5.
- Check of securing nut tightness and replacement of missing nuts.
- Removal of surrounding materials covering the base plate or rag-bolt components (where required).
- Re-grouting of the baseplate (where required) according to Clause S2.6.

7.2.5 If defects are not suspected or evident below groundline, finalise the pole or column inspection according to Clause S2.5.

7.2.6 If defects below groundline are suspected or evident following the above ground inspection, proceed to the partial excavation.

7.2.7 The pole or column shall meet the following criteria before excavation and below ground inspection is performed:

- Concrete perforations or spalling does not extend beyond the reinforcing or cover 25% of the pole circumference, and
- Concrete cracking does not extend around the entire pole circumference, and
- The pole or column is not considered to be loaded close to or beyond its structural capacity (indicated by excessive lean or bending of the pole), and
- The base plate or mounting components of rag-bolt or pile mounted poles or columns do not have any steel with a condition rating of less than or equal to 30% according to Clause 6.5 or cracked welds, and
- The base plate of a rag-bolt mounting does not have two or more missing nuts that cannot be replaced during the inspection, and
- Pole or column stability will not be affected by, or suspected to be affected by, excavation of the pole or column.

7.2.8 If a pole or column is identified as potentially unsafe to excavate:

- Do not excavate the pole or column – finalise the inspection, and
- Report the potentially unsafe pole or column immediately to the nominated Ausgrid representative, or to Ausgrid's Emergency Line (13 13 88) when the nominated representative is unavailable.

## 7.3 Partial Excavation

7.3.1 Partial excavation of concrete poles and columns shall only be performed when the above ground inspection indicates that it is safe to proceed (refer to Clause 7.2.7).

7.3.2 Partial excavation and below ground inspections shall only be performed on concrete poles and columns where there is evidence of concrete perforation, spalling or cracking at groundline, or which extends below groundline.

7.3.3 Partial excavation and below ground inspection is not required on rag-bolt or pile mounted steel poles and columns other than minor excavation required to allow removal of surrounding material that has covered the base plate or rag-bolt components, or to allow re-grouting of the pole or column.

7.3.4 The following tasks shall be performed during the partial excavation and below ground inspection of concrete poles or columns:

- For concrete poles supporting overhead mains, excavation to a depth of 100mm below groundline on one non-load bearing face of the pole (neutral axis – refer to Annexure C), except where the preferred areas are covered by attachments and / or obstacles.
- For concrete columns, excavation to a depth of 100mm below groundline in an area on one side of the column or directly below cracks / spalling located above ground or near the groundline.
- Inspection of the pole or column for defects according to Clause S2.4.
- Where a defect extends beyond the exposed section of the pole and reinforcing bars are not exposed, excavate further to determine the extent of the defect. The pole or column shall not be excavated beyond a depth of 350mm below groundline.

7.3.5 Finalise the pole or column inspection according to Clause S2.5.

## 7.4 Serviceability Criteria – Concrete Poles and Columns

Pole inspection results shall be assessed against the serviceability criteria in Table 11 to determine whether the pole or column remains serviceable or corrective action is required.

7.4.2 Replacement of a 'dimensionally' serviceable pole or column may be justified following a subjective assessment by the nominated Ausgrid representative that a pole or column is incapable of lasting another inspection cycle. Details of the assessment and reason(s) for replacement and revised priority must be included in both the pole assess and pole replacement notifications.

**Table 11: Serviceability Criteria for Concrete Poles and Columns**

| Inspection outcome | Required Action | Priority / Severity |
|---|---|---|
| **Small area of missing, loose / weakened / softened concrete that penetrates into the pole beyond the steel reinforcing and where associated cracking exists adjacent to the perforation around the entire circumference of the pole** | Site is to be made safe and reported immediately. Replace pole. | CAT 1 Severity 5 (48 hrs) |
| **An area of missing, loose / weakened / softened concrete that covers an area of 25% of the pole circumference and that penetrates into the pole beyond the steel reinforcing** | Site is to be made safe and reported immediately. Replace pole. | CAT 1 Severity 5 (48 hrs) |
| **Multiple localised areas of missing, loose / weakened / softened concrete that penetrates into the pole beyond the steel reinforcing.** | Site is to be made safe and reported immediately. Replace pole. | CAT 1 Severity 5 (48 hrs) |

| | | |
|---|---|---|
| **Small area of missing, loose / weakened / softened concrete exists in the critical axis that penetrates into the pole beyond the steel reinforcing but there is no associated cracking adjacent to the perforation around the entire circumference of the pole.** | Repair pole where feasible or replace pole. | CAT 3<br>Severity 2<br>(< 12 mths) |
| **External defect extends below 350mm.** | Replace pole. | CAT 3<br>Severity 3<br>(< 3 month) |
| **Small area of missing, loose / weakened / softened concrete exists in the neutral axis that penetrates into the pole beyond the steel reinforcing but there is no associated cracking adjacent to the perforation around the entire circumference of the pole.** | Repair pole where feasible or replace pole. | CAT 4<br>Severity 1<br>(< 2 years) |
| **Areas of missing, loose / weakened / softened concrete are found that expose the steel reinforcing but which do not penetrate beyond the reinforcing.** | Repair pole where feasible or replace pole. | CAT 4<br>Severity 1<br>(< 2 years) |
| **Pole reinforcing is corroding, and outer concrete is beginning to lift away.** | Repair pole where feasible or replace pole. | CAT 4<br>Severity 1<br>(< 2 years) |
| **Pole concrete is cracking on one side over its length due to bending caused by loading.** | Repair pole where feasible (e.g. reduce impact of load) or replace pole. | CAT 4<br>Severity 1<br>(< 2 years) |
| **Missing or severely damaged access cover, or loose or damaged attachment to pole, such as luminaires or earthing connections.** | Site is to be made safe and reported immediately. Repair pole where feasible or replace pole. | CAT 1<br>Severity 5<br>(48 hrs) |
| **Rag-bolt or pile mountings have steel condition rating of less than or equal to 30% according to Clause 6.5 on the bolts, nuts or base plate and the pole or standard is leaning due to this degradation.** | Replace pole. | CAT 1<br>Severity 5<br>(48 hrs) |
| **Rag-bolt mounting has 2 or more missing nuts or pile mounting has 10% or more missing nuts which cannot be replaced at time of inspection.** | Repair pole where feasible or replace pole. | CAT 1<br>Severity 5<br>(48 hrs) |
| **Rag-bolt or pile mountings have steel condition rating of less than or equal to 30% according to Clause 6.5 on the bolts, nuts or base plate, but the pole or standard is not leaning due to this degradation.** | Replace pole. | CAT 2<br>Severity 4<br>(< 1 month) |
| **Leaning or bending more than 10°, is an immediate risk to people or the environment and is either:**<br>• **leaning over the carriageway of a road,**<br>• **supporting a transformer or voltage regulators,**<br>• **causing low mains clearances to ground or vehicles,** | Repair pole where feasible or replace pole. | CAT 1<br>Severity 5<br>(48 hrs) |

| | | |
|---|---|---|
| • **causing reduced mains clearances to buildings or structures.** | | |
| **Leaning or bending more than 10° but does not meet the criteria above for Severity 5.** | Repair pole where feasible or replace pole. | CAT 4<br>Severity 1<br>(< 2 years) |
| **Pole is free of the above defects.** | Complete required maintenance. | Not defective |

# 8 Inspection Requirements – Fibre Composite Poles

## 8.1 General Requirements

8.1.1 Above ground inspections shall be performed on all fibre composite poles.

8.1.2 Below ground inspections shall only be performed on fibre composite poles where there is evidence of damage or material degradation at groundline, or which extends below groundline.

8.1.3 Fibre composite poles shall not be assessed for reinforcement.

8.1.4 The following risks shall be immediately reported to the nominated Ausgrid representative, or to Ausgrid's Emergency Line (13 13 88) when the nominated representative is unavailable;

- Immediately dangerous electrical hazards or pole hazards identified when implementing safety precautions according to Clause 3.1, or
- Poles assessed as possessing CAT 1 / Severity 5 defects according to the serviceability criteria in Clause 8.4, or
- The pole is potentially unsafe for excavation.

## 8.2 Above Ground Inspection

8.2.1 Above ground inspection shall be performed on all fibre composite poles to assess the condition of the pole and to determine that the pole or column is safe to excavate prior to performing excavation and below ground inspection.

8.2.2 The following tasks shall be performed prior to commencing the above ground inspection of each pole:

- Visual examination and testing of the pole for the presence of physical hazards according to Annexure A, and
- Visual assessment of the pole stability, or threats to pole stability, according to Annexure A including damage, deformation / folds or deterioration of the external surface (missing or degraded cement or resin matrix).

8.2.3 The following tasks shall be completed during the above ground inspection of each pole:

- Inspection for defects according to Clause T2.2.

8.2.4 If defects are not suspected or evident below groundline, finalise the pole or column inspection according to Clause T2.5.

8.2.5 If defects below groundline are suspected or evident following the above ground inspection, proceed to the partial excavation.

8.2.6 The pole shall meet the following criteria before excavation and below ground inspection is performed:

- Missing, loose or weakened / softened matrix (cement or resin) is less than 40mm in size, is not located in the critical axis and does not penetrate beyond the fibre reinforcing, and.
- Cement matrix is not damaged in the king bolt area, and
- Resin matrix is not damaged (folds or deformation) and does not have large areas of ultraviolet degradation or exposed (unbonded) fibres, and

- The pole is not considered to be loaded close to or beyond its structural capacity (indicated by excessive lean, cracks or folds in the pole), and
- Pole stability will not be affected by, or suspected to be affected by, excavation of the pole.

8.2.7 If a pole is identified as potentially unsafe to excavate:

- Do not excavate the pole – finalise the inspection, and
- Report the potentially unsafe pole immediately to the nominated Ausgrid representative, or to Ausgrid's Emergency Line (13 13 88) when the nominated representative is unavailable.

## 8.3 Partial Excavation and Below Ground Inspection

8.3.1 Partial excavation of fibre composite poles shall only be performed when the above ground inspection indicates that it is safe to proceed (refer to Clause 8.2.6).

8.3.2 Partial excavation and below ground inspections shall only be performed on fibre composite poles where there is evidence of concrete perforation, spalling or cracking at groundline, or which extends below groundline.

8.3.3 The following tasks shall be performed during the partial excavation and below ground inspection of fibre composite poles:

- For fibre composite poles supporting overhead mains, excavation to a depth of 100mm below groundline on one non-load bearing face of the pole (neutral axis – refer to Annexure C), except where the preferred areas are covered by attachments and / or obstacles.
- For fibre composite poles not supporting overhead mains, excavation to a depth of 100mm below groundline in an area on one side of the pole or directly below cracks / spalling located above ground or near the.
- Inspection of the pole for defects according to Clause T2.4.
- Where a defect extends beyond the exposed section of the pole, excavate further to determine the extent of the defect. The pole shall not be excavated beyond a depth of 350mm below groundline.

8.3.4 Finalise the pole or column inspection according to Clause T2.5.

## 8.4 Serviceability Criteria – Fibre Composite Poles

8.4.1 Pole inspection results shall be assessed against the serviceability criteria in Table 12 to determine whether the pole remains serviceable or corrective action is required.

8.4.2 Replacement of a 'dimensionally' serviceable pole or column may be justified following a subjective assessment by a nominated Ausgrid representative that a pole or column is incapable of lasting another inspection cycle. Details of the assessment and reason(s) for replacement and revised priority must be included in both the pole assess and pole replacement notifications.

**Table 12: Serviceability Criteria for Fibre Composite Poles**

| Inspection outcome | Required Action | Priority / Severity |
|---|---|---|
| **Localised area of missing, loose or weakened / softened matrix (cement or resin) greater than 40mm in size, located in the critical axis, and which penetrates into the pole beyond the fibre reinforcing.** | Site is to be made safe and reported immediately. Repair pole where feasible or replace pole. | CAT 1 Severity 5 (48 hrs) |
| **Damaged cement matrix in the area surrounding king bolts.** | Site is to be made safe and reported immediately. Repair pole where feasible or replace pole. | CAT 1 Severity 5 (48 hrs) |
| **Localised area of missing, loose or weakened / softened matrix (cement or resin) greater than** | Repair pole where feasible or replace pole. | CAT 3 Severity 2 |

| | | |
|---|---|---|
| **40mm in size, located in the neutral axis and which penetrates into the pole beyond the fibre reinforcing.** | | (< 12 mths) |
| **Localised area of missing, loose or weakened / softened matrix (cement or resin) less than 40mm in size and which penetrates into the pole beyond the fibre reinforcing.** | Repair pole where feasible or replace pole. | CAT 4<br>Severity 1<br>(< 2 years) |
| **Large areas of ultraviolet degradation resulting in change in colour of pole where significant fibre reinforcing is unbound from the resin matrix and is free to contaminate the environment.** | Repair pole where feasible or replace pole. | CAT 3<br>Severity 2<br>(< 12 mths) |
| **Folds in, or deformation of, the resin matrix** | Replace pole. | CAT 2<br>Severity 3<br>(< 3 month) |
| **External defect extends below 350mm.** | Replace pole. | CAT 2<br>Severity 3<br>(< 3 month) |
| **Localised areas of missing, loose or weakened/softened matrix (cement or resin) that expose the inner fibre reinforcing and which is not either Severity 5 or Severity 3.** | Repair pole where feasible or replace pole. | CAT 4<br>Severity 0<br>(> 2 years) |
| **Some fibre reinforcing is exposed and not bound by the resin matrix due to ultraviolet radiation degradation of the matrix.** | Repair pole where feasible or replace pole. | CAT 4<br>Severity 0<br>(> 2 years) |
| **Leaning or bending more than 10°, is an immediate risk to people or the environment and is either:**<br>• **leaning over the carriageway of a road,**<br>• **supporting a transformer or voltage regulators,**<br>• **causing low mains clearances to ground or vehicles,**<br>• **causing reduced mains clearances to buildings or structures.** | Repair pole where feasible or replace pole. | CAT 1<br>Severity 5<br>(48 hrs) |
| **Leaning or bending more than 10° but does not meet the criteria above for Severity 5.** | Repair pole where feasible or replace pole. | CAT 4<br>Severity 1<br>(< 2 years) |
| **Pole is free of the above defects.** | Complete required maintenance. | Not defective |

## Annexure A: Safety Precautions

### A1 General Requirements

Overhead lines and poles are installed in all types of terrain, from suburban areas to mountainous terrain and coastal marine areas. It is not possible for this Network Standard to account for all specific safety precautions for every situation.

If at any stage during the asset inspection it is considered that the condition of the overhead line or a pole is potentially dangerous, or if the pole appears to be loaded close to or beyond its available capacity or in danger of immediate collapse, inspection work shall cease. The work site shall be made safe and the situation immediately reported to the nominated Ausgrid representative so appropriate action can be taken.

Asset inspection work is normally performed with the overhead line inspection process completed first as a non-intrusive inspection to identify any other safety concerns not identified during the Hazard Assessment Conversation (HAC) process.

### A2 Ausgrid's Emergency Line

The results of some inspections or tests can reveal the existence of a hazardous situation on the customer's premises or Ausgrid's network, or the possibility that such a situation exists.

In such circumstances, as detailed in the sections that follow, the Asset Inspector shall immediately contact the nominated Ausgrid representative when electrical safety hazards or hazardous poles are identified. The Asset Inspector shall immediately contact the Ausgrid Emergency Line (13 13 88) in circumstances where the nominated Ausgrid representative cannot be contacted.

Upon contacting the nominated Ausgrid representative or Ausgrid's Emergency Line due to a hazardous situation, work shall cease. Asset Inspectors shall safeguard themselves and others against unsafe exposure to these hazards until the hazard has been removed, or Ausgrid staff attend to remove the hazard, or until directed otherwise by Ausgrid staff.

### A3 Asbestos-Containing Paint

Asset inspection works other than visual inspection shall not occur on poles confirmed as containing asbestos paint, or those identified as having a similar appearance.

The confirmed instances of remnants of friable asbestos paint on Ausgrid's poles have occurred within the areas of Rockdale, Kogarah, Hurstville and Bexley however, poles containing asbestos may be present in other areas. Confirmed instances include:

- poles with a band of white paint at ground level, or
- poles with 'grey' paint, or
- poles with 'black' paint at ground level.

All poles tested have been recorded on the Asbestos Register and in GIS including those where no asbestos was present. Poles confirmed as containing asbestos paint are typically prioritised for replacement. Where a pole is found with 'grey', 'white' or 'black' paint and it is not listed in the Asbestos Register or GIS, contact the Hazardous Materials Hotline on 02-9394 6961 to arrange testing before planned work is undertaken.


**Figure 1 – Examples of Poles with Remnant Friable Asbestos Paint**

## A4 CCA and Creosote treatment

Asset Inspectors shall use appropriate health precautions when working on CCA treated poles and poles treated with creosote.

Leather gloves shall be worn when making contact with the pole. Safety glasses and a disposable half-face particulate filter respirator shall also be worn when drilling holes in CCA treated poles due to the risk of pressurised liquid solution spraying from voids within the pole.

Inspection of fire damaged CCA poles shall be performed according to Annexure N. Asset Inspectors shall not inspect poles which are burning or smouldering.

Additional information regarding CCA treated poles is available in NEG-SE09.

## A5 Synthetic mineral fibres

Asset Inspectors shall use appropriate health precautions when working on fibre composite poles where the synthetic mineral fibres have become exposed.

Disposable overalls, safety goggles, leather gloves and a disposable half-face particulate filter respirator shall be worn if contact needs to be made with fibre composite poles with exposed fibres.

## A6 Falling Objects

Appropriate personal protective equipment (e.g. hard hat) shall be used when working at the base of a pole. Asset Inspectors shall also be aware that falling objects present a hazard to other parts of the body.

A pre-work visual inspection shall be conducted to identify above ground hazards such as:

- Loose sapwood.
- Loose streetlights.
- Loose nuts.
- Loose vertical construction.
- Tools left on crossarms.
- Cracked, loose or damaged insulators.

Asset Inspectors shall report any immediately dangerous above ground hazards to the nominated Ausgrid representative or Ausgrid's Emergency Line (13 13 88) when the nominated Ausgrid representative cannot be contacted.

Asset Inspectors shall safeguard themselves and others against unsafe exposure to these hazards until the hazard has been removed or Ausgrid staff attend to remove the hazard.

## A7 Hazardous Voltages

Asset Inspectors shall be aware of voltage gradients (differences in voltage) that can exist on or near a pole (both above ground and below ground) and which can potentially cause electrical safety hazards. Hazardous voltages may occur due to damage or degradation of the pole and overhead mains or underground cables, including;

- Conductors not being properly fixed to insulators (eg broken tie wires).
- Low ground clearance of conductors.
- Broken or missing earth wires, or loose earth connections.
- Cracked or damaged insulators.
- Conductive foreign objects (eg fencing wires, metal chains).
- Underground cable damage or degradation.

Asset Inspectors shall take precautions to safeguard themselves and others against inadvertent contact with hazardous voltages.

Testing of each pole and any attached conductive structure shall be performed according to Ausgrid's Electrical Safety Rules to confirm the absence of hazardous voltages prior to initial contact with the pole or any attached conductive structure.

Any hazardous voltages identified shall be immediately reported to the nominated Ausgrid representative or Ausgrid's Emergency Line (13 13 88) when the nominated Ausgrid representative cannot be contacted.

Asset Inspectors shall safeguard themselves and others against unsafe exposure to these hazards until the hazard has been removed or Ausgrid staff attend to remove the hazard or until directed otherwise by Ausgrid staff.

## A8 Visual Inspection of Earth Wires

Earth wires form part of an earthing system which can become damaged or degraded over time.

Prior to making initial contact with the pole, Asset Inspectors shall visually inspect above ground sections of earth wires connected to primary assets (for example, earth connections for overheads mains, UGOH's, air-break switches, pole transformers, regulators or reclosers) to assess its condition and whether the earth wire is intact. Earth wires shall then be tested according to Clause A7 to confirm the absence of hazardous voltages.

If earth wires connected to primary assets are present on a pole, the below ground condition of the earth wire shall also be assessed and continuously monitored by visual inspections and retested according to Clause A7 to confirm the absence of hazardous voltages during and after excavation.

Asset Inspectors shall not attempt to tighten loose earth connections or re-join broken / missing earth wires. Full phase to earth voltage may exist between the severed ends.

Any loose earth connections or broken / missing earth wires identified shall be reported immediately as a dangerous electrical safety hazard to the nominated Ausgrid representative or Ausgrid's Emergency Line (13 13 88) when the nominated Ausgrid representative cannot be contacted.

Asset Inspectors shall safeguard themselves and others against unsafe exposure to these hazards until the hazard has been removed or Ausgrid staff attend to remove the hazard or until directed otherwise by Ausgrid staff.

## A9 Single Wire Earth Return (SWER) Substation Poles

The inspection and treatment of any SWER Transformer poles shall only occur while the feeder is out of service and under access permit conditions. This work shall be completed in conjunction with Ausgrid's annual inspection of SWER pole earthing installations and in the presence of a member of Ausgrid's staff authorised to carry out such earthing installation inspections.

## A10 Insufficient Depth in Ground

Road re-alignment work, landscaping, subsidence or erosion can result in a pole having less depth in ground compared to when it was originally installed. This can severely reduce the stability of the pole and pole movement may be evident. Refer to Clause U1 for further details. Clause B1 also describes the correct height of pole discs, which are a good indicator of pole sinking depth (refer to NS128 for the correct pole sinking depths).

Poles that have evidence of movement in the ground, excessive lean (10 degrees or more) or 350mm less depth in the ground than originally installed shall be reported to the nominated Ausgrid representative and inspected before any excavation is carried out.

Immediately dangerous situations shall be immediately reported to the nominated Ausgrid representative or Ausgrid's Emergency Line (13 13 88) when the nominated Ausgrid representative cannot be contacted. Asset Inspectors shall safeguard themselves and others against unsafe exposure to these hazards until the hazard has been removed or Ausgrid staff attend to remove the hazard or until directed otherwise by Ausgrid staff.

## A11 Excavation Precautions

Pole excavation shall only be performed where the above ground inspection indicates that it is safe to proceed according to the criteria in this Standard. Extreme caution shall be exercised when excavating around a pole, particularly those poles that have cables (UGOH's) and other items attached to them. Contact with cables shall be minimised.

Asset Inspectors shall use non-conductive tools or tools with non-conductive handles, or wear insulating gloves, when electrical assets are located. Underground cables shall be tested according to Clause A7 prior to, and after, excavation to confirm the absence of hazardous voltages.

Where a cable is observed as having damaged insulation (e.g. where the outer covering is partially removed exposing the underlying material) it shall be immediately reported to the nominated Ausgrid representative or Ausgrid's Emergency Line (13 13 88) when the nominated Ausgrid representative cannot be contacted. Asset Inspectors shall safeguard themselves and others against unsafe exposure to these hazards until the hazard has been removed or Ausgrid staff attend to remove the hazard or until directed otherwise by Ausgrid staff. Refer to Clause U1 for further details on precautions to be taken when excavating poles.

## A12 Pesticide Precautions

The risks associated with the application of pesticides shall be managed by:

- Restricting the application of pesticides to trained and authorised workers.
- Handling pesticides according to the product label, the Safety Data Sheet (SDS) for the product and the precautions detailed below.
- Ensuring that bandages and wraps are installed with no parts appearing above ground.
- Sealing treated inspection holes according to Annexure P.
- Providing notification of the use of pesticides according to EG 210.
- Applying the product strictly according to the manufacturer's product label requirements and any guidance provided by this Standard.
- Wearing PVC chemical resistant gloves when handling Polesaver Rods.
- Wearing oil resistant gloves and boots when handling Ausplast wraps.
- Washing clothing worn when handling Ausplast wraps after each day's use.

## A13 Copper Napthenate (CN) Timber Oil Precautions

The risks associated with the application of CN Timber Oil (Copper Napthenate paint) shall be managed by:

- Wearing synthetic rubber or PVC gloves and eye protection when handling or applying CN Timber Oil.
- Only applying CN Timber Oil with a brush.

## Annexure B: Information About Ausgrid Poles

### B1 Finding the Pole Disc

The positioning of the identification disc on Ausgrid timber poles is as follows:

### B1.1 Newcastle and Hunter areas (prior to March 1997)

Discs are fitted 2 metres from nominal groundline, which is 2 metres above ground when the pole is sunk to the standard sinking depth stipulated for that size pole in the Electricity Association specification drawing EAS 111.

### B1.2 Sydney and Central Coast areas (prior to March 1997)

Discs are fitted four metres from the butt. In the 'Mackellar County Council' district (Sydney Northern Beaches area) poles were historically marked with a 'T' shaped notch 10 feet (approximately 3 metres) from the base of the pole.

### B1.3 All Ausgrid areas (March 1997 to 2013)

Discs are fitted four metres from the butt.

### B1.4 All Ausgrid areas (2014 to 2020)

Discs are fitted 2 metres from nominal groundline, which is 2 metres above ground when the pole is sunk to the standard sinking depth stipulated for that size pole in the Australian Standard AS3818.11.

### B1.5 All Ausgrid areas (From 2021)

Discs are fitted four metres from the butt.

### B2 Types of Pole Discs

### B2.1 Poles 1974 Onwards

Poles purchased since 1974 are fitted with an aluminium identification disc, recessed into the timber, 4 meters from the butt.

### B2.2 Pre 1982 Discs

Until 1982, pole sizes were designated only by length and application. High strength poles were termed 'heavy'. The discs were 40mm in diameter and included information such as length, year of purchase and timber variety.

An example of a pre-1982 disc is shown below. This disc shows an 11 metre, heavy grey ironbark pole purchased in 1979.

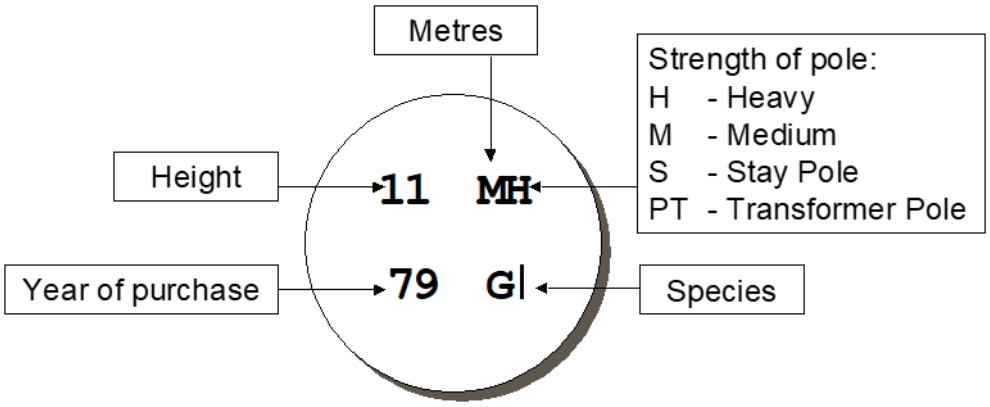



**Figure 2 – Example of a pre-1982 pole disc**

### B2.3 1982 - 1988 Discs

Kilonewton poles were introduced in 1982. The new identification discs were 40mm in diameter.

An example of a 1982 - 1988 disc is shown below. This disc shows a 15.5 metre grey ironbark pole rated at 12kN, purchased in 1982.

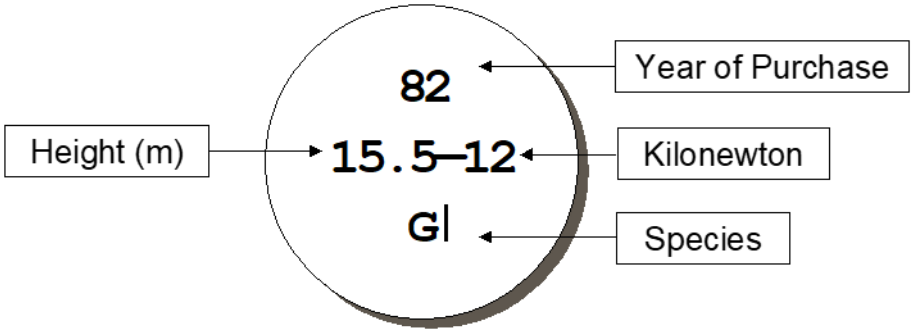



**Figure 3 – Example of a 1982 - 1988 pole disc**

## B2.4 1988 Onwards Discs

A 50mm diameter disc was introduced in 1988 to enable more information to be recorded.

An example of a 1988 onwards disc is shown below. The disc shows a 9.5 metre tallowwood pole rated at 4 Kilonewton purchased in 1989. As there is no code, you can assume that the pole has not been fumigated.

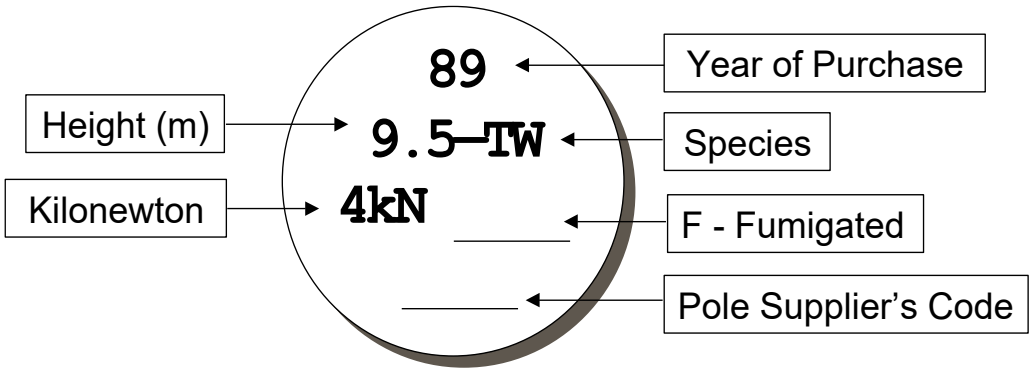



**Figure 4 – Example of a pole disc from 1988 onwards**

A number of disc options also became available to record additional information on the disc. Examples of these options are shown below.

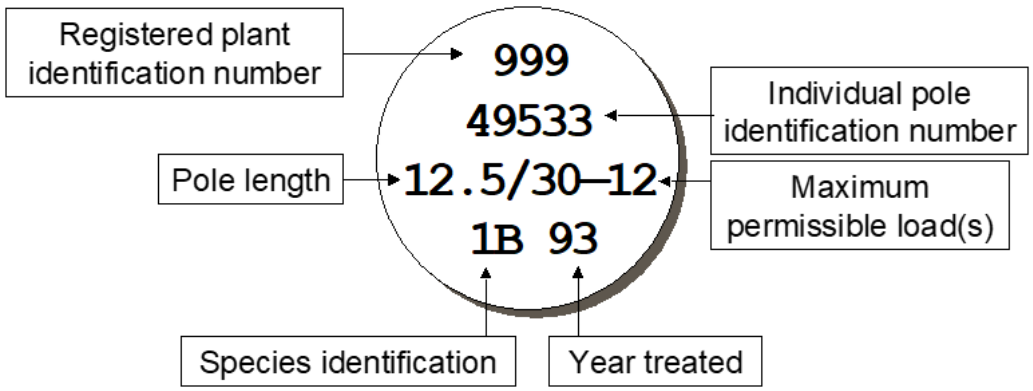



**Figure 5 – Example of a pole disc from 1988 onwards (Option 1)**

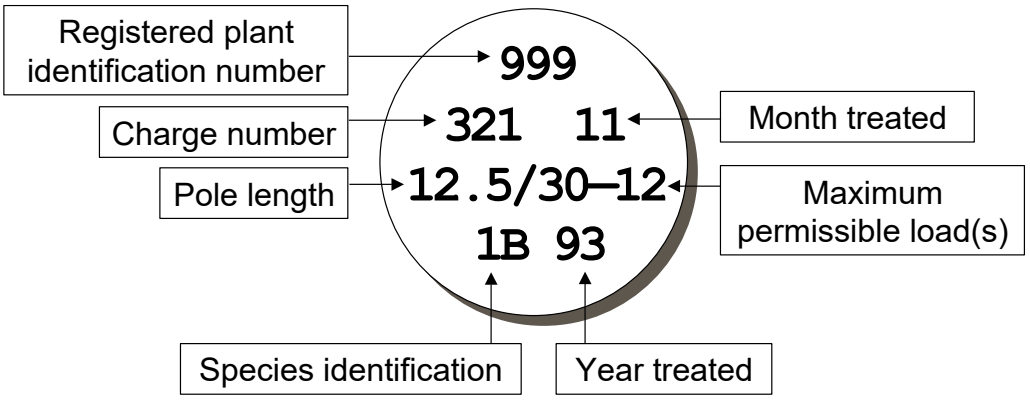



**Figure 6 – Example of a pole disc from 1988 onwards (Option 2)**

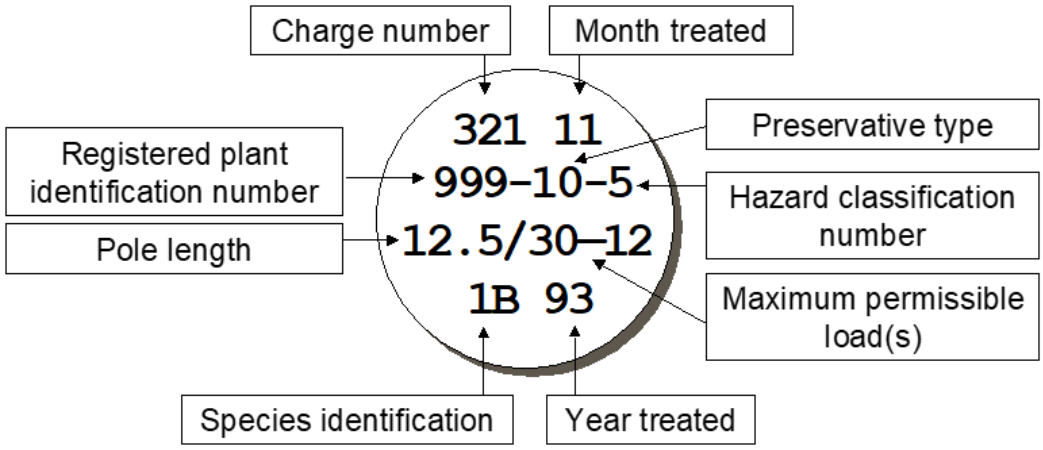



**Figure 7 – Example of a pole disc from 1988 onwards (Option 3)**

## B2.5 Concrete Pole Disc

A diagram of a concrete pole disc is shown below.

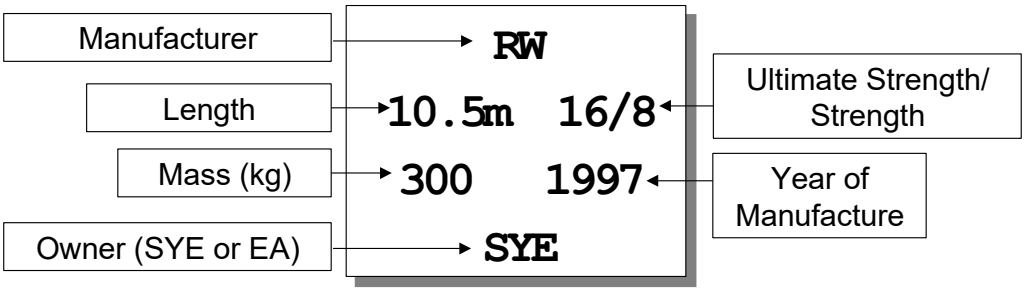



**Figure 8 – Example of a concrete pole disc**

**Note:** concrete poles discs do not always include ultimate strength and working strength ratings.

## B2.6 Abbreviations used on Discs

A sample of the abbreviations used on the discs include:

**m** = Metre **BB** = Blackbutt **GI** = Grey Ironbark

| | | |
|---|---|---|
| **H** = Heavy | **BS, RS, WS, YS** = Stringybark | **SG** = Spotted Gum |
| **M** = Medium | **GB** = Grey Box | **SY, SO** = Blue Gum |
| **S** = Stay Pole | **GG** = Grey Gum | **TW** = Tallowwood |
| **PT** = Transformer Pole | **GM** = Gympie Messmate | **WM** = White Mahogany |

For a complete list, refer to the User Guide Annexure in the SAP Training Manual.

## B3 Pole Species, Treatments and Properties

Ausgrid currently uses two types of timber poles:

- Desapped Durable Species timber poles in very limited numbers, and
- Full length Copper Chrome Arsenate (CCA) Pressure Impregnated timber poles.

Ausgrid uses durability Class 1 and Class 2 timbers for power poles.

Many timber poles on the Ausgrid system have been treated with Creosote at some stage in their life. Creosote is a by-product from the production of coke. It contains a number of chemicals that are toxic to fungi and act as a termite repellent.

Almost all timber poles purchased since the early 1990's are full length CCA pressure impregnated poles.

### B3.1 Desapped Durable Species Timber Poles

These poles have all (or most of) their sapwood removed and are Durability Class 1 species only. They are machined to remove their sapwood because it is not durable and have an octagonal (8-sided) appearance for a length of 4.5 m from the butt and are round dressed (i.e. 16-sided) for the remainder of their length. They are the strongest and most durable varieties of the eucalyptus (gum) family.

The durability of these poles comes from the chemical qualities of their heartwood, however their sapwood is not naturally protected. This sapwood when left untreated degrades rapidly and must not be included in pole strength calculations. However natural round timber poles with all of the sapwood still remaining and which have not been pressure impregnated over their full length can also be found in service in some areas.

### B3.2 Full Length Pressure Impregnated Timber Poles

These poles are debarked only with all the sapwood remaining. Full length pressure impregnation treatment is applied to these poles to raise their durability. The preservation treatment can only penetrate the sapwood, the heartwood being impervious to this type of treatment. The treatment fully penetrates the sapwood thereby making it highly durable and therefore allowing it to be included in the pole's strength calculation. The sapwood has been commonly impregnated with creosote (historic treatment) or copper chrome arsenate (current treatment)..

### B3.3 Creosote

Creosote has some advantages over CCA oxide as it reduces splitting in poles and renders the pole somewhat fire resistant. Pigmented Emulsified Creosote (PEC) treated poles, of regal species timber are in use in tidal areas where they could be subject to marine borer attack. These poles have been debarked but not desapped, and for additional protection are wrapped with Denso marine products between the high and low tide marks.

### B3.4 Copper Chrome Arsenate (CCA)

CCA uses copper and arsenic to protect against decay and termites, while the chromium is used to fix the chemical to the wood fibres. CCA salts were used in the early days and then switched to CCA oxides in the 1980's as it is generally less corrosive to steel and fixes better in the wood. Generally, the CCA salts treated poles will be a much lighter green colour (sometimes look like natural rounds). CCA salts treated poles more commonly have issues with soft rot of the treated sapwood at ground line, but CCA oxide treated poles can also have issues if the poles were not held under pressure for an extended period at the end of the pressure impregnation cycle.

## B4 Pole Reinforcements

### B4.1 Poles Reinforced with Splints

Two types of reinforcing ‘splints’ have been installed on Ausgrid poles – ‘Oz C’ splints (supplied by Ausmose in the 1990’s) and ‘Osmo-C-Truss’ or ‘Osmo-C2-Truss’ splints (supplied by Osmose / Logsys Power Services commencing ~2023).

The Ausmose Oz C Splint is a steel ‘C’ section channel made from 6mm thick galvanised steel. They vary in length from 3.1 to 3.4 metres and are secured to the pole using four or more 52mm wide galvanised steel bands. Poles reinforced with Ausmose Oz C splints require at least 25% residual strength below groundline to provide the required support for the pole.

**Figure 9 – Example of an Ausmose Oz-C splinted reinforced pole**

The Osmose (Logsys) ‘Osmo-C-Truss’ or ‘Osmo-C2-Truss’ splints are of similar appearance and design to Ausmose Oz C splints however, the splints are embossed vertically along the above ground length of the splint with the splint details and a label for the splint details is attached to the pole above the splint (refer to Figure 10). Osmo-C-Truss splints are typically used for poles with a large diameter and Osmo-C2-Truss splints are used for typical distribution poles due to their lighter weight design.


**Figure 10 – Examples of Osmose Osmo-C-Truss embossed details and pole label**

These poles are unlikely to suffer timber failure above the reinforcement. Usually, the below ground section of the pole will degrade first resulting in the pole exhibiting an abnormal lean if the attached load is unbalanced or during wind gusts. The securing bands are designed not to hold the pole absolutely rigid so as to allow some movement rather than transferring all the stress to the section of the pole near the top of the reinforcement.

When the pole suffers below ground timber failure it must be replaced, however the pole will not normally fall to ground and the necessity for replacement is less urgent than unreinforced poles unless the pole head movement may create a dangerous situation due to the proximity of traffic or reduction in conductor clearances.

Timber poles reinforced with Ausmose Oz C splints shall be marked as a defective pole after any inspection, irrespective of the inspection results, and shall be prioritised for replacement.

## B4.2 Poles Reinforced with Nails

Two types of reinforcing ‘nails’ have been installed on Ausgrid poles – ‘RFD nails’ (supplied by UAM commencing in the 2000’s) and ‘Powerbeam’ nails (supplied by Genus PFA commencing ~ 2023). Powerbeam nails superseded RFD nails as the preferred nailing reinforcement option.

RFD nails are pressed steel section channels made from 6mm or 8mm thick galvanised steel. They vary in length from 2.4 to 3.15 metres long and are secured to the pole using four galvanised steel bolts.

The securing bolts of RFD nails rigidly hold the pole in place therefore, no below ground pole inspection is considered necessary, other than an examination of the steel reinforcement to check for rust. However, because the pole can remain in service with no sound timber at groundline, care shall be taken when inspecting the above ground section of the pole.

**Figure 11 – RFD nail secured with bolts**

Powerbeam nails are now used for nail reinforcing. Powerbeam nails are pressed steel section channels made from thick galvanised steel. They vary in length from 2.4 to 3.15 metres long and are secured to the pole using four galvanised steel bolts.

Powerbeam nails may also be secured to the pole using 2 to 4 galvanised steel bands and are considered to be ‘splinted’ poles.

**Figure 12 – Powerbeam nail secured with bolts**

**Figure 13 – Powerbeam nail secured with bands**

When inspecting nailed poles, particular care shall be taken around the top securing bolts to ensure degradation does not continue in this section of the pole resulting in failure near the top of the reinforcement.

## B4.3 Composite Timber Poles

Composite timber poles consist of a timber pole that has the section from a minimum of 300mm above groundline to the bottom of the pole, replaced with a steel reinforced concrete stub and a sliding steel sleeve, or a concrete filled steel caisson (steel tube partially filled with concrete).

In both cases the timber pole is 'joined' to the concrete filled steel tube, or concrete stub with sliding steel tube, by placing the machined down section of the pole into the steel tube (sliding or fixed). The quantity of remaining composite timber poles is small as many have been replaced since the time that they were originally installed.

**Figure 14 – Example of a composite timber pole**

The advantage of the concrete butt was that the pole did not have to be lifted as high, but it was more expensive. Use of a caisson necessitated the pole being lifted 0.8m to 1.35m so that it could be lowered into the caisson. There was approximately a dozen different sizes of replacement butts originally installed depending on the size and rating of the pole to be rebutted.

Composite timber poles are inspected visually for termites and fungal decay in a manner similar to timber poles. In addition, the inspection hole in the steel tube near the bottom of the pole shall be cleared to allow water to drain out.

Composite timber poles shall be marked as a defective pole after any inspection, irrespective of the inspection results, and shall be prioritised for replacement.

## B5 Fire Protection of Timber Poles

Fire mesh manufactured by Genics is being installed as a protective barrier against fire damage on selected timber poles. This product consists of a fibreglass mesh with a fire-resistant coating that allows the pole to ‘breathe’ under normal circumstances. When the mesh is affected by fire or extreme heat, the coating expands to fill the spaces in the mesh - this protects the portions of the pole covered by the mesh.

Genics fire mesh is supplied in rolls 900mm wide and is cut to size on site. It is installed around the full circumference of the pole from 200mm below groundline to approximately 1.5m above groundline (2 full wraps with a 50mm overlap between the wraps) and is secured in place with Tek screws. The mesh can be shaped to cover pole attachments such as UGOH’s or reinforcements.

The mesh can be pulled back, removed, cut or drilled to perform an inspection of the pole. The mesh shall be reinstalled and re-secured to its original state when the inspection has been completed – this can involve patching and securing an additional small piece of the mesh to the pole to maintain the protective barrier when the mesh has been altered. Sounding of the pole can be performed with the mesh in place.

Refer to Technical Guide T0150 for further information.

**Figure 15 – Examples of Genics fire mesh installed on timber poles**

**Figure 16 – Examples of partially removing or cutting Genics fire mesh for pole inspection**

## B6 Street Light Insulating Spigots

Insulating spigots have historically been installed in the mounting arrangements for single insulated luminaires in the Sydney and Central Coast areas to provide a pseudo ‘double insulated’ design. Insulating spigots were not required in the Hunter areas as streetlighting assets in those areas used a ‘single insulated’ system. The purpose of the insulating spigot is to prevent steel standards or steel posts used for streetlighting becoming energised if there is any breakdown of

electrical components within the single insulated luminaire. The three types of insulating spigot used (with their standard construction drawing number) are shown below.

**For steel standards (with clamping bolts) Drawing 125149 & 240795**

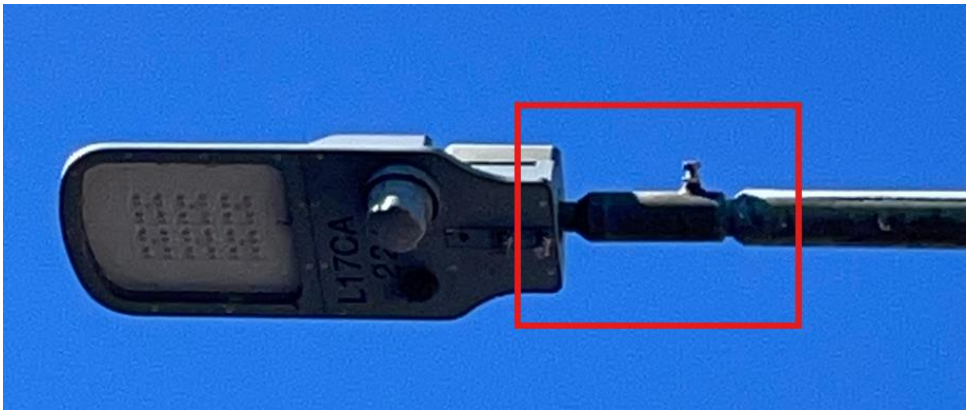
**For steel standards (threaded) Drawing 41826**

**For steel lighting posts (post-top mounting) Drawing 43238**

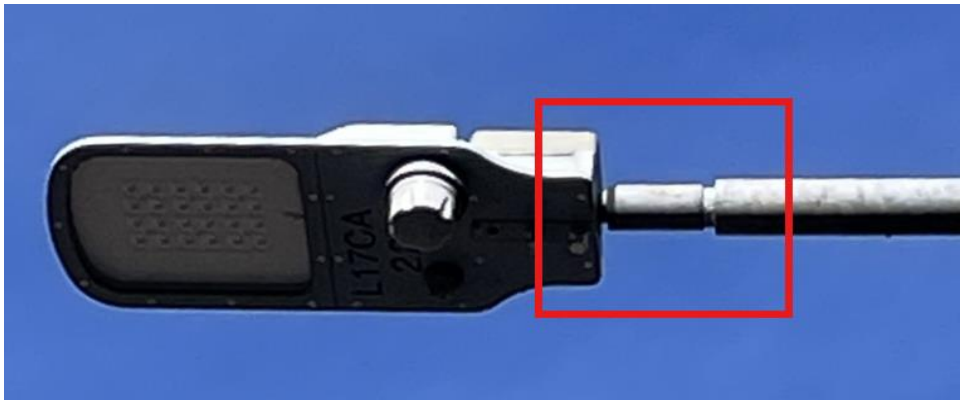
**Figure 17 – Insulating Spigot Types**

The insulating spigots are installed on steel streetlighting standards (including pillar standards) and some steel decorative lighting posts (with single insulated post-top mounted luminaires). Some examples are shown below.

**Insulating spigot with clamping bolts (LED luminaire)**




**Threaded insulating spigot (LED luminaire)**



**Steel light post with an insulating spigot for a post-top luminaire**

**Figure 18 – Examples of insulating spigot installations**

Since 2018, the street lighting design in the Hunter areas have been changed to a 'double insulated' system utilising an insulated spigot when a steel standard or steel post is newly constructed or replaced. Insulating spigots are also required on luminaires installed on concrete poles with overhead lines attached to the pole (refer to the example below and standard construction drawing 209423).

**Insulating spigot for a luminaire - concrete pole**

**Figure 19 – Example of concrete pole insulating spigot installations**

## B7 Aerial Warning Markers

Aerial warning markers have been attached to overhead lines or structures (or a combination of both) at some locations to provide a visual warning to pilots of aviation risks associated with those overhead lines or structures.

Aerial warning marker balls of various colour may be attached to conductors when the span is (refer to the examples below):

- greater than 90m above the ground, water or vegetation, or

- longer than 1,500m and greater than 60m above the ground, water or ambient vegetation, or
- in an area where low level aviation operations are performed.

**Note:** low level aerial operations are aviation operations that involves flying below approximately 150m above ground, including overhead line inspection or other approved activities.

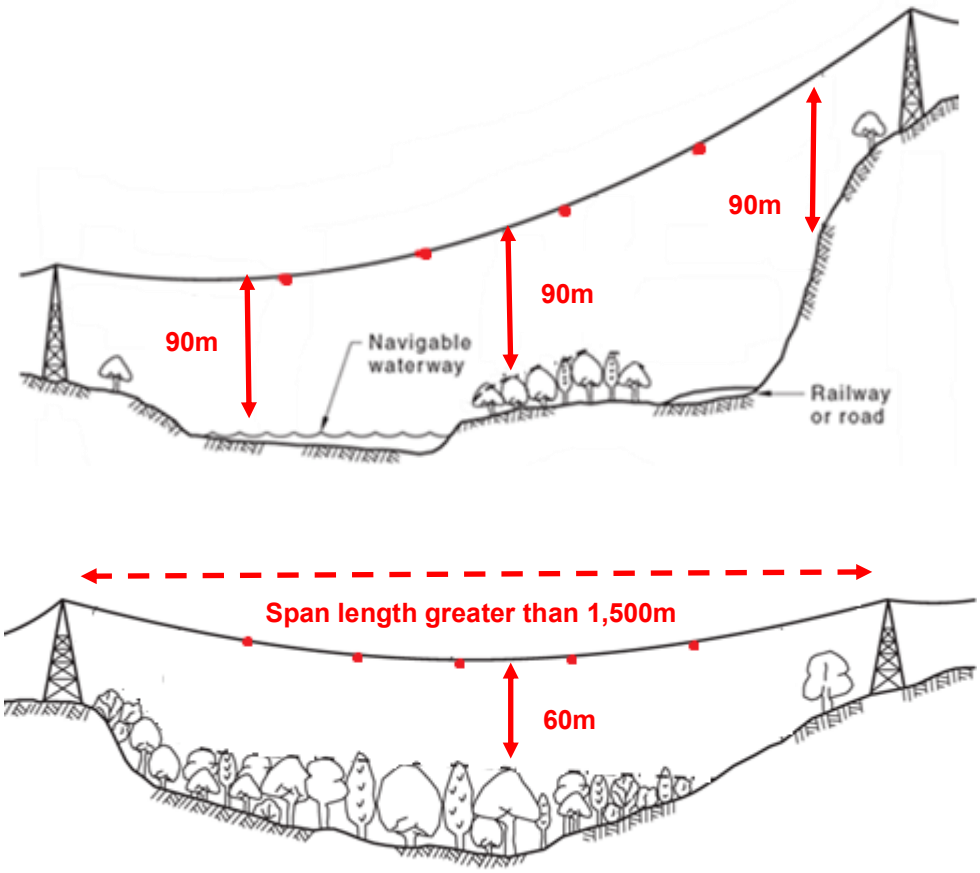
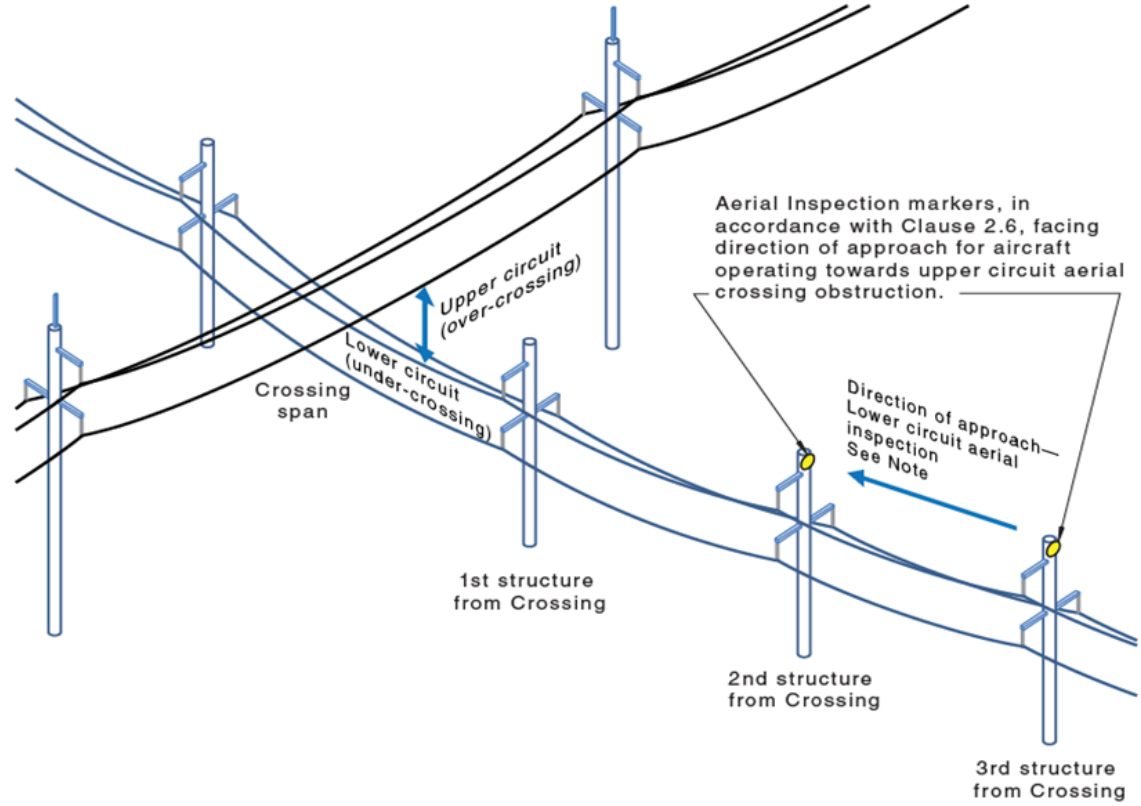



**Figure 20 – Conductor aerial markers (from AS3891)**

Aerial warning markers may be attached to poles adjacent to overhead line crossings in areas where low level aviation operations are performed. The warning markers face away from the crossing and are typically yellow in colour and may be a circular or triangular shape. The warning markers should be attached to the second and third poles leading to the overhead line crossing on either side of the crossing but may be installed on the first pole from the crossing in some circumstances. Refer to the examples below.



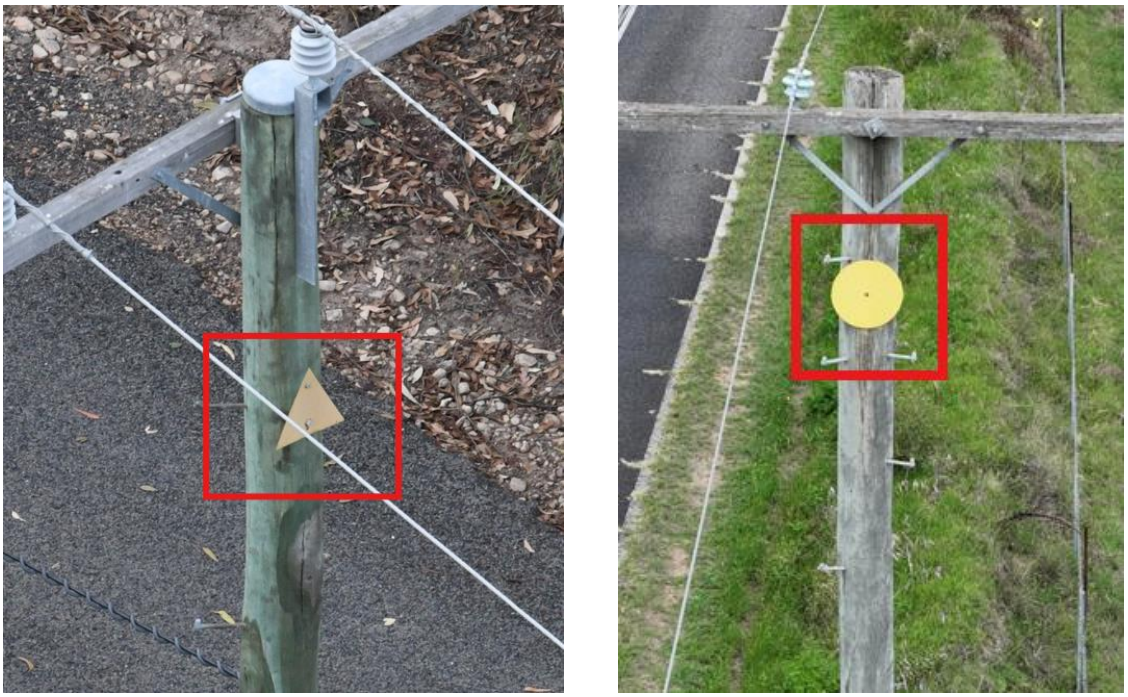



**Figure 21 – Aerial markers on poles (from AS3891)**

## B8 How to Determine a Pole's Age for the Purpose of Maintenance

A pole's age shall be determined by the disc 'year' value only. The 'month' shall be ignored. For example, a CCA pole with a disc date of 2010 shall not be excavated in 2025, but excavation would be required if the inspection fell in or after 2026 (shall be over 15 years old). Similarly, an untreated timber pole with a disc date of 2020 would not be internally inspected in 2025, but

internal inspection would be required if inspection fell in or after 2026 (shall be over 5 years old). Exceptions are detailed in Clause 5.1.2.

## Annexure C: Finding the Neutral Axis

### C1 Neutral Axis of a Pole

The neutral axis of a pole is an imaginary line, drawn through the pole where the timber fibres are neither in tension (being stretched) nor compression.

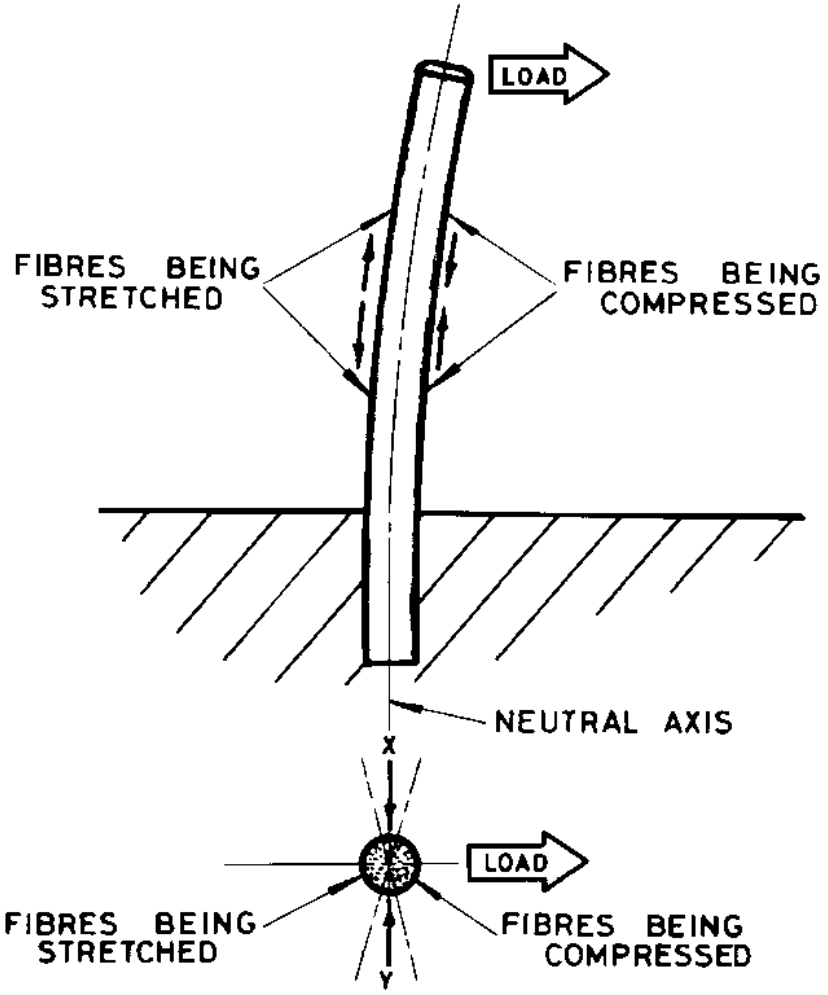



**Figure 22 – Neutral Axis of a Pole**

In Figure 22 the fibres close to the neutral axis are stretched or compressed much less than the fibres on the near-side or far-side to the load. It is important to bore the pole in a position where the fibres are least strained, i.e. within approximately 10 to 15 degrees of the neutral axis, as shown by X or Y.

The neutral axis is always:

- at right angles to the resultant load on the pole, or
- at right angles to the direction in which a stay wire would need to be erected to stay the pole, or 90° to the fall line of the pole.

These statements mean the same thing since the required direction of a stay wire is directly opposite to the resultant load on the pole.

## C1.1 Neutral axis - In-line Pole without Service Mains

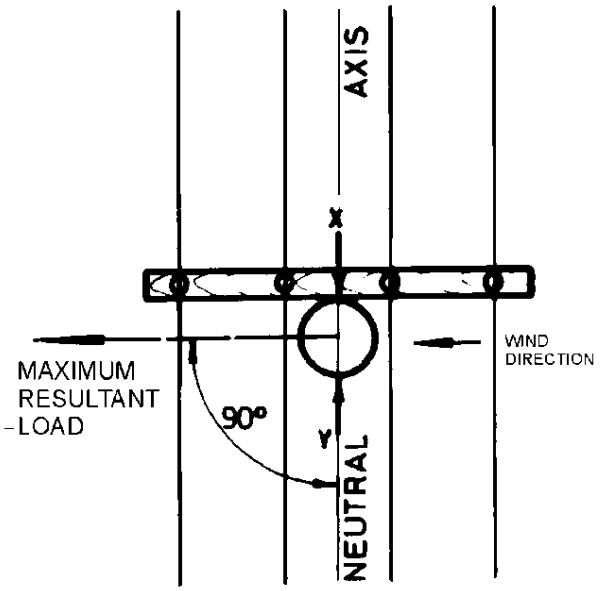



**Figure 23 – Neutral Axis of an In-line Pole**

Assuming the worst case of wind direction at right angles to the conductors the maximum resultant load is also at right angles to the conductors and the neutral axis is parallel to the conductors. Bore the pole at X or Y, as shown in Figure 23.

## C1.2 Neutral axis - In-line Pole with Service Mains

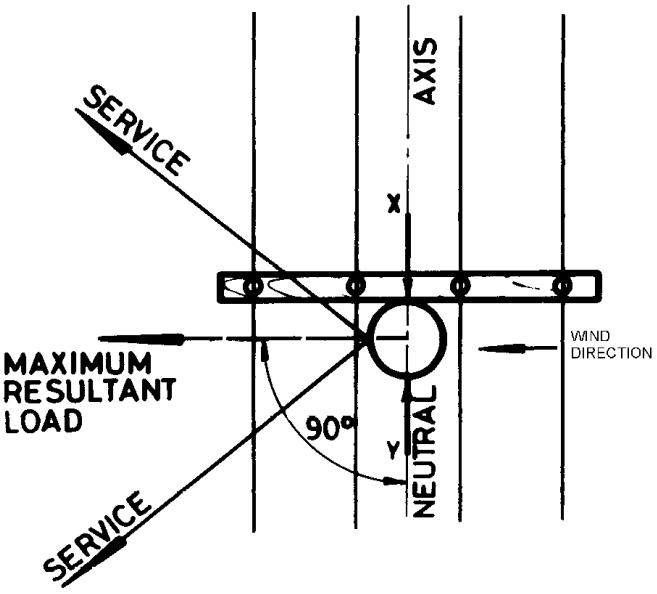



**Figure 24 – Neutral Axis of a Pole with Service Mains**

The loading of this pole is a combination of the wind forces on the pole and conductors, and the tension in the service mains. Service mains may be altered many times during the life of the pole, so the actual neutral axis may vary. As a rule, always take the neutral axis as being parallel to the line conductors. Bore the pole at X or Y, as shown in Figure 24.

## C1.3 Neutral axis - Angle Pole

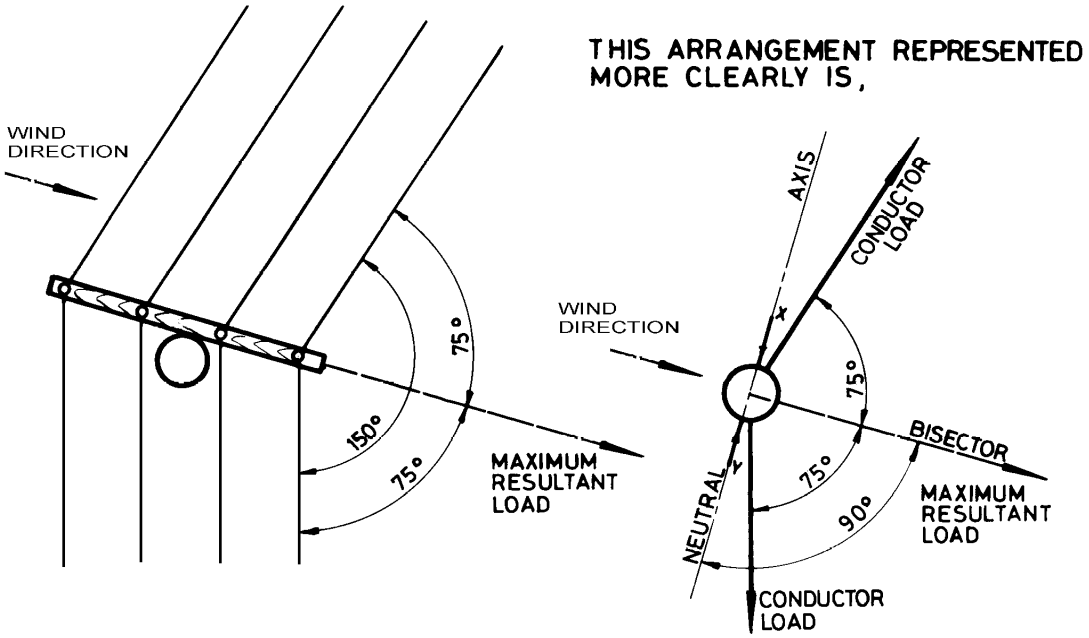



**Figure 25 – Neutral Axis of an Angle Pole**

Loading of an angle pole is a combination of the wind loading on the pole and conductors and the tension in the conductors. The maximum resultant loading on the pole is in the direction of the bisector of the included angle between the conductors.

The neutral axis is at right angles to the bisector. Bore the pole at X or Y, as shown in Figure 25.

## C1.4 Neutral axis - Termination Pole

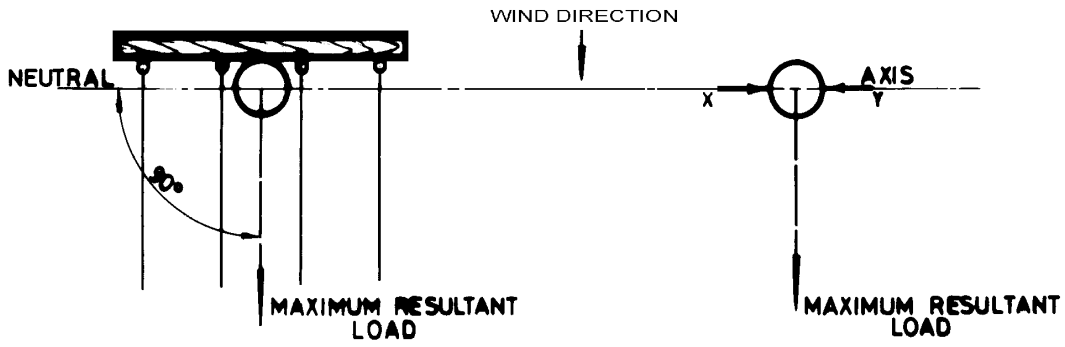



**Figure 26 – Neutral Axis of a Termination Pole**

Loading of a termination pole is due to wind loading and tension in the conductors. The maximum resultant load is directed away from the pole in the direction of the conductors.

The neutral axis is at right angles to the conductors. Bore the pole at X or Y, as shown in Figure 26.

# Annexure D: Overhead Lines - Inspection Process

## D1 General Requirements

The inspection process from ground level for overhead lines consists of:

- Assessment of access to the pole supporting the overhead line according to Clause D2.2.
- Implementation of appropriate safety precautions according to Annexure A.
- Visual inspection of conductors, pole top arrangements, pole attachments (including third party assets) and fittings according to Clause D2.3.
- Assessment of conductor clearances according to Clause D2.3.
- Inspection finalisation according to Clause D3.

The primary purpose of overhead line inspection is to identify defects that may cause a system failure or present a hazard to employees, contractors, the general public or the environment before the next line inspection is performed. Above ground inspection of the pole supporting the overhead lines shall be performed according to the Annexures below.

With the exception of height measurement, examination of all above ground assets is to be performed visually, and from the ground only. As not all defects will be visible or identifiable from a single viewpoint, Asset Inspectors shall move around the pole to get the best view of each asset or assembly to improve the effectiveness of the inspection. Inspections may be performed utilising other effective technologies that do not require climbing a pole (for example, binoculars, cameras, drones).

The overhead line inspection seeks to identify and report defects that may fail within the period of the next inspection cycle. It is also used to identify and report non-conforming use of materials (construction defects). The inspection is not intended to identify old constructions that do not meet the current Ausgrid standard but should consider whether materials have been used in a manner other than that for which they are intended to be used.

Asset Inspectors shall report any immediately dangerous defects to the nominated Ausgrid representative or Ausgrid's Emergency Line (13 13 88) when the nominated Ausgrid representative cannot be contacted.

## D2 Overhead Line Inspection Process

### D2.1 General Requirements

It is the Asset Inspector's responsibility to make sure that an effective inspection is performed to detect all overhead line defects. Some components of the overhead line inspection process may be performed when implementing the safety precautions according to Annexure A. The overhead line inspection may also be performed before, during or after the above ground inspection of a pole.

Overhead line inspection shall be performed without disturbing termites on timber poles where termite activity is detected or if the pole is undergoing termite treatment. Overhead line inspection may proceed when a pole has been identified with immediately dangerous defects if the inspection can be performed without risk to the Asset Inspector or others in the vicinity of the pole and only after reporting the immediately dangerous defect to the nominated Ausgrid representative.

Where corrosion is identified, assess the steel condition according to Clause 6.5.

### D2.2 Access routes

Access routes and associated infrastructure (including access tracks, walking paths, rights of way and easements) shall be inspected enroute to the pole / overhead line to be inspected.

The inspection procedure for access routes shall be performed as follows:

1) Perform a visual inspection of the access route to the pole as follows:
    - Examine the access route for vegetation, obstructions, changes to the built environment (for example, new buildings or fences) or surface degradation which prevents (or limits) walking or vehicle access to the pole.

2) Perform an inspection of access route gates and fences owned by Ausgrid (as shown in GIS) as follows:

   - When the vehicle is required to stop to open / close gates, examine Ausgrid gates / locks / fences / livestock barriers for degradation (corrosion, timber rot / termites, difficult operation), and damage due to vandalism / unauthorised access, vehicles, livestock or bushfire.
   - When operating gates, check that gate Ausgrid locks are operable and secure.

3) Perform a visual inspection of access route identification and signage posts as follows:

   - Examine ID posts and signage for degradation (post corrosion or timber rot / termites), damage due to vandalism or bushfire, visibility (not obstructed), legibility and presence (that is, installed where it should be installed).

### D2.3 Line Inspection Procedure

The inspection procedure for overhead lines shall be performed as follows:

1) On arrival at the pole, implement safety precautions according to Annexure A.
2) Verify that the asset details are correctly recorded in the Ausgrid asset management system. Missing or incorrect information shall be recorded and updated in the asset management system. Asset details include, but are not limited to, the following:

   - Asset numbers and labels (for example, pole numbers, switch numbers, feeder numbers or other identifying marks). Also assess their condition, legibility and presence (that is, installed where it should be installed).
   - Asset address details.
   - Asset ownership.
   - Equipment characteristics.

3) Record any advertising material or unauthorised attachments on the pole.
4) Perform a visual inspection of the full length of the conductors to adjacent support structures or terminations in all directions from the pole (including service mains / points of attachment, overhead earth wires, bonds, tee-offs, droppers, jumpers, transpositions, and tails) for defects including, but not limited to, the following:

   - Degradation – examine the conductors for corrosion, stranding / breakages / ‘bird caging’, annealing, entanglement, foreign objects (for example, branches, balloons / kites, shoes) and deterioration of the conductor insulation or covering.
   - Service mains – examine phase and neutral connections for stranding / breakages or disconnected conductors. Examine mains connection boxes
   - Damage – examine the conductors for damage due to conductor clashes, lightning strikes, fires / burning / overheating, vegetation contact, vandalism or vehicle impact.
   - Uneven sag – examine conductors for uneven / excessive sag or excessive tightness within each span / bay.
   - Reduced clearances – examine each conductor for adequate clearances to ground, adequate clearances to all other conductors in the same span / bay and for circuit crossings, and adequate clearances to objects including vegetation, buildings and fences. Measure reduced clearances with a telescopic operating and measuring stick (where reasonably practicable) and record the ‘actual’ clearance value.
   - Redundant or obsolete construction – assess whether any conductor is obsolete / redundant.

5) Perform a visual inspection of all crossarms and fittings for defects including, but not limited to, the following:

- Degraded crossarm mounting – examine all crossarms for evidence of twisting, bending or rotation away from the pole surface due to conductor loading, loose or tilted (misaligned) attachment to the pole, or crossarms that have fully detached from the pole.
- Damage and contamination – examine all crossarms for breakage or damage due to burning / fire, lightning strikes, vehicle contact or conductor overloading (including crossarm bending), and surface contamination or foreign objects (for example, branches, moss, lichen, salt, bird droppings, bird nests).
- Timber degradation – examine timber crossarms for loss of strength due to rot, fungal decay, termites, cracks or splits.
- Steel crossarm degradation – examine steel crossarms for loss of strength due to corrosion and surface degradation (for example, moss, lichen, salt).
- Steel fitting degradation – examine steel earth risers, raiser brackets, bracing, gain blocks, pole bands, pole caps and fasteners (bolts, screws, nuts and washers) for loss of strength due to corrosion, and correct seating (not jammed, twisted, loose or incorrectly attached).
- Fibre composite degradation – examine composite fibre crossarms for loss of strength due to ultraviolet degradation (for example, loss of surface coating, exposed fibres).
- Redundant or obsolete construction – assess whether any crossarm is obsolete / redundant (no attached overhead lines).

6) Perform a visual inspection of all insulators (including surge arrestors) for defects including, but not limited to, the following:

- Insulator degradation – examine all insulators for cracks / breakage, corroded pins / caps / disc couplings / supports, tracking or surface degradation, misalignment or bending due to conductor loading, loose or misaligned attachment to the crossarm / pole, or insulators that have fully detached from the crossarm / pole.
- Damage and contamination – examine all insulators for breakage or damage due to burning / fire, lightning strikes, vandalism or bird attack (polymeric insulators), and surface contamination or foreign objects (for example, branches, salt / pollution, bird nests).
- Termination degradation – examine all insulator termination fittings for corrosion, overheating, breakage, correct seating / securing of the conductor, evidence of twisting or damage due to conductor loading, loose attachment to the insulator, and conductors that have fully detached from the termination fitting.

  **Note:** termination fittings include tie wires, helical ties (preforms), bolted terminations ‘U’ bolts, wedge clamps, snail clamps).
- Attachment degradation – examine insulator steel attachment fittings (attaching the insulator to the pole, or the conductor to the insulator) for loss of strength due to corrosion, and correct seating (not jammed, twisted, loose or incorrectly attached).

  **Note:** insulator attachment fittings include thimbles, clevis-tongues, bow shackles, K-straps (flat steel shackles), clearance hangers and post / stand-off insulator bases.
- Redundant or obsolete construction – assess whether any insulator is obsolete / redundant (no attached overhead lines).

7) Perform a visual inspection of all conductor connections and accessories for defects including, but not limited to, the following:

- Connection degradation – examine all conductor connections for corrosion, overheating, conductor breakage, correct seating / securing of the conductor and evidence of damage due to conductor loading.

  **Note:** conductor connections include parallel groove clamps, split bolts, wedge clamps, insulated piercing connectors, bail clamps, live-line clamps, sleeves / compression fittings, inter-distributor tee’s, ‘U’ bolts, and earth clamps / connectors.

- Accessory degradation – examine all conductor accessories for corrosion, overheating, conductor breakage, correct seating / securing of the conductor and evidence of damage due to conductor loading.

  **Note:** conductor accessories include joints, repair fittings, low voltage spreaders, high voltage spreaders, vibration dampers, aircraft marker balls, bird deflectors and temporary insulation.

- Redundant or obsolete construction – assess whether any conductor connection is obsolete / redundant.

8) Perform a visual inspection of all switchgear for defects including, but not limited to, the following:

   - Degradation – examine all switchgear and operating mechanisms (including down-rods) for corrosion, loose or overheating connections, conductor breakage / disconnection at terminations, cracking / tracking / surface degradation on insulators and surge arrestors, loose or disconnected earth downleads / connections, and timber / composite fibre degradation on down-rods.

     **Note:** switchgear includes LV links, LV fuse switches, LV ABC link boxes (fuse switch disconnector), HV drop-out fuses, HV links, HV air-break switches and HV auto-links.

   - Degraded switchgear mounting – examine all switchgear for evidence of corrosion (including fasteners), twisting, bending or rotation away from the crossarm / pole surface due to conductor loading, loose or tilted (misaligned) attachment to the crossarm / pole, or switchgear that has fully detached from the crossarm / pole.

   - Damage and contamination – examine all switchgear components for breakage or damage due to burning / fire, lightning strikes, vandalism (including earth downleads and connections), vehicle contact or conductor overloading (including crossarm bending), and surface contamination or foreign objects (for example, branches, moss, lichen, salt, balloons, bird nests).

   - Redundant or obsolete construction – assess whether any switchgear is obsolete / redundant.

9) Perform a visual inspection of pole-mounted plant for defects including, but not limited to, the following:

   - Degradation – examine all pole-mounted plant (including control panels, relays and indicators) for corrosion, loose or overheating connections, conductor breakage / disconnection at terminations, cracking / tracking / surface degradation on insulators and surge arrestors, loose or disconnected earth downleads / connections, correct oil level and evidence of oil or gas leakage.

     **Note:** pole-mounted plant includes transformers, voltages regulators, capacitors, reclosers, enclosed switches, static compensators and batteries.

   - Shrouds - examine insulator and surge arrestor shrouds for degradation, damage, secure fitting and missing shrouds (not installed where they should be installed).

   - Explosion vents – examine explosion vents for evidence of rupture / damage.

   - Degraded mounting (including control panels, relays and indicators) – examine all plant mountings for evidence of corrosion (including fasteners), twisting or rotation away from the pole surface, or loose or tilted (misaligned) attachment to the pole.

   - Damage and contamination – examine all plant components for breakage or damage due to burning / fire, lightning strikes, vandalism (including earth downleads and connections) or vehicle contact, and surface contamination or foreign objects (for example, branches, moss, lichen, salt, balloons, insects, bird nests, fauna).

   - Redundant or obsolete construction – assess whether any components are obsolete / redundant.

10) Perform a visual inspection of streetlights for defects including, but not limited to, the following:

- Luminaire degradation – examine all luminaires for corrosion, breakage, loose / hanging (open) / missing / excessively dirty visors, loose or tilted (misaligned) attachment to the bracket / pole, and luminaires that have fully detached from the bracket or pole. Record luminaries that are operating during daytime.
- Wiring degradation – examine the external wiring and conduits for corrosion (steel conduits, saddles and fasteners), stranding / breakages, deterioration of the conductor insulation or covering, and secure fixing to the pole.
- Control equipment degradation - examine external fuses, PE cells, chokes and streetlighting control points (SLCP's) for corrosion (mounting brackets, fasteners, choke housings), open or insecure covers (chokes / SLCP's), secure fixing to the pole, correct seating of fuses, and UV degradation (fuses, PE cells, SLCP housings).
- Bracket degradation – examine all luminaire brackets (including outreach arms) for evidence of corrosion (including fasteners), twisting or rotation (misaligned) away from the crossarm / pole surface or normal direction, and brackets that have fully detached from the crossarm / pole.
- Insulating spigots – assess whether insulating spigots have been installed correctly (installed where they should be installed). Refer to Clause B6.
- Obstructions – examine all streetlights for vegetation encroachments expected to restrict or block light output.
- Damage and contamination – examine all streetlighting components for breakage or damage due to burning / fire, lightning strikes, vandalism or vehicle contact, and contamination or foreign objects (for example, salt / pollution, insects / spiders).
- Redundant or obsolete construction – assess whether any luminaire or control equipment (PE cell, chokes, control point) is obsolete / redundant.

11) Perform a visual inspection of earthing arrangements (without removing battens or covers) for defects including, but not limited to, the following:

- Earthing degradation – examine all earth downleads and mid-pole earth bars for corrosion (including fasteners and connections), secure fixing to the pole, loose or overheating connections, stranding / breakages, deterioration of the conductor insulation or covering, cracking / tracking / surface degradation of stand-off insulators, loose or disconnected earth connections, and earth downleads that have fully detached from the pole. Record broken earth downleads.
- Batten / cover degradation – examine earthing system battens and covers for rot, fungal decay, termites, cracks / splits, UV degradation (plastic covers), secure fixing to the pole, corrosion (fasteners, conduits), and battens or covers that have fully detached from the pole or are missing. Record earthing systems with missing / detached battens or covers from ground level to approximately 2.4m above ground level.
- Damage and contamination – examine all earth system components for breakage or damage due to burning / fire, lightning strikes, vandalism or vehicle contact, and contamination or foreign objects (for example, termites, bird nests, insects / spiders). Record damaged earth downleads.
- Redundant or obsolete construction – assess whether the earthing components are obsolete / redundant.

  **Note:** Asset Inspectors shall not attempt to repair loose, broken or damaged earth system components as full phase to earth voltages may be present.

12) Perform a visual inspection of UGOH's (including relays / indicators) for defects including, but not limited to, the following (without removing covers or excavating):

- Cable cover degradation – examine the mechanical protection for the cable (cable covers, conduits) for corrosion (including fasteners), UV degradation (plastic conduits),

secure fixing to the pole, loose or disconnected earth connections (where fitted), and exposed cables at ground level.

**Note:** Asset Inspectors shall not attempt to repair loose or broken earth wires.

- Cable degradation – examine attached cables for corrosion (including cable armour, saddles, fasteners), UV degradation, secure fixing to the pole, and splits / rot (timber cleats). Also examine for clearance between the cable and the top of the cable cover (that is, the cable is not rubbing against the top edge of the cable cover).
- Cable termination degradation – examine pot heads, sealing ends and terminations for corrosion (including brackets, fasteners), leaking compound / bitumen (pot heads, sealing ends), UV degradation (polymeric terminations), secure fixing to the bracket / pole, loose or overheating connections, conductor breakage / disconnection at terminations, and cracking / tracking / surface degradation on insulators and surge arrestors.
- Shrouds and animal-proofing - examine insulator and surge arrestor shrouds and conductor animal-proofing for degradation, damage, secure fitting and missing shrouds or animal-proofing (not installed where they should be installed).
- Damage and contamination – examine all UGOH components for breakage or damage due to burning / fire, lightning strikes, vandalism / third party / vehicle impact, and contamination or foreign objects (for example, branches, salt, insects, bird nests, fauna).
- Redundant or obsolete construction – assess whether the UGOH components are obsolete / redundant.

13) Perform a visual inspection of all warning signs for defects including, but not limited to, the following:

- Degradation – examine all warning signs for corrosion (including support posts / brackets and fasteners), secure fixing to the bracket / post / pole, vegetation or other encroachments expected to restrict or block sighting of the sign, legibility / fading, correct alignment, and presence (that is, installed where it should be installed).
- Record the ‘as found’ front face of water crossing signs for overhead lines and submarine cables.
- Cable coverage – examine cable routes adjacent to submarine cable warning signs for exposed (uncovered) cables.
- Damage and contamination – examine all warning signs for breakage or damage due to burning / fire, lightning strikes, flooding, vandalism / third party contact, and contamination or foreign objects (for example, salt, pollution, debris).
- Redundant or obsolete construction – assess whether the warning signage is suitable for its current location or is obsolete / redundant.

  **Note:** warning signage includes aircraft warning signs / discs affixed to poles and overhead line (refer to Clause B7), antenna / RF hazard warning signage (refer to NS102), ‘Danger’ signs for pole-top plant (refer to relevant Network Standards or standard drawings) and water crossing signs (refer to NS268).

14) Perform a visual inspection of all overhead lines, poles and attachments for the following:

- Third party asset placement, detachment or damage that may encroach upon the conductor clearances, cause consequential damage to Ausgrid’s network, or pose a risk to the Ausgrid staff or the public.

  **Note:** third party assets include communications cables, service UGOH’s, antennas, signs and banners, special small services, traffic signals, street signs, security cameras operated by Councils and the like.
- Unauthorised attachments on the pole. Where doubt exists about the authorisation of an attachment, contact the nominated Ausgrid representative.

  **Note:** unauthorised attachments include advertisements, political placards, services / conduits, basketball rings, personal security cameras, personal antennas, or cables.

- Any attachments, fittings, trees or structures in the vicinity of the pole or on the pole which may facilitate climbing of the pole or access to overhead lines by unauthorised persons. Refer to NS128 for further information on prevention of unauthorised access to poles.

## D3 Finalising the Inspection Process

After the line inspection procedure has been completed, the inspection process shall be finalised as follows:

1) Record (photograph) the following:
   - Overhead line and submarine cable water crossing signs 'as found';
   - Identified defects (excluding missing pole caps).
   - Unauthorised attachments (including advertisements or political placards greater than 2m above ground level) and evidence of suspected or identified unauthorised access.
2) Record inspection results and create defect records (including conductor clearance violations) in the Ausgrid Asset Management System. This shall be performed using relevant forms (refer to Annexure W) or direct entry into a MAM device.
3) Determine the initial prioritisation of defect repairs according to the Ausgrid Defect Catalogue. Refer to Clause D4.

Overhead lines posing imminent safety, environmental or bushfire risks (including severed / stolen earth downleads) shall be reported immediately to the nominated Ausgrid representative, or Ausgrid's Emergency Line (13 13 88) when the nominated Ausgrid representative cannot be contacted.

## D4 Defect prioritisation

### D4.1 General requirements

The Ausgrid Defect Catalogue provides detailed information for prioritisation of asset defects however other factors may influence the defect repair priority for overhead lines and poles. Factors which are identified as being relevant to the defect repair prioritisation shall be recorded in the defect record.

### D4.2 Pole configuration

The configuration of the circuits on a pole may have an influence on the risk assigned priority for a defect. This is because under different circuit configurations, different conductor loading and forces are applied to the pole, crossarms, insulators and terminations. For the purpose of defect risk prioritisation, pole circuit configurations can be grouped into four main types.

For termination pole configurations, the resultant force is in the direction of the circuit as shown in the diagram below. The loading on a termination pole is due to any wind loading and the tension in the conductors. The maximum resultant load is directed away from the pole in the direction of the conductors (i.e. in this case to the right of the pole and crossarm). A defect on a termination pole may require a higher repair priority to be assigned than a straight-line pole configuration due to the unbalanced forces applied to the pole and crossarm(s).

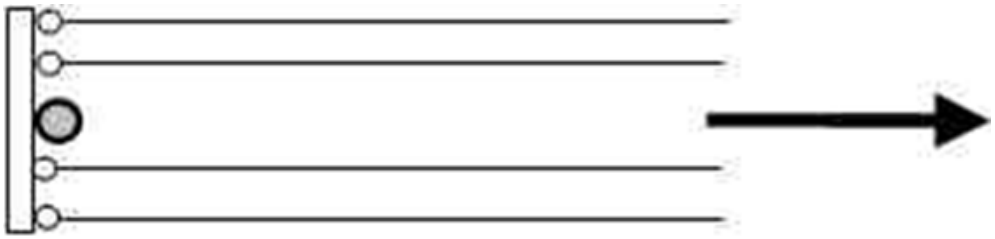


**Figure 27 – Termination pole configuration**

A pole in a straight-line ('intermediate') configuration will have longitudinal forces on either side of it that will cancel each other out (assuming the loading on each circuit is the same). This results in the sustained load on a straight-line pole being zero. Any resultant force will be due to transverse wind loading or service mains that may be attached and will generally be comparatively small and at right angles to the line.

Assuming the worst-case wind direction at right angles to the conductors, the maximum resultant load will also be at right angles to the conductors. If service mains are present the loading will be a combination of the wind forces and tension in the service mains.

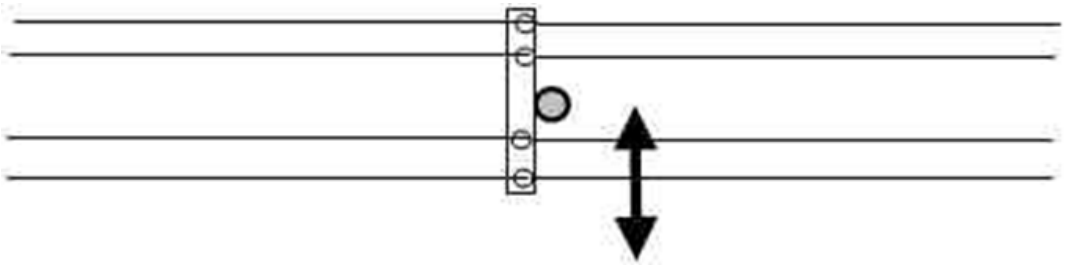


**Figure 28 – Straight-line pole configuration**

For deviation angle, corner, tee-off and complex pole configurations the resultant force on the pole will be the sum of the force vectors for each circuit, and non-zero. A diagram showing the resultant force in each of these cases is shown below.

As with the termination pole configuration, depending on the type of defect, if a pole is in any of these configurations where the sustained load is non-zero they may require a higher repair priority to be assigned than a straight-line pole configuration due to the unbalanced forces applied to the pole and crossarms.

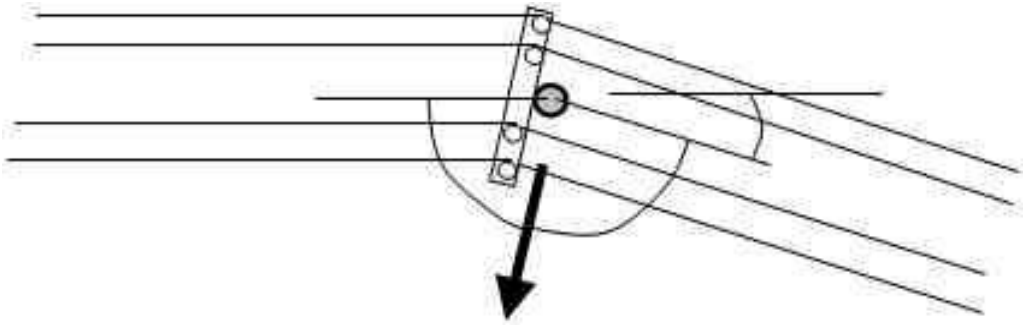


**Figure 29 – Deviation angle pole configuration**

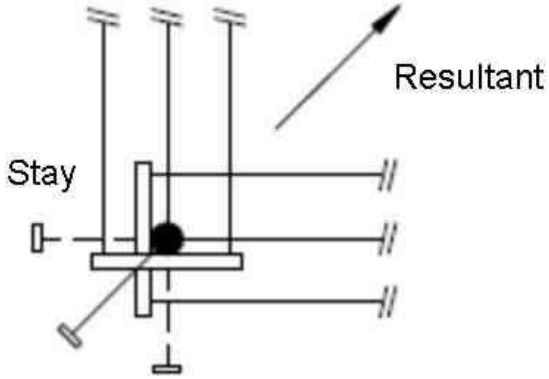



**Figure 30 – Corner pole configuration**

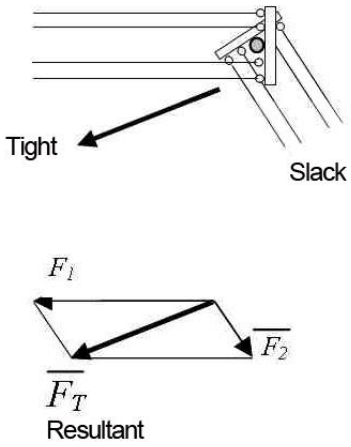



**Figure 31 – Complex pole configuration**

For athwartship pole configurations the conductor tension is the same in all directions. This results in an athwartship pole having no specific neutral axis, and the loading on the pole is effectively zero. A defect on a pole that is in an athwartship pole configuration could be assigned a 'lower' repair priority than the same defect on a straight-line pole configuration. This is due to the nature of the balanced loading on the pole in both directions.

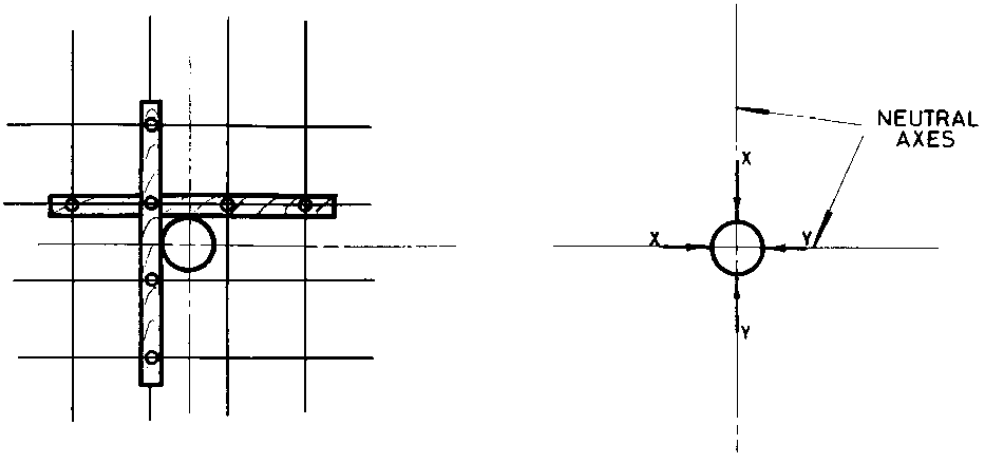



**Figure 32 – Athwartship pole configuration**

## D4.3 High priority areas (HPA)

The repair priority assigned to a defect may also be influenced by site-specific factors related to assumed increased exposure to a defect risk, or an increased likelihood of a defect risk occurring. Refer to Clause D4.4 for information regarding bushfire prone areas.

Factors assumed to increase exposure to the risk that a defect poses, and which may influence defect prioritisation include, but are not limited to, the following:

- Locations with high volumes of pedestrian or public activity (for example schools, pedestrian crossings, sports fields, areas where people congregate and commercial areas).
- Locations adjacent to or over roads with high volume or fast traffic flow.
- Locations adjacent to or over railways.

Factors assumed to increase the likelihood of a defect risk occurring (for example, contact with low mains) include, but are not limited to, the following:

- Locations where the public or workers undertake climbing or other work activities (for example construction sites, rail yards, livestock yards).
- Locations where large / high / extendable vehicles or plant operate (for example irrigation areas / equipment, mining or logging operations, construction sites, high load traffic routes).
- Locations where boats are launched or operated (including boat ramps, marinas).

### D4.4 Bushfire prone areas (BPA)

The repair priority assigned to a defect may additionally be influenced by:

- The bushfire risk category for the defect location, and
- Whether the defect priority results in repair requirements within the nominal bushfire danger period.

'Bushfire prone' land maps are prepared by local councils (including bushfire risk categorisation) prior to the bushfire danger period and are certified by the Commissioner for the NSW Rural Fire Service (RFS). Ausgrid overlays these land maps with its geospatial asset information to identify assets located in bushfire prone areas. The bushfire danger period extends from (depending on the area)

- the 1st of September to the 31st of March in the next year, or
- the 1st of October to the 31st of March in the next year.

Defects identified in BPA's shall be assessed as to whether a failure of that component in its current location (including the effects of wind and adverse weather) would be capable of starting a bushfire and the 'system effect' determined. The system effect shall be selected from the following and recorded in the defect record:

- **Effect (1) – "No Effect"** when the defect does not pose a genuine risk of igniting a bushfire.
- **Effect (2) – "In Service – Limited Operation"** when the defect poses a genuine risk of igniting a bushfire and is currently in service with limited operation. This option can be used to better describe the state of the network if applicable.
- **Effect (3) – "In Service – Bushfire Risk"** when the defect poses a genuine risk of igniting a bushfire and is currently in service.
- **Effect (4) – "Out of Service"** when the defect does not pose a risk of igniting a bushfire and is out of service.

  **Note:** A blank system effect field in a defect record in a bushfire area by default indicates that a risk assessment has not been completed.

# Annexure E: Timber Poles (Unreinforced) - Inspection Process

## E1 General Requirements

The pole inspection procedure for unreinforced timber poles consists of:

- Implementation of appropriate safety precautions according to Annexure A .
- Above groundline visual inspection and sounding according to Clause E2.
- Partial excavation, internal inspection and assessment according to Clause E3.
- Full excavation, below ground inspection and strength assessment according to Clause E3.
- Inspection finalisation according to Clause E4.

Poles which have a Termite Tag with all three segments ('T' 'T2' and 'T1') still attached identifies the pole as currently being under treatment. These poles shall not be inspected without confirmation from the nominated Ausgrid representative that the inspection shall proceed. Refer to Annexure N11 for further details of the 'Termite Tag'.

A pole with a Termite Tag consisting of only the top, or top and second segment, ('T', or 'T' and '$T_2$)' attached indicates termite treatment has been performed and initial control achieved, and full pole inspection shall be performed.

Where fire mesh has been installed on the pole to be inspected, refer to Clause B5.

Defective poles that are supported by being attached to a new (replacement) pole, shall not be inspected or treated, except for treatment for active termites.

Defective poles that are not attached to a new (replacement) pole shall not be inspected without confirmation from the nominated Ausgrid representative that the inspection shall proceed.

Asset Inspectors shall report any immediately dangerous defects to the nominated Ausgrid representative.

## E2 Above Ground Inspection Process

### E2.1 General Requirements

Where termite activity is detected, it shall be determined if termites are active (present in the pole) according to Annexure G. If termites are active in the pole and a termiticide dust or bait is to be applied, perform the restricted inspection, sounding and excavation process outlined in Clause G4.1. Where there are no active termites, or if active termites have been sighted and a liquid termiticide will be used to treat the termites, continue with the full above ground inspection as detailed below.

### E2.2 Above Ground Inspection Procedure

The above ground inspection procedure for timber poles shall be performed as follows:

1) Implement safety precautions according to Annexure A.
2) Perform a visual inspection of the full length of the pole (without climbing) for signs of termites according to Annexure G.
3) Remove any advertising material from the surface of the pole. If active termites are found while removing the advertising material, fully remove the advertising material and perform the restricted inspection, sounding and excavation process according to Clause G4.1.
4) Remove all protruding fasteners (including nails) from the surface of the pole. Where many fasteners such as nails and staples exist on the surface of the pole, they may be driven flat to remove the hazard, rather than completely removing each fastener.
5) Perform a visual inspection of the full length of the pole (without climbing) for the following external defects (refer to Clause E5):
    - Depth in Ground - look for evidence of pole movement at ground level and evidence on the pole of an old 'ground level' mark or 'high tide' mark to indicate that the pole is no longer as deep in ground as originally installed. The pole disc also provides a reference for the original ground level (refer to Clause B1).

- Vertical alignment (lean) - where a pole is leaning, the angle of the lean must be accurately measured using a digital level. Estimates of lean taken by eye or measurement using a mobile phone app will not be accepted. Where a pole is identified as leaning excessively (ie, more than 10 degrees from the vertical position) look for causes of the leaning – causes may include subsidence, erosion or alterations to the natural ground level.
- Fire damage – look for evidence of fire damage to the pole, including the areas where cross arms are mounted. Assess the depth of damage into the timber (for example, is it just surface charring or has it penetrated through the sap wood). Where fire damage is identified on CCA treated timber poles, refer to Annexure L.
- Fire mesh – if fire mesh has been installed on the pole, look for evidence of damage or vandalism to the fire mesh and evidence that it has been affected by fire. Report fire mesh defects or damage to the nominated Ausgrid representative.
- Third party damage – look for evidence of damage caused by vehicles (bites in the timber), unauthorised attachments, vandalism, or graffiti. Record the size of any bite on the DPA sheet.
- Fungal decay – look for brown rot, white rot, soft rot and white pocket rot.
- Fruiting bodies - look for decayed timber and fruiting bodies on the pole. Where fruiting bodies are identified which can be reached from ground level, the pole is to be sounded in that region of the pole and an internal inspection carried out where the defect is largest. If a fruiting body is identified anywhere on the pole, the pole shall be inspected in the groundline area with additional diligence. Above ground fruiting bodies shall be reported to the nominated Ausgrid representative and the defect recorded in the DPA sheet.
- Knot holes, grub holes, and checks – look for knot holes, grub holes or checks anywhere on the surface of the pole. Also look for termite flight holes in the groundline region and determine if they are borers or possible Glyptotermes species termites (refer to Clause G2.1).
- Pole head degradation - look for any splitting at or near the top of the pole. This includes splitting which extends through the full diameter at or near the centre of the pole, or which is in line with or extends past attachment bolts, or which is greater than 10mm wide.
- Pole bending – look for excessive curvature or bending of the pole.
- Stays – check that the stay has a firm footing in the ground. Perform a visual inspection for defects including corrosion of the steel rod. Check that the stay wire is tight and look for broken wire strands and corrosion at the anchor attachment as well as at the attachment to the insulator. If corrosion is evident on the steel rod near or at groundline, excavate to a depth of 200mm to assess the extent of corrosion. Where corrosion is identified, assess the steel condition according to Clause 6.5.
- Paint - de-sapped durable and natural round wood poles (i.e. poles other than CCA treated poles) shall not be painted.

6) Sound the pole above groundline according to Annexure H.

7) Except for CCA impregnated poles, decayed and loose wood up to 2 metres above ground shall be removed with an axe. Care shall be taken not to damage the heartwood with the axe. Where loose sapwood exists on any timber pole above 2 metres that is considered hazardous, report the pole to the nominated Ausgrid representative and record the defect on the DPA sheet.

8) Measure and record the original diameter of the pole ('$D_0$') in the groundline area according to Clause I2.

9) Measure and record the reduced diameter of the pole ('$D_1$') at any location above ground where a defect has been located according to Clause I3.

10) Inspect the timber where sounding indicates a defect exists noting the following:

- Where the defect is external, inspect the pole according to Clause E5, or

- Where the defect is internal, inspect the pole according to Annexure J.

11) If an internal defect or reduced diameter has been identified during the above ground inspection, calculate the internal defect diameter ‘d’, minimum wall thickness and residual strength of the pole according to Annexure K.

12) Compare the above ground inspection results against the serviceability and wall thickness criteria in Clause 5.5 to determine whether the pole is defective prior to excavation and below ground inspection. If the pole does not meet the safe to excavate criteria in Clause E3.1, finalise the pole inspection according to Clause E4.

## E3 Excavation and Below Ground Inspection Process

The objective of the below ground inspection procedure is to subject each pole (where it is safe to do so) to a thorough inspection between groundline and 350mm below groundline. This section of the pole is commonly referred to as the critical zone because it is subject to the most bending load and generally suffers the greatest degradation due to the relative moisture and oxygen levels in this layer of soil.

Extreme caution shall be exercised when excavating around poles. It shall not be assumed that attached cables or services (including earth cables) enter vertically from a depth below 350mm or perpendicular to the pole from an adjacent asset, or that any cable is clear of the remaining inspection area around the pole. These cables can be easily damaged by digging implements and this may cause a hazardous situation. Refer to Clause U1 and NS156 for further details.

Full excavations on poles shall be performed in such a way that a thorough testing of the pole can be performed using the rounded point bar from groundline down to 350mm below groundline. No concrete (kerbs excepted), tree roots or other obstructions shall be in contact with the pole or be in a position that prevents correct use of the rounded point bar. Concrete kerbs and services such as storm water pipes shall not be damaged.

Concrete kerbs shall not be cut or damaged. Poles installed close to concrete kerbs shall be carefully probed in the area facing the kerb because this area will retain moisture and is more likely to suffer fungal decay damage than other areas around the pole.

Obstructions that are hard up against the below ground portion of the pole such as cables, cable covers, pipes and kerbs will help adjacent timber stay moist and will prevent good application of the fungicidal treatment. This means the timber adjacent to these obstructions may degrade faster than other areas of the pole and it shall be carefully inspected for decay without damaging the obstructing asset. All soil shall be removed from around these obstructions fully exposing the asset and the adjacent timber and then the timber shall be probed with the rounded point bar. Refer to Annexure A for safety precautions when excavating around poles and attachments, and Clause U1 for excavation procedures.

### E3.1 Safe to Excavate Criteria

Excavation and below ground inspection shall only be performed if the pole meets all of the following criteria;

- The calculated residual strength from the above ground inspection results is equal to or greater than 25%, and
- Coptotermes species termites have not been located, and
- The pole is not considered to be loaded close to or beyond its structural capacity (indicated by excessive lean or bending of the pole), and
- Any reduction in pole diameter does not equal or exceed 20% (1/5) of the original diameter; and
- Pole stability will not be affected by, or suspected to be affected by, excavation of the pole.

If a pole is identified as potentially unsafe prior to excavation or during excavation:

- Do not proceed with excavation of the pole – finalise the pole inspection according to Clause E4, and
- Report the potentially unsafe pole immediately to the nominated Ausgrid representative.

## E3.2 Partial Excavation Procedure

The partial excavation and initial below ground inspection procedure for timber poles shall be performed as follows only when the above ground inspection indicates that it is safe to proceed (refer to Clause E3.1):

1) If considered safe, select the location in the neutral axis (refer to Annexure C) on one side of the pole to undertake the internal inspection (drilling) taking into account the location of any attachments such as Underground to Overhead (UGOH) cables, so that drilling will not be carried directly towards them.
2) At the location chosen for the internal inspection, expose the groundline area adjacent to the neutral axis. This may require removal of paving tiles or cutting of concrete at ground level or below ground level.
3) Excavate to a depth of 100mm below groundline in the neutral axis according to Clause U1 - only remove material sufficient to allow an internal inspection to be carried out.
4) Inspect for termite activity in the excavation, the pole and the excavated soil according to Annexure G while performing the excavation. Take note if active termites are sighted and complete a Termite Treatment Report Form (refer to Clause 2.4 and Annexure W) and install a 'Termite Tag' according to Clause N11. The initial below ground inspection shall continue even if active termites have been identified in the partial excavation, but no sounding or additional excavation shall be carried out, other than that necessary to prove the integrity of the pole (refer to Clause G4.1).
5) Expose the timber in the partial excavation according to Clause E6.
6) Perform a visual inspection of the exposed section of the pole for the following external defects (refer to Clause E5) and determine the extent of any external defect:
    - Fungal decay – look for brown rot, white rot, soft rot and white pocket rot.
    - Knot holes, grub holes, and checks.
    - Reduction in the pole diameter (waist) – measure the reduction in diameter in the exposed section of the pole assuming any reduction in diameter continues completely around the circumference of the pole. This shall be the 'assumed' reduced diameter if excavation on the opposite side of the pole does not need to be performed. Any reduction on one side of the pole shall not exceed 10% of the original diameter.
7) If defects are found, sound the pole according to Annexure H.
8) Where identified external defects appear to extend beyond the exposed area of the pole circumference, excavate to a depth of 100mm below groundline in the neutral axis on the opposite side of the pole and repeat the visual inspection for defects and sounding where defects are identified.
9) Where both sides of the pole have been excavated, measure and record the reduced diameter '$D_1$' (refer to Clause I3).
10) If '$D_1$' is not equal to or greater than 20% of the original diameter and the assessment of the pole based on the visual inspection and sounding indicates that the pole is not dangerous, identify the preferred location for performing an internal inspection. If the chosen preferred location has an existing inspection hole;
    - bore the new hole 100mm below the existing inspection hole, or on the opposite side of the pole; or
    - bore 50mm to the side of previous locations if internal inspections have already been carried out in these locations.
11) Perform an internal inspection according to Annexure J to determine the diameter of internal defects and the wall thickness. Record the results. If termite flight holes have been found in the groundline region that may be due to Glyptotermes species termites - pay particular attention when drilling for the characteristic 'good wood / bad wood' effect of a Glyptotermes infestation.

12) If external or internal defects have been identified, calculate the residual strength of the pole according to Annexure K based on the defect diameter 'd' and the relevant reduced diameter as below, and record the results.

- If only one side of a pole has been excavated, multiply the diameter reduction measured on that side by 2, or
- When both sides of a pole have been excavated, use the actual reduced diameter measured.

13) Compare the initial below ground inspection results against the safe to excavate criteria in Clause E3.1 to determine whether it is safe to proceed. If it is deemed not safe to proceed, finalise the pole inspection according to Clause E4.

14) Mark the pole immediately above groundline using yellow crayon, pointing down to the location of the below ground inspection hole(s) that have been drilled during the current inspection.

## E3.3 Full Excavation and Below Ground Inspection Procedure

The full excavation and below ground inspection procedure for timber poles shall be performed as follows only when the partial excavation inspection indicates that it is safe to proceed (refer to Clause E3.1):

1) Fully excavate around the pole to a depth of 350mm according to Clause U1.

2) Inspect for termite activity in the excavation and the excavated soil while performing the excavation according to Annexure G. Take note if active termites are sighted and complete a Termite Treatment Report Form (refer to Clause 2.4 and Annexure W) and install a 'Termite Tag' according to Clause N11. The inspection shall continue even if active termites have been identified in the full excavation, because in excavating it is likely that subterranean galleries have probably been dug up and considerable disturbance of the termites has already occurred.

3) Remove the Bioguard Bandage and dispose of it according to Clause M3.3.

4) Clean the areas of the pole that are not supporting electrical assets according to Clause E6. Areas adjacent to electrical assets shall be carefully cleaned according to the requirements of Clause U1.3.

   Any sapwood remaining on the below ground surface of the pole (except full length pressure treated poles including CCA and creosote) shall be fully removed unless it is firmly attached to the pole and cannot be cut away without damaging the heartwood. This includes sapwood where decay exists between the sapwood and the heartwood – this shall be removed completely from the below G/L area, or back to the point where there is no separation between the heartwood and sapwood. Where a separation has occurred between the sapwood and heartwood, moisture will be retained, and it may hide fungal decay or termite activity protected from the applied remedial treatment.

5) Use a rounded point bar to test the soundness of the exposed timber down to 350mm below ground according to Clause H2.2.

6) Where a timber pole is affected with fungal decay at a depth greater than 350mm continue with the excavation to 400mm below ground. If decay is found below 400mm, immediately report the pole to the nominated Ausgrid representative.

7) Measure the reduced diameter $D_1$ of the pole according to Clause I3.

8) Perform an internal inspection according to Annexure J where any suspected internal defect is identified by sounding and record the result.

## E4 Finalising the Inspection Process

After the above ground and below ground inspection procedures have been completed, the inspection process for timber poles shall be finalised as follows:

1) When termites have been located during the inspection, apply termite treatments according to Annexure N.

2) Perform preservative treatment of inspection holes and defect holes according to Clause M2.1 , and preservative treatment of knot holes, grub holes and checks according to Clause M5.
3) Perform a below ground preservative treatment according to Clause M3.
4) Record (photograph) the following external defects:
    - Evidence of active termites.
    - Pole lean, pole bending or evidence of pole movement at groundline.
    - Fire and third-party damage, including fire mesh and painted poles.
    - Pole head degradation (excluding missing pole caps).
    - Fungal decay, fruiting bodies, knot holes, grub holes and checks.
    - Stay wire and anchor defects.
5) Seal above ground and below ground inspection holes and defect holes according to Annexure P.
6) Restore the excavation according to Clause U2.
7) Calculate the internal defect diameter ‘d’, minimum wall thickness and residual strength of the pole as follows and according to Annexure K.
    - At 100mm below groundline (if it was not calculated during the partial excavation), and
    - Where other internal defects are identified further below ground.
8) Compare the above ground and below ground inspection results and residual strength values against the serviceability and minimum wall thickness criteria in Clause 5.5 and Clause 5.6 to assess whether the pole remains serviceable or corrective action is required.
9) If the pole was assessed at any stage as defective, clearly mark the pole as defective (condemned or conditionally serviceable) according to Annexure V and complete a ‘Defective Pole Action’ sheet or ‘Head of Pole Action’ sheet and enter details into SAP.
10) Record pole inspection results and defects in the Ausgrid Asset Management System. This shall be performed using relevant forms (refer to Annexure W) or direct entry into a MAM device.

If the pole appears to be loaded close to or beyond its available capacity (indicated by excessive pole lean or bending of the pole), or appears to be in danger of collapse, it shall be reported immediately to the nominated Ausgrid representative.

### E5 Inspection of External Defects on Timber Poles

When inspecting for external defects, all defective timber, dirt or other covering material shall be removed so the full extent of any defect is revealed and can be measured. Pay particular attention to areas under loose sapwood because fungal decay commonly proliferates in these areas.

Sound timber shall not be removed to get to the fungal decay nor shall sound timber be removed to retain a symmetrical appearance. Every effort shall be made to avoid the ‘hourglass’ effect by tapering off chipped areas. Where it is difficult to determine the extent of deep external pockets of rot without damaging adjacent sound timber, a drill shall be used to probe and measure the extent of the defect.

If any external decay is found on a CCA impregnated pole less than 15 years old (based on the disc date), it shall be immediately reported to the nominated Ausgrid representative so the pole can be reported as a ‘failed pole’ according to the requirements of Technical Guide T0001. Complete a Defective Pole Action sheet. The pole shall not be scraped or cleaned with any tool at this time, however the remaining tasks of the inspection process shall be carried out.

Once the full extent (depth) of a defect is exposed, measure and record the reduced diameter of the pole in that location ‘$D_1$’ according to Clause I3. All measurements are to be recorded on the Defective Pole Action sheet and in SAP.

### E6 Cleaning and Removal of External Decay from Timber Poles

Cleaning poles and removal of decayed material from the outside of wood poles shall be undertaken with any appropriate tool provided the following requirements are met:

- sound timber the defect shall be explored using the drilling method (internal inspection). Untreated sapwood, as found on natural round poles, is not sound timber.
- Below ground soil build up shall be removed to allow inspection and treatment.
- The extent of external defects shall be fully explored to allow an accurate assessment of the residual strength of the pole.
- Termite damage shall be managed according to Annexure G.
- The chisel-end of the rounded point bar may be used where appropriate. Precautions shall be put in place to protect persons and property from the rounded point while the chisel-end is in use.
- Loose dirt and other material shall be removed prior to the installation of any external below ground remedial treatment (e.g. Bandage containing fungal chemical treatment).

Refer to Clause U1 for further details on excavating around poles.

# Annexure F: Timber Poles (Reinforced & Composite) - Inspection Process

## F1 General Requirements

The pole inspection processes for reinforced and composite timber poles consists of:

- Implementation of appropriate safety precautions according to Annexure A .
- Above groundline visual inspection and sounding according to Claus F2.2 or F3.2.
- Partial excavation according to Clause F2.4.
- Full excavation, below ground inspection and strength assessment according to Clause F2.5.
- Inspection finalisation according to Clause F2.6 or F3.3.

Reinforced timber poles are inspected above ground in a similar manner to unreinforced timber poles. Excavation and below ground inspection is performed on all Ausmose splinted poles however, excavation and below ground inspection on other splinted and nailed reinforced poles is only required if defects on the splint or nail are evident at, or near, groundline. Composite timber poles do not require excavation. Preservative treatment is not required on reinforced timber poles and composite timber poles as the reinforcement or steel caisson provides support to the pole in areas where the preservative treatments are intended to be effective in extending the life of a pole. Where fire mesh has been installed on the pole to be inspected, refer to Clause B5.

The critical area for inspecting reinforced timber poles is near the top of the reinforcing steel and the area of the pole near the top and bottom securing band or bolts. It is essential that adequate sound timber exists in these areas.

Extreme caution shall be exercised when excavating around poles. It shall not be assumed that attached cables or services (including earth cables) enter vertically from a depth below 350mm or perpendicular to the pole from an adjacent asset, or that any cable is clear of the remaining inspection area around the pole. These cables can be easily damaged by digging implements and this may cause a hazardous situation. Refer to Clause U1 and NS156 for further details on excavating near underground cables.

Where excavation is required according to the following Clauses, concrete kerbs shall not be cut or damaged. Poles installed in close proximity to concrete kerbs, or which have obstructions such as cables, cable covers or pipes hard up against the below ground portion of the pole shall be carefully probed in the area facing the kerb because this area will retain moisture and is more likely to suffer fungal decay damage than other areas around the pole. Refer to Annexure A for safety precautions when excavating around poles and attachments, and Clause U1 for excavation procedures.

Defective poles that are supported by being attached to a new (replacement) pole, shall not be inspected or treated, except for treatment for active termites.

Timber poles reinforced with Ausmose Oz C splints, composite timber poles and defective poles that are not attached to a new (replacement) pole shall not be inspected without confirmation from the nominated Ausgrid representative that the inspection shall proceed. All timber poles reinforced with Ausmose Oz C splints and composite timber poles shall be marked as defective to initiate their replacement, irrespective of the inspection outcomes.

Asset Inspectors shall report any immediately dangerous defects to the nominated Ausgrid representative.

## F2 Splinted and Nailed Reinforced Poles Inspection Process

### F2.1 Description

Splinted and nailed reinforced poles shall be inspected above ground in a similar manner to unreinforced poles. Full excavation and below ground inspection shall be performed on all poles reinforced with Ausmose Oz-C splints - all other splinted or nailed reinforced poles only require partial excavation to assess the condition of the splint or nail below groundline. Refer to Clause B4 for further details on reinforcing splints and nails used on Ausgrid poles.

The critical areas for splinted or nailed reinforced poles are the area near the top of the reinforcement and the areas where reinforcing bands or bolts are installed. Pay particular attention to these areas when performing the inspection.

## F2.2 Above Ground Inspection Procedure

The above ground inspection procedure for all splinted and nailed reinforced timber poles shall be performed as follows:

1) Implement safety precautions according to Annexure A.
2) Perform a visual inspection of the full length of the pole (without climbing) for signs of termites according to Annexure G. Pay particular attention along the edges of the splint or nail for evidence of termite infestation.
3) Remove any advertising material from the surface of the pole. If active termites are found while removing the advertising material, fully remove the advertising material and perform the restricted inspection, sounding and excavation process according to Clause G4.1.
4) Remove from the surface of the pole, all protruding fasteners (including nails). Where many fasteners such as nails and staples exist on the surface of the pole, they may be driven flat to remove the hazard, rather than completely removing each fastener.
5) Perform a visual inspection of the full length of the pole (without climbing) for the following external defects (refer to Clause F4):
    - Depth in Ground - look for evidence of pole movement at ground level and evidence on the pole of an old ‘ground level’ mark, or ‘high tide’ mark to indicate that the pole is no longer as deep in ground as originally installed. The pole disc also provides a reference for the original ground level (refer to Clause B1).
    - Vertical alignment (lean) - where a pole is leaning, the angle of the lean shall be accurately measured using a digital level. Estimates of lean taken by eye or measurement using a mobile phone app will not be accepted. Where a pole is identified as leaning excessively (ie, more than 10 degrees from the vertical position) look for causes of the leaning – causes may include subsidence, erosion or alterations to the natural ground level.
    - Fire damage – look for evidence of fire damage to the pole, including the areas where cross arms are mounted. Assess the depth of damage into the timber (for example, is it just surface charring or has it penetrated through the sap wood). Where fire damage is identified on CCA treated timber poles, refer to Annexure L.
    - Fire mesh – if fire mesh has been installed on the pole, look for evidence of damage or vandalism to the fire mesh and evidence that it has been affected by fire. Report fire mesh defects or damage to the nominated Ausgrid representative.
    - Third party damage – look for evidence of damage caused by vehicles (for example, bites in the timber, deformed reinforcement), unauthorised attachments, vandalism, or graffiti. Record the size of any bite on the DPA sheet.
    - Fungal decay – look for brown rot, white rot, soft rot and white pocket rot.
    - Fruiting bodies - look for decayed timber and fruiting bodies on pole. Where fruiting bodies are identified and can be reached from ground level, the pole is to be sounded in that region of the pole and an internal inspection carried out where the defect is largest. If a fruiting body is identified anywhere on the pole, the pole shall be inspected in the groundline and reinforced area with additional diligence. Above ground fruiting bodies shall be reported to the nominated Ausgrid representative and the defect recorded in the DPA sheet.
    - Knot holes, grub holes, and checks – look for knot holes, grub holes or checks anywhere on the surface of the pole. Also look for termite flight holes in the groundline region and determine if they are borers or possible Glyptotermes species termites (refer to Clause G2.1).

- Pole head degradation - look for any splitting at or near the top of the pole. This includes splitting which extends through the full diameter at or near the centre of the pole, or which is in line with or extends past attachment bolts, or which is greater than 10mm wide.
- Pole bending – look for excessive curvature or bending of the pole.
- Stays – check that the stay has a firm footing in the ground and carry out visual inspection looking for defects including corrosion of the steel rod. Check that the stay wire is tight and look for broken wire strands and corrosion at the anchor attachment as well as at the attachment to the insulator. If corrosion is evident on the steel rod or at groundline, excavate to a depth of 200mm to assess the extent of corrosion. Where corrosion is identified, assess the steel condition according to Clause 6.5.
- Paint - de-sapped durable and natural round wood poles (i.e. poles other than CCA treated poles) shall not be painted. Where paint is found on these untreated wood poles it shall be reported to the nominated Ausgrid representative.

6) Inspect the steel splint or nail for corrosion or vehicle damage from groundline up. Where corrosion is identified, assess the steel condition according to Clause 6.5.
7) Inspect the securing bands or bolts for corrosion or damage. Where corrosion is identified, assess the steel condition according to Clause 6.5.
8) Check that the securing bands (where used) are holding the pole tightly against the reinforcement and that there is no movement in the bands.
9) Sound the pole above groundline according to Annexure H. If an external defect is identified, inspect the pole according to Clause F4.
10) Except for Copper Chrome Arsenate (CCA) impregnated poles, decayed and loose wood up to 2 metres above ground shall be removed with an axe. However, care shall be taken not to damage the heartwood with the axe. Where loose sapwood exists on any timber pole above 2 metres that is considered hazardous, report the pole to the nominated Ausgrid representative and record the defect in the DPA sheet.
11) Measure and record the original diameter of the pole ('$D_0$') at 200mm, 800mm and 1 metre above groundline according to Clause I2. Where 800mm and 1 metre above groundline is not adjacent to / in the vicinity of securing bands, perform the measurement at 200mm above groundline and 50mm above and below the top securing bands.
12) Measure and record the reduced diameter of the pole ('$D_1$)' at any location above the top of the splint or nail where a defect has been located according to Clause I3.
13) Perform an internal inspection for wall thickness at 200mm, 800mm and 1 metre above groundline to ascertain (measure) the remaining good wood in the vicinity of the reinforcement securing bands or bolts according to Annexure J. Where 800mm and 1 metre above groundline is not adjacent to securing bands, perform the internal inspection at 200mm above groundline and 50mm above and below the top securing bands. Use existing holes where possible or bore new holes if existing ones are inaccessible.
14) Perform an internal inspection according to Annexure J where any suspected internal defect is identified by sounding and record the result.
15) If an internal defect or reduced diameter has been identified above the reinforcement during the above ground inspection, calculate the internal defect diameter 'd', minimum wall thickness and residual strength of the pole according to Annexure K.
16) Compare the above ground inspection results against the serviceability and minimum wall thickness criteria in Table 1 in Clause 5.5 and in Clause 5.6 for reinforced poles to determine whether or not the pole is defective prior to excavation and below ground inspection. If the pole or reinforcement does not meet the safe to excavate criteria in Clause F2.3, finalise the pole inspection according to Clause F2.6.

## F2.3 Safe to Excavate Criteria

Excavation and below ground inspection shall only be performed if the pole meets all of the following criteria;

- The calculated residual strength at any location above the reinforcement is equal to or greater than 25%, and
- The timber wall thickness adjacent to the reinforcement is equal to or greater than the minimum allowable wall thickness according to Table 6 for splinted poles or Table 7 for nailed poles, and
- Coptotermes species termites have not been located, and
- The pole is not considered to be loaded close to or beyond its structural capacity (indicated by excessive lean or bending of the pole), and
- Reinforcing splints / nails or securing bands / bands do not have any steel condition rating of less than or equal to 30% according to Clause 6.5 and pole movement is not evident, and
- Any reduction in pole diameter at a height greater than 100mm above groundline does not exceed 20% (1/5) of the original diameter; and
- Pole stability will not be affected by, or suspected to be affected by, excavation of the pole.

If a pole is identified as potentially unsafe prior to excavation or during excavation:

- Do not proceed with excavation of the pole – finalise the pole inspection according to Clause F2.6, and
- Report the potentially unsafe pole immediately to the nominated Ausgrid representative.

## F2.4 Partial Excavation Procedure

Below ground inspection of splinted and nailed reinforced poles is primarily undertaken to assess the condition of the splint or nail however, for poles reinforced with Ausmose Oz-C splints the condition of the timber below ground also needs to be assessed when the pole is fully excavated.

The partial excavation and initial below ground inspection procedure for splinted and nailed reinforced poles shall be performed as follows only when the above ground inspection indicates that it is safe to proceed (refer to Clause F2.3):

1) Excavate the ground adjacent to the splint or nail to a depth of 100mm according to Clause U1.
2) Inspect for termite activity in the excavation and the excavated soil while performing the excavation according to Annexure G. Take note if active termites are sighted and complete a Termite Treatment Report Form (refer to Clause 2.4 and Annexure W) and install a ‘Termite Tag’ according to Clause N11. The initial below ground inspection shall continue even if active termites have been identified in the partial excavation, but no sounding or additional excavation shall be performed, other than that necessary to prove the integrity of the pole (refer to Clause G4.1).
3) Inspect the splint or nail for corrosion. Where corrosion is identified, assess the steel condition according to Clause 6.5 Table 8. If any steel condition rating of less than or equal to 30% according to Clause 6.5 is evident, finalise the pole inspection according to Clause F2.6.
4) Where corrosion of the splint or nail (excluding Ausmose Oz C splints) extends beyond 100mm below groundline, excavate further adjacent to the reinforcement to determine the extent of the defect. Do not excavate beyond a depth of 350mm below groundline.

## F2.5 Full Excavation and Below Ground Inspection Procedure

The full excavation and below ground inspection procedure for Ausmose Oz-C splinted reinforced timber poles shall be performed as follows only when the partial excavation and initial below ground inspection indicates that it is safe to proceed (refer to Clause F2.3):

1) Fully excavate around the pole to a depth of 350mm according to Clause U1.
2) Inspect for termite activity in the excavation and the excavated soil while performing the excavation according to Annexure G. Take note if active termites are sighted and complete a Termite Treatment Report Form (refer to Clause 2.4 and Annexure W) and install a ‘Termite Tag’ according to Clause N11. The inspection shall continue even if active termites have been

identified in the excavation, because in excavating it is likely that subterranean galleries have probably been dug up and considerable disturbance of the termites has already occurred.

3) Inspect the Ausmose Oz-C splint for rust / pitting and perforations or thinning of the steel cross-section from the bottom of the excavation to ground level. If scaling / pitted rust, perforations or thinning of the steel cross-section is evident, finalise the pole inspection according to Clause F2.6.

4) Remove the Bioguard Bandage (if installed) and dispose of it according to Clause M3.3.

5) Clean the areas of the pole that are not supporting electrical assets according to Clause E5.

   Areas adjacent to electrical assets shall be carefully cleaned according to Clause U1.3. Any sapwood remaining on the below ground surface of the pole (except full length pressure treated poles including CCA and creosote) shall be fully removed unless it is firmly attached to the pole and cannot be cut away without damaging the heartwood. This includes sapwood where decay exists between the sapwood and the heartwood – this shall be removed completely from the below groundline area, or back to the point where there is no separation between the heartwood and sapwood. Where a separation has occurred between the sapwood and heartwood, moisture will be retained, and it may hide fungal decay or termite activity protected from the applied remedial treatment.

6) Use a rounded point bar to test the soundness of the exposed timber down to 350mm below ground according to Clause H2.2.

7) Where a timber pole is affected with fungal decay at a depth greater than 350mm continue with the excavation to 400mm below groundline. If decay is found beyond 400mm below groundline, immediately report the pole to the nominated Ausgrid representative. Record the defect in the DPA sheet.

8) Measure the reduced diameter $D_1$ of the pole according to Clause I3.

9) Perform an internal inspection according to Annexure J where any suspected internal defect is identified by sounding and record the result.

### F2.6 Finalising the Inspection Process

After the above ground and below ground inspection procedures have been completed, the inspection process for splinted or nailed reinforced poles shall be finalised as follows:

1) When termites have been located during the inspection, apply termite treatments according to Annexure N.

2) Record (photograph) the following external defects:

   - Evidence of active termites.
   - Pole lean, pole bending or evidence of pole movement at groundline.
   - Fire and third-party damage, including fire mesh and painted poles.
   - Pole head degradation (excluding missing pole caps).
   - Reinforcement damage or degradation.
   - Fungal decay, fruiting bodies, knot holes, grub holes and checks.
   - Stay wire and anchor defects.

3) Seal above ground and below ground defect holes and inspection holes according to Clause M6 and Annexure P;

4) Restore the excavation according to Clause U2.

5) Calculate the internal defect diameter ‘d’, minimum wall thickness and residual strength of the pole according to Annexure K.

6) Compare the above ground and below ground inspection results against the serviceability and wall thickness criteria in Table 1 in Clause 5.5 and Clause 5.6 for reinforced poles to assess whether the pole remains serviceable or corrective action is required.

7) If the pole was assessed at any stage as defective, clearly mark the pole as defective (condemned or conditionally serviceable) according to Annexure V and complete a 'Defective Pole Action' sheet and enter details into SAP. Poles reinforced with Ausmose Oz C splints shall be marked as defective to prioritise their replacement irrespective of their inspection results.

8) Record pole inspection results and defects in the Ausgrid Asset Management System. This shall be performed using relevant forms (refer to Annexure W) or direct entry into a MAM device.

9) Report defects or defective poles to the nominated Ausgrid representative.

10) If the pole appears to be loaded close to or beyond its available capacity (indicated by excessive pole lean or bending of the pole), or appears to be in danger of collapse, it shall be immediately reported to the nominated Ausgrid representative.

## F3 Composite Timber Poles Inspection Process

### F3.1 Description

Composite timber poles consist of a timber pole that has the bottom portion of the pole replaced with a steel reinforced concrete stub and a sliding steel sleeve, or a concrete filled steel caisson (steel tube partially filled with concrete).

In both cases the timber pole is 'joined' to the concrete filled steel tube, or concrete stub with sliding steel tube, by placing the machined down section of the pole into the steel sleeve (sliding or fixed).

The critical area for composite timber poles is the section of timber within the steel sleeve. It is essential that sound timber exists in this area and that drain holes are not blocked as pooled water or moisture within the stub or tube will cause degradation of the timber.

### F3.2 Above Ground Inspection Procedure

The above ground inspection procedure for composite timber poles shall be performed as follows:

1) Implement safety precautions according to Annexure A.

2) Perform a visual inspection of the full length of the pole (without climbing) for signs of termites according to Annexure G.

3) Remove any advertising material from the surface of the pole. If active termites are found while removing the advertising material, fully remove the advertising material and perform the restricted inspection, sounding and excavation process according to Clause G4.1.

4) Remove from the surface of the pole, all protruding fasteners (including nails). Where many fasteners such as nails and staples exist on the surface of the pole, they may be driven flat to remove the hazard, rather than completely removing each fastener.

5) Perform a visual inspection of the full length of the pole above the steel sleeve (without climbing) for the following external defects (refer to Clause F4):

- Depth in ground - look for evidence of pole movement at ground level and evidence on the pole of an old 'ground level' mark, or 'high tide' mark to indicate that the pole is no longer as deep in ground as originally installed. The pole disc also provides a reference for the original ground level (refer to Clause B1).
- Vertical alignment (lean) - where a pole is leaning, the angle of the lean shall be accurately measured using a digital level. Estimates of lean taken by eye or measurement using a mobile phone app will not be accepted. Where a pole is identified as leaning excessively (ie, more than 10 degrees from the vertical position) look for causes of the leaning – causes may include subsidence, erosion or alterations to the natural ground level.
- Fire damage – look for evidence of fire damage to the pole, including the areas where cross arms are mounted. Assess the depth of damage into the timber (for example, is it just surface charring or has it penetrated through the sap wood).

- Third party damage – look for evidence of damage caused by vehicles (for example, bites in the timber), unauthorised attachments, vandalism, or graffiti. Record the size of any bite on the DPA sheet.
- Fungal decay – look for brown rot, white rot, soft rot and white pocket rot. Particularly inspect the machined-down timber immediately above the sleeve.
- Fruiting bodies - look for decayed timber and fruiting bodies on pole. Where fruiting bodies are identified which can be reached from ground level, the pole is to be sounded in that region of the pole and an internal inspection carried out where the defect is largest. If a fruiting body is identified anywhere on the pole, the pole shall be inspected within the steel sleeve with additional diligence. Above ground fruiting bodies shall be reported to the nominated Ausgrid representative and the defect recorded in the DPA sheet.
- Knot holes, grub holes, and checks - look for knot holes, grub holes or checks above the steel sleeve and record the defect in the DPA sheet. Also look for termite flight holes in the groundline region and determine if they are borers or possible Glyptotermes species termites (refer to Clause G2.1).
- Pole head degradation - look for any splitting at or near the top of the pole. This includes splitting which extends through the full diameter at or near the centre of the pole, or which is in line with or extends past attachment bolts, or which is greater than 10mm wide.
- Pole bending – look for excessive curvature or bending of the pole.

6) Inspect the steel sleeve for evidence of corrosion or termite activity. Where corrosion is identified, assess the steel condition according to Clause 6.5.
7) Inspect the timber inside the steel sleeve through the three inspection holes in the steel sleeve for evidence of fungal decay.
8) Inspect the drain hole(s) in the steel sleeve for blockages and clear them out if they are blocked.
9) Probe the space between the top of the concrete and the bottom of the pole inside the steel sleeve for evidence of timber degradation or termite activity through the drainage hole(s).
10) Sound the pole above the steel sleeve according to Annexure H. If an external defect is identified, inspect the pole according to Clause F4.
11) Except for Copper Chrome Arsenate (CCA) impregnated poles, decayed and loose wood up to 2 metres above ground shall be removed with an axe. Care shall be taken not to damage the heartwood with the axe. Where loose sapwood exists on any timber pole above 2 metres that is considered hazardous, report the pole to the nominated Ausgrid representative and record the defect in the DPA sheet.
12) Measure and record the original diameter of the pole ('$D_0$') above the top of the steel sleeve according to Clause I2.
13) Measure and record the reduced diameter of the pole ('$D_1$') at any location above the top of the steel sleeve where a defect has been located according to Clause I3.
14) Perform an internal inspection according to Annexure J where any suspected internal defect is identified by sounding above the steel sleeve and record the result. Use existing holes where possible or bore new holes if existing ones are inaccessible.

### F3.3 Finalising the Inspection Process

After the above ground inspection procedure has been completed, the inspection process for composite timber poles shall be finalised as follows:

1) When termites have been located during the inspection, apply termite treatments according to Annexure N.
2) Record (photograph) the following external defects:
   - Evidence of active termites.
   - Pole lean, pole bending or evidence of pole movement at groundline.

- Fire and third-party damage, including painted poles.
- Pole head degradation (excluding missing pole caps).
- Reinforcement damage or degradation.
- Fungal decay, fruiting bodies, knot holes, grub holes and checks.

3) Seal above ground defect holes and inspection holes according to Annexure P.
4) If an internal defect or reduced diameter has been identified above the steel sleeve, calculate the internal defect diameter ‘d’, minimum wall thickness and residual strength of the pole according to Annexure K.
5) Compare the inspection results against the serviceability criteria in Table 1 in Clause 5.5 and for composite timber poles in Clause 5.6 to assess whether the pole remains serviceable or corrective action is required.
6) Clearly mark the pole as defective (irrespective of the inspections results) according to Annexure V and complete a ‘Defective Pole Action’ sheet and enter details into SAP. Composite timber poles shall be marked as defective to prioritise their replacement irrespective of their inspection results.
7) Record pole inspection results and defects in the Ausgrid Asset Management System. This shall be performed using relevant forms (refer to Annexure W) or direct entry into a MAM device.
8) Report defects or defective poles to the nominated Ausgrid representative.

If the pole appears to be loaded close to or beyond its available capacity (indicated by excessive pole lean or bending of the pole), or appears to be in danger of collapse, it must be immediately reported to the nominated Ausgrid representative.

### F4 Inspection of External Defects on Wood Poles

When inspecting for external defects, all defective timber dirt or other covering material shall be removed so the full extent of any defect is revealed and can be measured (refer to Clause E6). Pay particular attention to areas under loose sapwood because fungal decay commonly proliferates in these areas.

Sound timber shall not be removed to get to the fungal decay nor shall sound timber be removed to retain a symmetrical appearance. Every effort should be made to avoid the ‘hourglass’ effect by tapering off chipped areas. Where it is difficult to determine the extent of deep external pockets of rot without damaging adjacent sound timber, a drill shall be used to probe and measure the extent of the defect.

If any external decay is found on a Copper Chrome Arsenate (CCA) impregnated pole less than 20 years old (based on the disc date), it shall be immediately reported to the nominated Ausgrid representative so the pole can be reported as a ‘failed pole’ according to the requirements of Technical Guide T0001. Complete a Defective Pole Action sheet. The pole shall not be scraped or cleaned with any tool at this time, however the remaining tasks of the inspection process shall be carried out.

Once the full extent (depth) of a defect is exposed, measure and record the reduced diameter ‘$D_1$’ of the pole in that location according to Clause I3. All measurements are to be recorded on the Defective Pole Action sheet and in SAP.

## Annexure G: Timber Poles – Inspecting for Termites

### G1 General Requirements

Evidence of termite activity may be identified in or on a pole during the above ground, partial excavation or full excavation stages of the timber pole inspection process. All advertising materials attached to the surface of the pole shall be removed to perform the termite inspection. If active termites are found while removing the advertising material, perform the restricted pole inspection procedure according to Clause G4.1.

### G2 External Evidence

Initially inspect for general external evidence of termite activity on the pole. External evidence that termites have been or are in the pole will include:

- Mud galleries on the exterior of the pole.
- Mud deposits in cracks/splits on the outside of the pole.
- Mud like deposits in unfilled holes.
- A mud like mound towards the top of the pole or a mud like build up around the areas where crossarms connect to the pole.
- In CCA poles a hollow sound above groundline may be the only indication (which would need to be evaluated by internal inspection). Subterranean termites generally only do significant damage to CCA poles above groundline and may not reveal any evidence of their presence as the outer timber is repellent to them. As a result, they are often not identified until significant damage has occurred.
- Evidence of the termite species Glyptotermes is unique to the species and is characterised by flight holes in the groundline region of the pole with possibly some termite damaged timber at groundline (refer to Clause G2.1). Removal of small amounts of timber around the flight holes will reveal a 90° turn several millimetres from the surface if they are Glyptotermes holes. It is critical that a thorough below ground and internal inspection be carried out to confirm the pole has sufficient sound wood to remain until replacement can be arranged.

### G2.1 Identification of Glyptotermes Species Termites

Where Glyptotermes species termites have infested a pole, flight holes will almost always be in evidence in the groundline region. After the pole has been scraped clean below ground, the wood around several flight holes shall be further scraped to remove several millimetres of wood to reveal whether the gallery takes a 90° turn shortly after entering the wood – this is evidence they were the result of Glyptotermes. Glyptotermes damage shall also be reported to the nominated Ausgrid representative for further assessment. Where doubt exists, Ausgrid's Mains Engineering shall be contacted for assistance.

Poles affected by Glyptotermes will, when drilled, feel as if the drill bit first bites like normal and then it stops biting. The only recourse that will seem open to the Asset Inspector will be to push the drill to get the bit to bite again. If this is done, then typically the bit will begin to bite again but will quickly once again stop biting. The shaving shall be inspected closely. Glyptotermes infected timber will have a yellow (very light brown) colour as it is infected with early stages of brown rot around each termite tunnel.

An Asset Inspector shall never push the drill through the timber when trying to determine the quality of the timber. This alone is sufficient to report the pole.

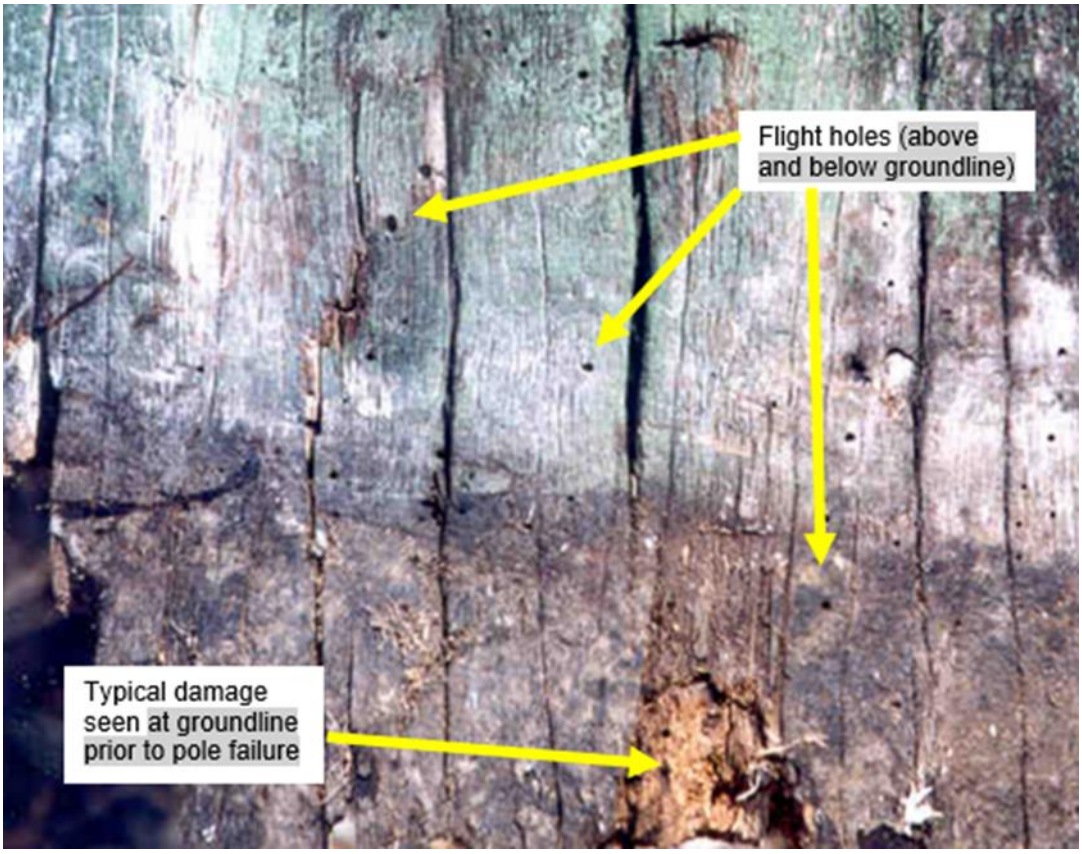



**Figure 33 – Typical Glyptotermes Flight Holes At, And Just Above, Groundline**

**Figure 34 – Typical Glyptotermes Flight Holes Above Groundline**

**Figure 35 – Damage Caused by Glyptotermes At and Below Groundline**

**Figure 36 – Glyptotermes Damage Causing Pole Failure**

## G3 Internal Evidence

Evidence of termite infestations that may be found when drilling for internal inspections includes:

- Live termites being brought out on the auger bit or in the swarf.
- Mud like material being brought out on the auger bit or in the swarf. Distinguish between termite gallery material 'mud' and brown rot by placing a sample between the gloved fingers and attempting to smear the material. Damp mud from the inside of a pole will have a greasy feel or appearance to it possibly interspersed with grains of sand like material. Brown rot will crush leaving a residue that still has very small components of fibres in it and will not appear slimy or greasy.
- A hollow in the pole where small papery pieces of material are brought out on the auger bit or in the swarf. This may indicate a nest site.
- Evidence of Glyptotermes is unique to the species and is characterised by a 'good wood / bad wood' pattern when drilling indicating extensive damage near groundline. Usually, an Asset Inspector would have to push a drill to keep it progressing into the timber affected by these termites. Where a powered drill is being used and the Asset Inspector finds they have to push the drill to get the bit to bite they shall stop using the powered drill for the duration of the inspection (a hand brace is the only effective tool to use for the inspection by drilling of the timber affected by these termites). Where doubt exists, consult with the nominated Ausgrid representative for assistance.

## G4 Determining If Termites Are Active

If evidence of a termite infestation exists (other than Glyptoterme Species) it shall be determined if there are active termites in the pole. To determine if active termites are present:

- Gently break open any mudded termite galleries looking for active termites. An old hacksaw blade or an auger bit can be helpful in investigating mudded checks in poles that extend deep into the wood. A mirror to direct sunlight, or a torch, is helpful in checking for active termites.
- Cut away any loose sapwood where external termite damage exists. Termites may be found under intact sapwood.
- Remove all external above ground plastic plugs and check for mudding and termites inside the hole. A Borescope shall be used to check for active termites inside the pole where evidence of termites exists. It is often necessary to drill additional holes above groundline when searching for termites. Following treatment, termites will commonly abandon previous areas of infestation and move elsewhere and may only be found by drilling additional inspection holes. It is less damaging to the pole, and therefore preferable to drill in the neutral axis or into an existing check (crack/split) in the pole above groundline when searching for termites. Termite inspection holes shall be no larger than 12mm diameter and shall be treated with Preschem rods and sealed with Black plugs when finished.
- If active termites are identified, apply the appropriate termite treatment process (refer to Clause N4).
- If no termites are present or if active termites have been sighted and a liquid termiticide shall be used to treat the termites, sound the pole above groundline according to Annexure H.
- If a termiticide dust treatment or bait is to be used perform the restricted inspection process detailed in Clause G4.1.

## G4.1 Termiticide Dust or Bait Use Where Active Termites Are Found

When active termites are identified in a pole prior to excavation around the pole, all above ground visual checks shall be completed, but no sounding or general excavation is to be performed, other than the minimum necessary to prove the pole's integrity.

A check of the below ground condition of the pole shall be performed by scooping a minimum quantity of soil from one side of the pole in the neutral axis followed by an internal inspection 100mm below groundline according to Clause E3.2 for unreinforced timber poles or Clause F2.4 for splinted or nailed reinforced poles. Record all results.

Where full excavation has already been carried out, the full pole inspection process shall be completed. Complete a Termite Treatment Form (refer to Clause 2.4 and Annexure W).

# Annexure H: Timber Poles – Sounding

## H1 General Requirements

Each pole shall be sounded as part of the above ground inspection, and again as part of the below ground inspection, except where it has been decided to use a termiticide bait or powder. Where sounding indicates the presence of a defect, the area shall be investigated by removing the decayed timber if on the outside of the pole, or by an internal inspection (drill) if the defect is internal.

Where poles have external timber above ground or below ground that is in 'as new' condition a reduced amount of sounding may be appropriate. However, it is the Asset Inspector's responsibility to make sure sufficient sounding is performed to detect all defects in the inspection area.

## H2 Guidance on Sounding

Sounding of timber poles above groundline shall be performed with a ball pein hammer. Sounding of timber poles below groundline shall be performed with a ball pein (where it is practical to do) when the pole is partially excavated, and then with a rounded point bar when the pole is fully excavated. When performing sounding of a timber pole, an Asset Inspector shall concentrate on:

- The sound that is developed.
- The amount the hammer or rounded point bar rebounds. This can also be described as the 'feel' of the pole.
- Whether or not the rounded point bar penetrates through the outer timber into an internal defect.
- Using a rigorous and methodical process to make sure defects are not missed.

## H2.1 Guidance on the Use of a Ball Pein Hammer

The ball of a 16oz / 450g (or heavier) ball pein hammer shall be used to sound the above ground portion of wood poles as well as that area at and just below groundline where it is practical to do because it generates a more consistent sound regardless of the angle at which the ball strikes the pole. The weight of the hammer is important for the feel and sound of the centre of the pole as well as for the heartwood condition behind decayed or loosened sapwood. Tools other than a ball pein hammer, such as a flat faced hammer, or the back of an axe, shall not be used for sounding.

The following guidance shall be followed when using a ball pein hammer:

- Test the timber pole by striking it firmly.
- A good pole will 'ring' or resonate when correctly struck with a hammer. The hammer blow will generate a distinctive solid sound, a sharp 'whack' or hard 'tap', and a noticeable rebound of the hammer when struck against solid timber.
- A degraded pole will not normally 'ring' or resonate when struck. Instead, it will give a dull 'thud' or a soft 'thump' sound, or a distinctly 'hollow' or 'drummy' sound. There may only be a small rebound of the hammer, or no rebound at all. The hammer may become embedded in the timber of poles in very poor condition.
- Where the timber surface is affected by minor decay it will be necessary to hit the pole harder in order to compress the decayed timber and generate an indicative sound. Where a 'good' sound cannot be generated this generally indicates a defect. Loose sapwood will generate a defective sound and further inspection will be needed to confirm it is only loose sapwood giving the bad sound (refer to Clause E6).

Sounding prior to excavation (above ground sounding) shall extend from groundline (with additional focus on the portion within 50mm of groundline) to as high as can comfortably be reached (generally 2m above groundline). To sound a pole so that an internal defect is not missed it is necessary to perform at least 8 soundings (strikes) around the circumference of a round pole, or one on each flat face of a dressed pole, within 50mm of groundline, then repeat this at least 4 times around the pole at each 500mm interval above groundline to as high as can be comfortably reached.

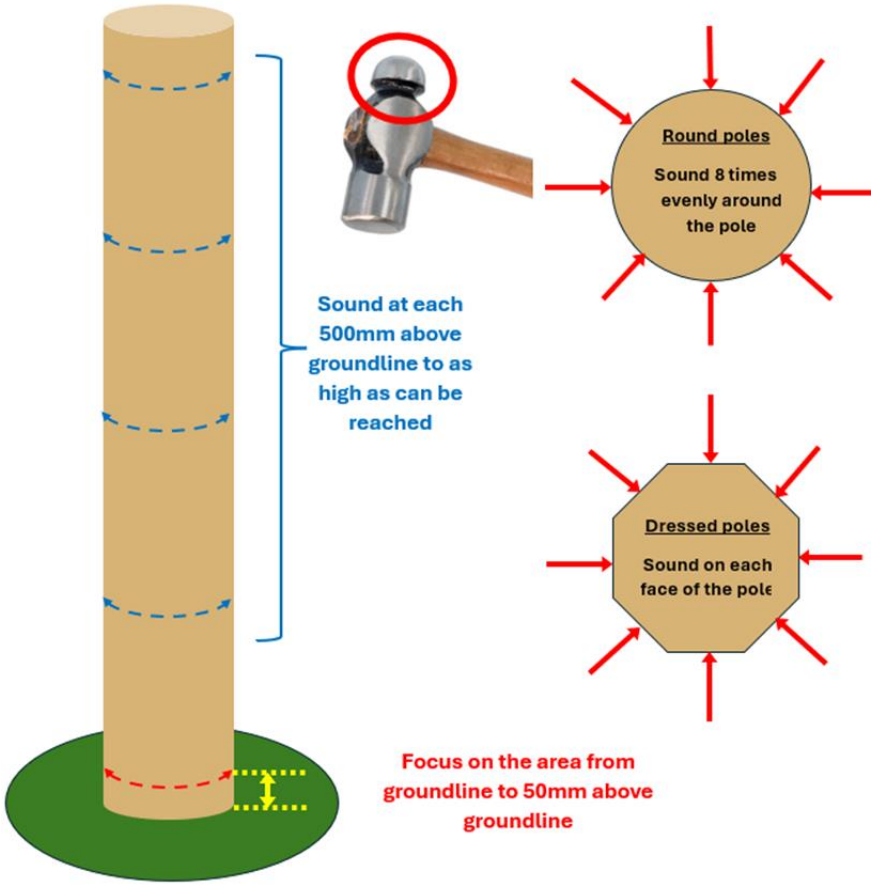



**Figure 37 – Sounding above groundline with a ball pein hammer**

Some poles will need to be sounded at much closer intervals than the minimum specified above, particularly where a defect is indicated at groundline[2]. Where defects such as fruiting bodies, knots, checks, termite damage, loose sapwood, or other visual indicators are seen on the pole, a more thorough sounding shall be performed around and nearby the defect indicator.

When the pole has been partially excavated, the exposed portion of the pole shall be struck with the ball of the ball pein hammer to thoroughly sound the pole for internal defects within 50-100mm below groundline where it is practical to swing the hammer into this area of the pole.

[2] Ausgrid pole failure data indicates that defects in the area at and adjacent to (within 50mm) of groundline can be very localised (in a narrow band) and sounding above or below these defects may not identify their presence.

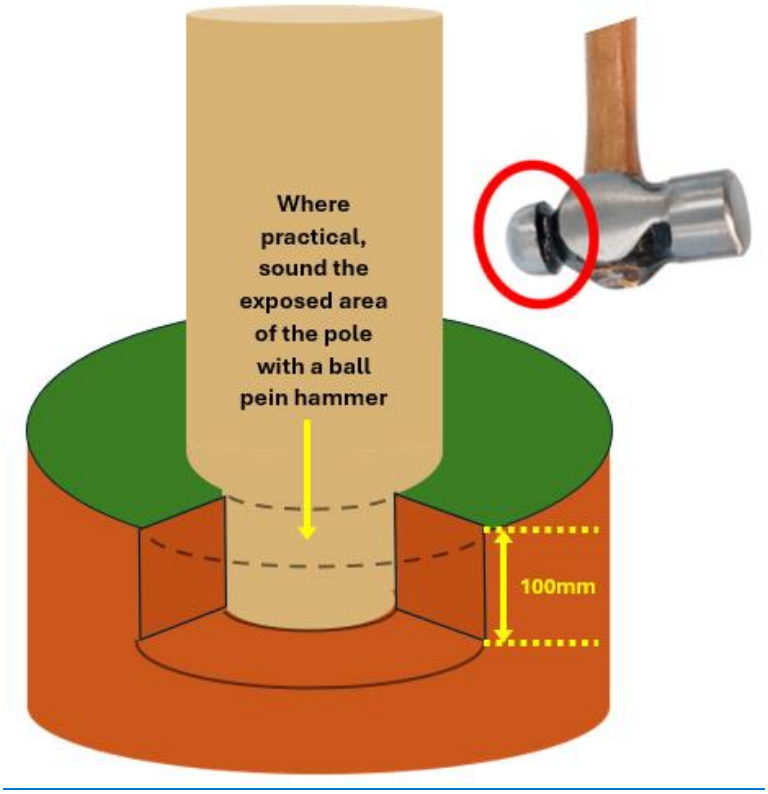



**Figure 38 – Sounding below groundline with a ball pein hammer**

## H2.2 Guidance on the Use of a Round Pointed Bar

When the pole is fully excavated, a 6kg rounded point bar with a 15mm hemispherical point shall be used to test the external below ground surface of the pole from the bottom of the excavation up to groundline. The bar may be dual purpose with a chisel point one end and the rounded point on the other end. The chisel-end can be used to scrape soil and decayed timber from the pole. The rounded end shall be used to test for areas of external decay and internal decay covered by a thin layer of good wood (typically less than 15mm).

Use of the bar shall not result in permanent damage to the face of the pole where the timber is in good condition, particularly CCA poles. A sharp point that will damage sound timber shall not be used under any circumstances.

Only CCA poles older than 15 years shall be sounded below ground with the rounded point bar

The following guidance shall be followed when using a rounded point bar (refer to Figure 39):

- Use a rigorous, methodical process so that localised defective timber areas are not missed. Newer defect-free poles may not require as much sounding as older poles. The amount of sounding performed shall be sufficient to locate any defect.
- Strike the pole firmly at the base of the excavation so that the bar strikes the pole where it meets the soil. The bar shall deflect off the pole if it is solid, the rounded point of the bar embedding itself into the soil at the base of the excavation.
- After testing at the base of the excavation, the bar shall then be used to impact the pole immediately above this point, then test again every 50-100mm in a vertical line up to groundline. The pole shall be tested in this manner at least every 150-200mm around the pole. It is critical that this procedure be performed rigorously and methodically to make certain of the safety and strength of the pole.

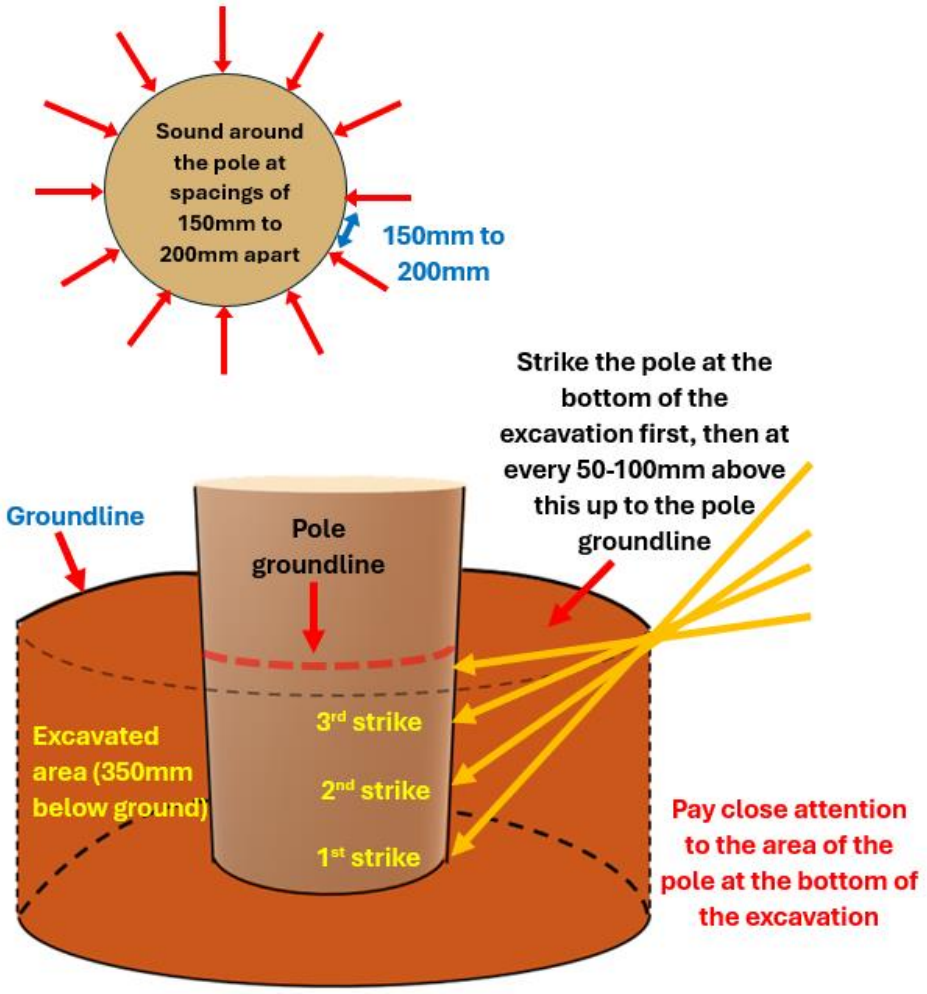



**Figure 39 – Sounding below groundline with a rounded point bar**

- Particular attention shall be paid to the area of the pole at, and just below, the bottom of the 350mm excavation and adjacent to assets or other obstructions attached to the pole such as UGOHs or concrete kerbs because these areas are less likely to be treated properly with pole preservative treatments during routine pole inspections and are much more likely to decay than areas that are properly treated. If severe decay exists deep below the excavated area or behind an obstruction, there will commonly be detectable decay near the bottom of the excavation or adjacent to the obstruction. In most instances the pole's condition will improve with depth, however under some conditions the pole will deteriorate below the excavated area. Be aware of this and pay particular attention to what the bar finds below the excavated area. Where external decay increases below the excavated area it shall be investigated by digging to 400mm (but not beyond as this may destabilise the pole) and checking the extent of any external defect found. The defect shall be reported to the nominated Ausgrid representative if it extends below 400mm.
- A pole with a significant defect below the bottom of the excavation may also be loose in the ground, The Asset Inspector shall be alert for any movement of the pole in-ground when struck with a bar at the base of the excavation.
- Where decay appears to be increasing behind an obstruction in the groundline area the situation is to be reported to the nominated Ausgrid representative for consideration.
- By testing a pole in the manner described, the rounded point of the bar can penetrate decayed timber to reveal the true extent of the remaining sound timber (refer to Clause I3 for instruction on correct measurement of the reduced diameter of the pole '$D_1$'). The pole shall be internally inspected where the pole sounds hollow.

- The pole shall not be hit excessively hard unless a defect is suspected, in which case the pole shall be hit very firmly. A bar with the correct rounded point will bounce off sound hardwood timber but will penetrate defects existing close to the surface of the pole. This procedure is critical to ensuring confidence in the soundness of the pole.
- Examples of situations where it would not be reasonably practicable to carry out the full recommended rounded point bar sounding process include poles with assets attached in the below ground area and poles placed adjacent to obstructions such as kerbs and fences.

## Annexure I: Timber Poles – Measuring and Calculating Pole Diameter

### I1 General Requirements

All measuring instruments used to measure a pole's diameter or internal defect size, such as callipers, measuring tapes and probes shall be of commercial quality, capable of providing measurements to an appropriate degree of accuracy and regularly calibrated against a known standard, where appropriate. Work carried out using substandard or out of calibration measuring equipment shall not be accepted.

All measurements shall be recorded for calculating the residual strength of the pole.

### I2 Measurement of Original Diameter ($D_0$)

A pole's original diameter ($D_0$) is the average diameter of the pole measured at, or close to groundline. It shall be measured and calculated before any decayed heartwood or treated sapwood is removed from the measurement location.

The original diameter measurement shall be measured using a diameter tape or outside callipers. If for any reason it is not possible or practicable to use a diameter tape (for example, due to attachments such as UGOH's, battens, conduits or oval-shaped poles), outside callipers shall be used to take two measurements of the pole's diameter 90° apart. The two readings are then averaged to provide an average diameter (refer to Figure 40).

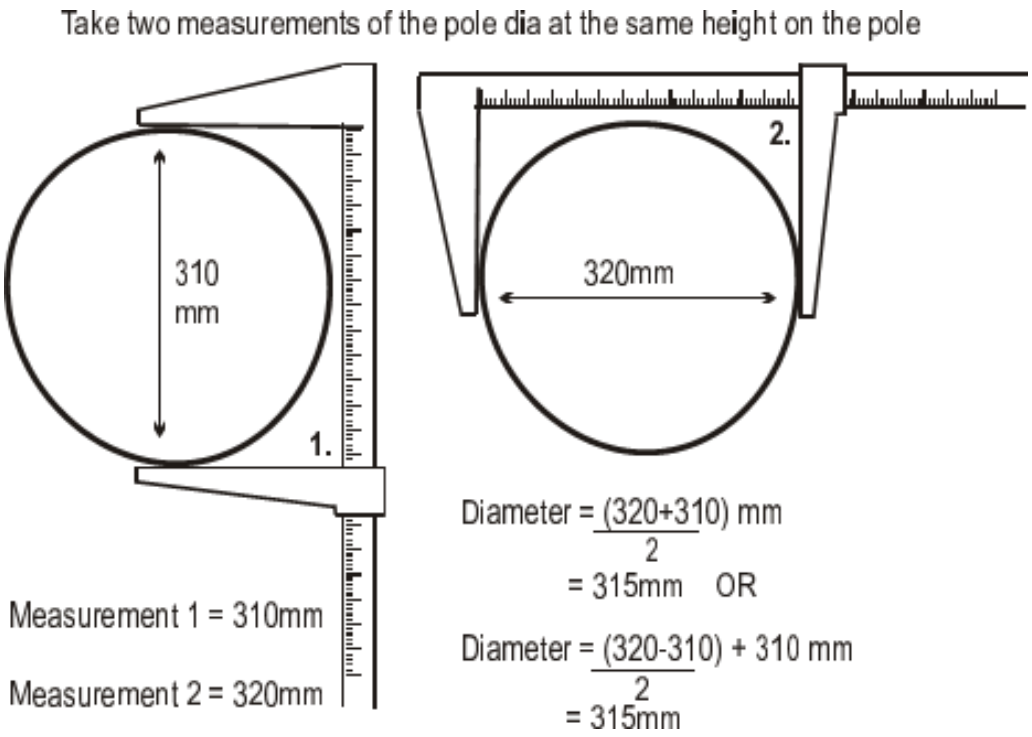



**Figure 40 – Measuring and Calculating Average Pole Diameters**

A suitable calliper for this task is manufactured by Harrybilt Engineering and Welding Services in Ballarat telephone 03 5339 4859 Part No. 0-600. (refer to Figure 41).

**Figure 41 – Outside callipers suitable for measuring the reduced diameter**

The original diameter of a pole is a measurement of the pole's diameter which only includes wood that would continue to contribute to the strength of a pole over time. Different measurements are needed for poles with and without full-length preservative treatment because untreated sapwood degrades relatively quickly losing all strength and was never assumed to contribute to the strength of the pole.

Use one of the following procedures to obtain the original diameter ($D_0$) of a pole.

### I2.1 Original diameter ($D_0$) - Full-length Preservative Poles[3]

With full-length preservative (Pressure Impregnated) poles, the sapwood is counted as part of the timber that supports the pole. Do not remove it unless it has rotted. Include all sapwood on full-length preservative poles regardless of its condition in your original diameter ($D_0$) measurements.

### I2.2 Original diameter ($D_0$) - Natural Round Poles Without Full-length Preservative

In natural round poles without full-length preservative treatment only heartwood counts in the strength assessment. The sapwood on these poles is not treated to make it durable and will quickly loose its capability to help support the pole. Do not include sapwood in the '$D_0$' measurements for these poles even if the sapwood is in good condition. Remove the sapwood if it has begun to detach, along with all decayed or partially decayed wood after the '$D_0$' measurement has been made so that the sound heart wood under it is not adversely affected.

Where sapwood is being discounted from the measurement, the most accurate '$D_0$' measurement is taken immediately below where the sapwood finishes just above or at groundline, provided the heartwood has not deteriorated.

Where the thickness of sapwood cannot be readily determined from observation, allow 20mm for the thickness of sapwood around the pole (40mm allowance in diameter).

### I2.3 Original diameter ($D_0$) - De-sapped Durable Species Poles

De-sapped durable species poles are machine dressed to an 8-sided shape on the lower section of the pole and 16 sided on the upper section of the pole. They should have been fully de-sapped and their strength calculated on their nominal groundline diameter measurement. Therefore, even if some sapwood is evident on the pole, the '$D_0$' measurement will be the largest diameter

[3] There are a relatively small number of poles installed (with a 2003 year disc) that have been de-sapped by machining to an 8 or 16 sided shape but have been through the CCA treatment process. These poles must be treated as non CCA impregnated de-sapped durable poles because without the sapwood to retain the chemical there can be no effective protection for the pole.

measurement either just above or below groundline and shall include that remaining sapwood because it was included in the original measurement to determine the poles capacity. However, no sapwood is to be included in the reduced diameter '$D_1$' measurement because it has no durability below groundline and will quickly deteriorate.

Older de-sapped durable poles may not appear to have the characteristic 16-sided upper and 8-sided lower machined portions of the pole due to weathering/aging of the external timber where the original sharp milled edges disappear. Any pole that has flat machined surfaces between groundline and 1.5m above groundline is to be considered a de-sapped durable pole.

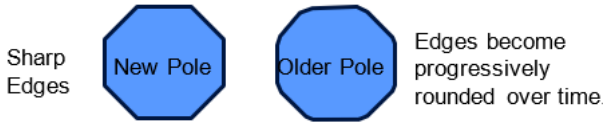



**Figure 42 – Identifying De-sapped Durable Poles**

## I2.4 Original diameter ($D_0$) - Oval / 'Seagull' Shaped Poles

Where the original outer shape of a pole is or has become oval or 'seagull' shaped at groundline which leads to individual diameter measurements that vary significantly, it can result in an inaccurate residual strength figure.

In these situations, the ovality / sea gulling of the pole is caused by the shrinkage and movement of the timber as it dries and the dimensional changes are offset to some extent by the change in strength of the pole – these changes have less effect on pole strength than the strength reduction caused by defects. For these circumstances, measure the original diameter '$D_0$' by either of the following methods:

- Use a diameter tape, or
- Use outside callipers to measure the largest diameter and smallest diameter and determine the average of the two readings.

## I3 Measurement of Reduced Diameter ($D_1$)

A timber pole in ground contact commonly suffers external timber degradation in what is termed the 'critical zone', which extends from groundline to approximately 350mm below groundline. This zone of the pole also suffers the most stress when the pole is loaded either by conductor or wind loading. A timber pole may also suffer external timber degradation above groundline however, this occurs less regularly than timber within the ground.

In calculating a pole's residual strength, the most important measurement is the original diameter and the minimum diameter of the pole in the critical zone. A 20% reduction in a pole's diameter in the critical zone will reduce the pole's strength by approximately 50%, making the pole almost unserviceable.

In assessing a pole's residual strength, it is extremely important that the pole's below ground diameter be accurately measured. An acceptable accuracy is ± 10mm, this is required to endeavour to keep the error in any calculated reduction in diameter to within ± 5%. The below ground diameter measurement is not to be an average figure, but the minimum diameter that can be measured in any axis and at any level across the pole, between groundline and the bottom of the excavation. This will give the strength reduction, in the axis with the smallest diameter, compared to the assessed strength of the pole when new which is determined by average diameter measured at nominal groundline.

The maximum depth that the 'rounded point' of the rounded point bar penetrates into decayed timber is the depth that the measuring callipers shall be placed in order to measure the reduced diameter below groundline '$D_1$'.

Outside callipers shall be used to measure the reduced diameter '$D_1$' as they take into account bites and hollows in the pole. A diameter tape shall only be used for '$D_1$' measurements if the full circumference has been cleaned of decay and the tape is in contact with the full circumference.

Before measuring the reduced diameter, it is critically important that all decayed timber be removed so that only sound timber is measured. Pockets of decay shall be removed so the callipers can accurately measure the sound wood diameter.

Where the below groundline diameter is greater than the above groundline diameter due to the taper of the pole, the reduced diameter '$D_1$' value recorded shall be the same as the original above groundline diameter '$D_0$'. For calculating residual strength, the reduced diameter '$D_1$' shall never be greater than the original diameter '$D_0$'.

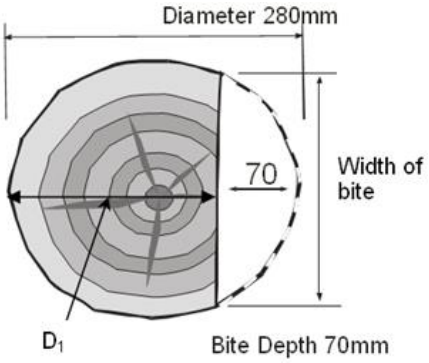
Where an untreated pole has a ribbed surface below ground line (refer to the example in Figure 43) where the wood is sound in the valley of the ribs and in the ribs themselves, it typically suggests a very durable species of wood. Assuming there are no significant decay pockets found, the diameter shall be measured around the tops of the ribs (the outer circumference) rather than in the valleys of the ribs.

**Figure 43 – Ribs on surface which are sound and do not extend significantly into the pole heart**

## I3.1 Measuring Reduced Diameter ($D_1$) Where 'Bites' Exist Above or Below Ground, and Calculating Residual Strength

Sections out of the side of the pole can sometimes be found to be missing due to vehicle impact or the action of decay or termites. These missing sections are commonly called 'bites'. Where a 'bite' is found at any level in the pole inspection area, the diameter measurements shall be taken and a strength calculation performed. Where a bite occurs in a pole, the reduced diameter '$D_1$' shall be measured using callipers. The bite depth is calculated as shown in the following formula:

Bite depth = $D_0$ (at or about that location) – $D_1$.



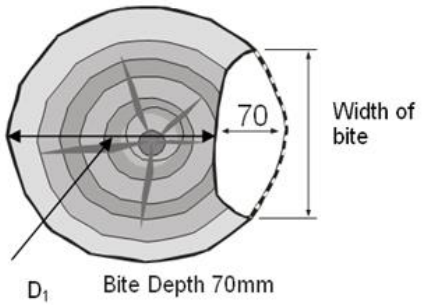

**Situation (a)**

The original diameter of the pole at the site of the bite shall be measured below the bite and in the same axis of the bite as shown.

$D_1$ = 210mm as measured with callipers

Bite depth = $D_0 – D_1$ = 70mm

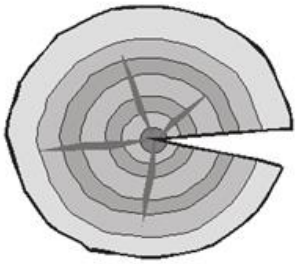
Bite depth and width shall be reported as part of the inspection.




**Situation (b)**

This situation is to be treated exactly the same as that above.

Although the bite may not extend completely across the pole, for the sake of simplicity, the pole's strength will be assessed as though it does. The resultant strength may therefore be conservative, however Ausgrid will take this into account when determining what action to take.




**Situation (c)**

Splits and checks are not bites, and there is no loss of timber from the pole. For the purposes of residual strength calculations, Splits and checks do not reduce the strength of the pole.

**Figure 44 – Reduced Diameter of Poles with a Bite**

## Annexure J: Timber Poles – Internal Inspection

### J1 General Requirements

Timber poles (except for Osmose splinted poles, nailed reinforced poles and composite timber poles) shall be internally inspected at 100mm below the lowest point of groundline and at each above ground and below ground level of the pole where a defect has been identified by sounding.

Internal inspections shall be performed using a brace and bit, suitable battery powered drill or variable speed 240 volt electric drill. Drills employing a hammer action shall not be used under any circumstances. Other types of drills shall not be used for internal inspections unless it is necessary for the particular job being carried out and the operator has received sufficient training and been individually authorised, having proven competency to Ausgrid's satisfaction.

All inspection holes shall be treated according to Clause M2 and sealed with blue or black plugs as applicable according to Annexure P.

All below ground inspection holes shall be drilled at 45° to the pole face (refer to Figure 45) and as close as reasonably practicable to the neutral axis (refer to Annexure C for information on how to find the neutral axis) and at 100mm below the lowest point of the groundline.

All above ground inspection holes shall be drilled at 90° to the pole face and as close as reasonably practicable to the neutral axis except for the inspection holes for reinforced poles which shall be angled upwards at five degrees so water will drain out.

All inspection holes drilled during the current inspection shall be sealed with blue plugs, except for above ground inspection holes for reinforced poles, which shall be sealed with grey plugs to identify their purpose. Refer to Annexure P for further detail.

Above ground inspection holes for reinforced poles fitted with grey plugs shall not be treated with a timber preservative product (refer to Clause M6). If these inspection holes are treated with a preservative, they will not be indicative of the true degradation at future inspections.

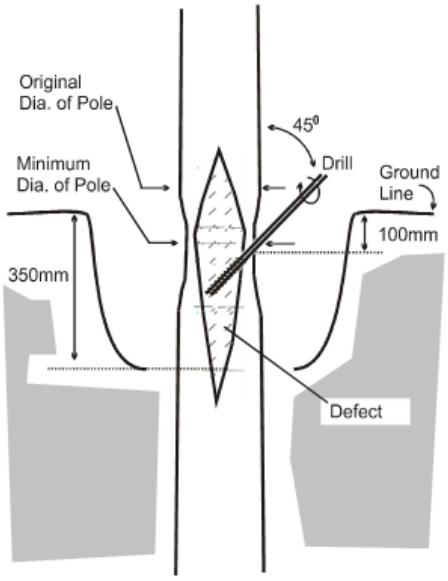



**Figure 45 – Drilling Angle below Groundline**

Be aware that drilling holes in poles is destructive to the pole and will ultimately make the pole unserviceable if too many holes are drilled. Holes shall not be drilled unnecessarily however, it is essential that, where timber degradation has taken place, the minimum wall thickness be identified so that the residual strength of the pole can be determined.

Where sounding indicates that the pole has suffered degradation and a defect likely exists, the pole shall be internally inspected at the location where sounding indicates that the wall thickness is least.

### J2 Drilling Assessment - Internal Inspection Methodology

The objective of drilling a pole for internal inspection is to accurately assess the thickness of sound timber, and in so doing determine the size and cause of any internal defect.

Where a timber pole has splits or checks as shown in Figure 46, there is no missing or degraded timber. This means the void (gap) in the timber is not a defect. Asset Inspectors shall avoid drilling directly down the length of such a split as this will give a wrong strength reading for the pole. The sounding technique used before drilling will provide ample evidence of an internal split and its orientation and a simple examination of the outer surface of the pole will enable external splits to be avoided. If the pole has been drilled, inspect the pole internally with a borescope to confirm whether a spilt / check or internal defect is present.

**Figure 46 – Example of a pole with heart collapse, checking and splitting**

The internal assessment is performed by drilling into the timber in such a manner that the drill will indicate to the Asset Inspector whether it is penetrating sound timber or not. The sound the drill makes, the size and colour of the shavings (refer to Figure 47), the smell of the wood shavings, the feel of the drill, and how strongly the worm on the drill pulls into the timber will all provide indications about the condition of the timber. The drill shall not be pushed into the timber. A drill bit in good condition should ‘pull’ into the timber of its own accord. If on a particular pole it seems necessary to push the bit into the timber, then the timber is probably defective, and the Asset Inspector shall take additional care. A good test may be to drill the pole well above groundline where the pole is in good condition and compare how the drill bit performs as well as the difference in the size of the timber shavings. Where an Asset Inspector is in doubt about the condition of timber the pole shall be reported to the nominated Ausgrid representative for follow up.

**Figure 47 – Example of large shavings from good timber (left) compared to small shavings from decayed timber (right) from the same pole**

Internal inspections are performed using a 14mm auger bit. A larger size bit shall not be used as this size has been found to produce consistent results while keeping the hole as small as possible. Inaccurate drilling angles will generate inaccurate sound wood measurements. It is necessary to be accurate to within plus or minus five degrees to obtain an acceptable result.

A Borescope shall be used for internal inspection of the pole where termites are suspected to be present, or where a pipe or internal void is found.

## J2.1 Internal Inspection Procedure

At each level of the timber pole where an internal inspection is required, the pole shall be internally inspected as follows:

1) Drill carefully until the first sign of an internal defect is noticed (clear out the drill hole). Insert the gauge into the bored hole until it rests against the end of the hole and record the reading, making sure not to include the thickness of untreated sapwood or decayed timber at the surface.

   Make sure that the scale on the probe is appropriate for the angle at which the hole is drilled. Using the wrong scale will result in incorrect measurements.

2) Remove the probe and continue drilling. If after starting to drill again, the wood feels to be still sound, disregard the first reading and continue as in Step 1. However, if the renewed drilling confirms the start of the defect, record the measurement and proceed with the next steps. The recorded measurement is the front wall thickness ‘A’ (as referenced in the DPA sheet).

3) Continue to drill until it is felt that the far side of the defect (back wall) has been reached and sound wood has been encountered. Stop drilling, clear out the drill hole and use the probe to take another measurement.

4) Remove the probe and confirm that the measurement to the far side of the defect was accurate by continuing to drill another 20mm. As in Step 2, if it was felt the reading is wrong, repeat Step 3 again. Keep in mind the pole’s diameter and how far the drill is into the pole while drilling to prevent drilling through the back of the pole and into an attachment.

5) Record the back wall measurement (‘B’ as referenced in the DPA sheet).

The result of all internal inspection measurements shall be recorded on the DPA sheet and in SAP if the pole is found defective. Record the type and cause of all internal or external defects found during the inspection.

The front wall thickness ‘A’ and the back wall thickness shall be used to calculate the internal defect diameter and the residual strength of the pole according to Annexure K.

# Annexure K: Timber Poles – Wall Thickness and Residual Strength

## K1 General Requirements

Pole diameter measurements and internal inspection measurements are used to calculate the wall thickness, internal defect size and residual strength of timber poles according to the following Clauses. The results from these calculations shall be assessed against the timber pole serviceability criteria in Table 1 in Clause 5.5 (for all timber poles), Clause 5.5 for unreinforced timber poles and Clause 5.6 for reinforced timber poles to determine whether a pole remains serviceable or whether further action is required.

## K2 Effect of Internal Defects on Strength

Internal defects, commonly caused by termites or fungal decay, shall be considered as pipes for the purposes of strength calculation because rotten material has little or no strength and shall be ignored.

The outer 20-30mm of a pole provides most of the strength to the pole – the centre section of the wood is of less structural importance. An example using residual strength follows:

A wood pole has an internal defect that is half as wide as the pole, located centrally. In a 400mm diameter pole this gives us a pipe size of 200mm and a wall thickness of 100mm. If you use the formula from Clause K6.1 you get a remaining strength of 93%. This means even though all this wood has gone from the middle, the pole has only lost 7% of its strength.

## K3 Calculation of Wall Thickness

The measurement of front wall thickness (’A’) and back wall distance (‘B’) shall be performed according to Clause J2.1. The front wall thickness ‘A’ is measured using a gauge. The back wall thickness is to be calculated by subtracting the back wall distance measurement ‘B’ from the reduced pole diameter ‘$D_1$’ as shown in the following formula:

Back wall thickness (timber poles) = $D_1 – B$

The smallest (minimum) of the front wall thickness or back wall thickness shall be used in the calculation of the internal defect diameter at each level that it is measured.

## K4 Calculation of Average Wall Thickness

The average wall thickness shall be calculated by adding the front wall thickness ’A’ to the back wall thickness and dividing the result by two as shown in the following formula:

Average wall thickness (timber poles) = (A + back wall thickness) / 2

## K5 Calculation of Internal Defect Diameter (‘d’)

The measurement of internal defects for the purposes of strength evaluation (i.e. defect diameter ‘d’) shall only include timber that has degraded due to fungal attack or been removed by termites. This degraded or removed timber may be rot, termite mud, termite tunnels, pipes (with or without current evidence of termite activity) or a combination of these.

The measurement of gaps as a result of splits such as those shown in Clause I2.4 where the void caused by the split is the only defect (for example, there is no additional decay or termite damage) shall not to be considered defective timber and shall therefore not be considered an internal defect for strength calculations.

Where an Asset Inspector’s sounding and drilling indicates that there may be a split and an additional defect (refer to Figure 46) the ‘d’ measurement taken shall take a conservative approach and shall include any gap that may be associated with a split.

The internal defect diameter ‘d’ (as used in the pole strength calculation) shall be calculated by multiplying the smaller of the two wall thickness measurements (front wall or back wall measurement) by two and subtract the result from the minimum reduced diameter of the pole ($D_1$) as shown in the following formula:

Internal defect diameter ‘d’ = $D_1 – (\text{smallest wall thickness} \times 2)$

The above approach is particularly important where internal inspections are carried out at 45 degrees. In these circumstances there can be a significant difference in vertical height between where the front wall and back wall measurements are taken, and it is entirely possible that a

defect could be bigger lower down than it is closer to the ground level or larger closer to ground level and smaller further down.

## K6 Calculation of Residual Strength

A residual strength calculation shall be performed according to Clause K6.1 at each level of the pole where a defect has been found and measured. The largest defect size based on the smallest of the wall thickness at each level shall be used in the residual strength calculation for that level. The pole's reported residual strength shall be the lowest of these strength figures.

## K6.1 Formulas for Calculation of Residual Strength

$$S = \frac{D_1^4 - d^4}{D_0^3 \times D_1} \times 100$$

Note: All measurements shall be in metres

**Circular Poles**

The formula for calculating the *residual strength* or *remaining strength* (S) of a circular pole is given opposite:

*S* – is the strength of the pole given as a percentage of the original strength

$D_0$ – represents the original diameter of the pole.

$D_1$ – represents the smallest diameter of the pole usually at or just below groundline.

*d* – represents the diameter of any internal defect.

$$S = \left( \frac{L_1}{L_o} \right)^3 \times 100$$

Note: All measurements shall be in metres

**Square Poles - where the reduced cross-section is square**

The formula for calculating the *residual strength* or *remaining strength* (S) of a square pole, where the degraded section retains a square profile, is given opposite:

*S* – is the strength of the pole given as a percentage of the original strength

$L_o$ – represents the original width of the square section pole

$L_1$ – represents the reduced width of the square section pole

$$S = \frac{1}{1.69} \left( \frac{D_1}{L_0} \right)^3 \times 100$$

Note: All measurements shall be in metres

**Square Poles - where the reduced cross-section is circular rather than square**

The formula for calculating the *residual strength* or *remaining strength* (S) of a square pole, where the degraded section has a circular profile, is given opposite:

*S* – is the strength of the pole given as a percentage of the original strength

$L_o$ – represents the original width of the square section pole

$D_1$ – represents the reduced cross-section of the pole expressed as a diameter

.

## Annexure L: Timber Poles – Fire-Damaged and Burning CCA Poles

### L1 Hazards When Handling CCA Treated Poles Exposed to Fire

CCA treated timber and poles pose handling hazards to the worker not found when working with other timber products under the following circumstances:

- When the CCA treated timber has been damaged by fire.
- When attempting to extinguish CCA treated timber that is burning or smouldering.

Toxins normally locked in the timber cells during treatment are released when the CCA treated timber is exposed to fire, creating a hazard in the working environment.

Additional information regarding CCA treated poles is available in NEG-SE09.

### L2 CCA Preservative Description

CCA preservatives are water-soluble mixtures of three elemental compounds, the primary functions of which are:

- Copper for the prevention of fungal decay (rot),
- Arsenic to protect against termite or borer attack, and
- Chromium as a fixative.

The CCA treatment of a hardwood timber pole results in full penetration of the sapwood band by the CCA solution. This causes a series of reactions which ‘fix’ the preservative chemicals within the cell structure of the timber.

### L3 Toxins In The Smoke and Ash Of Fire-damaged CCA Poles

The smoke / vapour from burning or smouldering CCA poles will emit toxins which may include:

- Carbon monoxide,
- Chromium 3, and
- Arsenic.

The ash produced from burning CCA poles will contain:

- Arsenic,
- Copper, and
- Chromium.

Contact with these toxins shall be avoided.

### L4 General Safety Precautions

Avoid smoke, fumes and contaminated charred material by staying well clear of the immediate area and remain up-wind.

### L4.1 Training

If you are required to be in the area when CCA treated timber is burning or while fire-damaged material is being handled, you shall be appropriately trained. Training should be equivalent to Ausgrid’s training course M1429 – Handling of Burnt and Burning CCA Poles.

In general, no person shall handle or disturb fire-damaged CCA treated material unless:

- the fire-damaged material shall be moved or contained at that time (this may be either for safety reasons or work requirements), and
- they have received the necessary training, and
- they have the required PPE.

Only appropriately trained workers shall disturb CCA treated timber that is burning or has been damaged by fire. All fire-damaged CCA treated poles shall be immediately reported to the

nominated Ausgrid representative to ensure appropriate action is taken (i.e. containment / removal). Complete a Defective Pole Action sheet.

### L4.2 Personal Protective Equipment (PPE)

All persons involved in work of this nature shall use the required PPE.

All non-disposable PPE, tools and vehicles exposed to CCA contaminated smoke and ash shall be washed immediately after the work is finished.

Any contaminated non-disposable overalls shall subsequently be cleaned by a commercial laundry (similarly to the overalls of Pole Inspector - Termite).

At the conclusion of the work, required personal hygiene includes showering to remove any possible contaminants.

### L4.3 Public Safety

The safety of the public in the immediate area around the contaminated site shall be considered (i.e. the nature and the associated usage of the location). Where it is likely that people may come into contact with the fire-damaged material, steps shall be made to ensure that contamination does not occur. These steps may include:

- Barricading the pole, or
- Standing by until the fire-damaged material is contained, or the pole removed. Stay out of the immediate area and up wind and warn others to do the same.

Do not attempt to remove charred material from poles located where it is likely that people may come in contact with fire-damaged material. Charred material on the pole shall be contained and the pole either cleaned or removed at the first opportunity.

Examples of locations where this may be necessary include:

- outside or adjacent to a School or Daycare facility, or
- in or adjacent to a shopping centre, or
- in or adjacent to a park or garden, or
- adjacent to boat ramps, or
- bus stops or taxi ranks.

### L4.4 High Pressure Water Cleaning

Ausgrid uses high-pressure water to clean fire-damaged CCA material from poles, where economic to do so, and if this service remains available it shall be considered before any fire-damaged poles are removed from service.

Any high-pressure cleaning process used shall be authorised by Ausgrid’s Mains Engineering.

## Annexure M: Timber Poles – Preservative Treatment

### M1 General Requirements

The preservative chemicals that Ausgrid employs to control fungi are by definition a pesticide and users shall meet the pesticide training, handling and recording requirements of Clause 1.2.

### M2 Internal Preservative Treatments

### M2.1 Bore Hole Sterilisation – Boron / Fluoride 'Polesaver' Rods (10mm Diameter)

Boron / fluoride Polesaver rods are solid rods with active constituents of elemental boron and fluoride. They and are manufactured as a 10mm diameter slow-release wood preservative for the control of fungal decay in structural timbers. These rods shall be used to sterilise inspection holes by preventing contamination with fungi that may be introduced through drilling a hole for inspection.

All inspection holes shall be treated with boron / fluoride rods except for holes drilled in the vicinity of the securing bolts or bands on reinforced poles (refer to Clause M6). Up to three rods shall be placed in each hole in the pole, to ensure each hole is fully charged, including those holes drilled for previous below ground inspections. All holes where rods have been inserted shall be sealed with plugs according to Annexure P.

PVC chemical resistant gloves shall be worn when handling Polesaver rods.

### M2.2 Heart Rot Treatment – Boron / Fluoride 'Polesaver' Rods (14mm Diameter)

Ausgrid has historically required heart rot treatment using 14mm Polesaver rods to be completed on specific poles where there is a risk of accelerated deterioration due to internal fungal decay. These rods were installed into the outer annulus of the timber immediately below groundline where they diffused into the timber, thereby preserving it. The pole was drilled abaxially to form cavities to contain two 14mm Polesaver Rods.

No new abaxial holes shall be drilled in Ausgrid poles. All existing abaxial holes shall be charged with Polesaver rods at each inspection and the holes sealed with Black PP16 plastic plugs according to Annexure P. Where the existing rods have not completely dissolved, the appropriate number of 14mm Polesaver rods shall be added to fill the hole. Where the existing rods have substantially dissolved, the holes shall be topped up with two 14mm Polesaver rods.

PVC chemical resistant gloves shall be worn when handling Polesaver rods.

### M3 External Preservative Treatments

### M3.1 Soft Rot Remedial Treatment - External Preservative Bandage

At each maintenance inspection where full excavation of the pole is required, the timber pole shall be treated for soft rot by the application of an external preservation bandage except for the following poles:

- CCA poles which do not require excavation and treatment for the first 3 maintenance cycles (or to a maximum of 20 years depending on inspection cycles) from the date marked on the pole disc (refer to Clauses 5.1.2, 5.1.3 and 5.1.4), and
- Reinforced poles.

The external preservative bandage is available in two forms:

- Preschem Bioguard Bandage (refer to Clause M3.3), and
- Ausmose 'Ausplast' Wrap – (refer to Clause M3.5).

The shape of the outer surface of the pole in the below ground area may become very uneven where fungal decay or termites have degraded the below-ground face of the pole. If Bioguard bandage was to be installed in these situations it would only make contact on the high points of the timber which would limit transfer of the preservative to the timber and would allow it to wash out of the bandage. Ausplast wrap shall be used where the below-ground face of the pole is very uneven.

Both external preservative bandages perform the same function but have different characteristics. An Ausplast Preservative Paste is also available in a cartridge form for direct application to the

pole. It shall be used on areas of the pole which cannot directly contact the external preservative bandage such as splits, checks, cavities or hollows.

### M3.2 General Bandage Installation Requirements

Bandages shall be placed around poles so that they remain in contact with the timber they are there to treat. Where hollows or splits exist, the pole surface shall be treated according to Clause M5.

Never install a bandage over earth wires or underground services. If the bandage cannot be run under these installations the bandage shall be butted up to the obstruction to make certain contact always exists between the bandage and as much of the pole's surface as possible.

Where an obstruction in the ground, such as a concrete kerb, is hard up against a pole the bandage shall be cut so that it is installed flush to the poles surface and covering as much of the timber as possible.

Where a pole has sapwood down to below groundline (as often seen on natural round poles), it shall be removed carefully to ensure that the heartwood is not damaged according to Clause E6 so that the bandage can be installed hard up against the heartwood.

Where sapwood below ground is firmly attached to the pole and not fully removed it may be necessary to shape the sapwood to ensure the preservative bandage can make even contact with the pole surface.

No part of the bandage, wrap or PVC tape shall be visible above groundline.

### M3.3 Bioguard Bandage

The Bioguard bandage is a plastic wrap of discs or pills of slow-release wood preservative. The plastic wrap is preformed into individual round recesses, within an impervious PVC matrix. It is the preferred soft rot treatment and shall be used instead of Ausplast in all situations except where:

- there is free ingress of water into the excavation, or
- the shape of the below ground face of the pole is not smoothly cylindrical and the bandage cannot make proper contact with the full surface of the pole face.
- where there are numerous UGOH's or other attachments to the pole.
- steeply sloping ground.

The slow-release wood preservative in the Bioguard bandage contains boron and fluoride and is identical in composition to the boron / fluoride rods described in Clauses M2.1 and M2.2. The Bioguard bandage shall be completely placed below ground so that the active ingredients diffuse from the bandage into moist timber. The chemical penetrates the heartwood of the pole by ionic diffusion and will provide long term protection of the timber against fungal decay once fungi-toxic levels are reached. Boron / fluoride does not act as termiticide however, termites will not touch timber impregnated with Boron / Fluoride.

PVC chemical resistant gloves shall be worn when handling the Bioguard bandage.

When removing the old bandage, all residue or spilt chemical tablets shall be put back into the hole. Bioguard bandages that contain no residue from the chemical tablets may be disposed of in landfill areas approved by the Environmental Protection Agency. Where an undepleted Bioguard Bandage is removed, the removed bandage shall be returned to Ausgrid's warehouse in an approved bag for recycling.

### M3.4 Application Process – Bioguard Bandage

The application process for the Bioguard bandage shall be performed as follows:

1) Scrape the pole to remove soil build up and any external decay.
2) Using a stiff brush or a scraping tool (the scaping tool shall not remove sound timber), remove any excess soil from the pole.
3) Where plugged inspection holes are located in the area to be covered with the Bioguard Bandage, plugs shall be driven flush to ensure the bandage is not held away from the pole surface.

4) Inject preservative paste into any splits, checks, cavities or hollows under the area to be covered by the bandage.
5) Measure the pole circumference at the widest point below groundline.
6) Measure and cut the Bioguard Bandage to allow 10-20mm overlap (overlap not to exceed 50mm).
7) Position the bandage 50mm below the true groundline. When the installation is complete and the soil has settled, no part of the bandage or the PVC tape shall be visible above ground.
8) Staple the trailing edge of the bandage to the pole. Wrap the leading edge around the pole and staple in place. The bandage shall be in even contact with the pole surface over its full coverage to be effective.
9) Tightly wrap the top edge of the bandage with two layers of 50mm wide PVC tape such that the tape half overlaps the top edge of the bandage and seals against the pole.

On steeply sloping ground where the Bioguard bandage is 50mm below groundline on the low side and 150mm or more below groundline on the high side, a piece of Ausplast external preservative wrap shall be cut to shape and fitted above the Bioguard bandage on the high side of the pole.

The section of Ausplast wrap shall be installed before wrapping two layers of 50mm PVC tape around the top of the Preschem bandage. There is no need to seal the top of the Ausplast wrap with PVC tape.

### M3.5 Ausmose 'Ausplast' Wrap

The active ingredient of the Ausplast wrap is Sodium fluoride, an S6 scheduled poison. It contains no Boron, unlike the Preschem product, and the active ingredient is blended with a waterproof paraffin oil base to the consistency of a stiff paste which is a light brown colour with a slightly oily odour. It is supplied coated onto a biodegradable plastic-coated paper wrap. Ausplast works in the same manner as Bioguard.

Ausplast wrap shall be used in all situations where irregular water inundation may occur but shall not be used in or near water bodies or where the treatment can enter water catchments, waterways or drains (for example, adjacent to roadside kerbing).

Oil resistant gloves and boots shall be worn when handling Ausplast wraps. Contaminated clothing shall be washed after each day's use.

Ausplast does not dissolve when submerged in water where the active constituent continues to slowly release from the paraffin oil base in a controlled manner. This makes it suitable for situations where irregular water inundation may occur.

Ausplast has the ability to conform more easily to irregularly shaped surfaces and is thus more effective where Bioguard cannot be made to sit flat against the pole face.

### M3.6 Application Process – Ausplast Wrap

The application process for the Bioguard bandage shall be performed as follows:

1) Scrape the pole to remove soil build up and any external decay.
2) Using a stiff brush or a scraping tool (the scaping tool shall not remove sound timber), remove any excess soil from the pole.
3) Where plugged inspection holes are located in the area to be covered with the Ausplast wrap, plugs shall be driven flush to ensure the wrap is not held away from the pole surface.
4) Inject preservative paste into any splits, checks, cavities or hollows under the area to be covered by the wrap.
5) Measure and cut one or more pieces of Ausplast wrap and peel off the plastic liner. Place the plastic liner in the supplied black plastic bag. Place the wrap against the pole with the paraffin side facing the pole such that the wrap comes no closer than 50mm to finished groundline. There is no need to staple or tape the bandage in place. Ensure that the full circumference of the pole is covered by slightly overlapping any joins. A large overlap is not of concern other than a waste of material, but joins shall overlap to ensure full coverage.

6) Ensure that the wrap is pressed firmly against the pole and into any dips and valleys so as much of the pole's external face is covered as possible.

On steeply sloping ground where the Ausplast wrap is 50mm below groundline on the low side and 150mm or more below groundline on the high side, a piece of Ausplast wrap shall be cut to shape and fitted above the first section of wrap on the high side of the pole.

The wrap is biodegradable and waste is not expected to require removal at subsequent inspections. The plastic liner and any other waste shall be placed in the black plastic bag supplied and disposed of in general waste.

## M4 Treatment of Damaged Copper Chrome Arsenate (CCA) Impregnated Timber

Above ground CCA treated timber damaged through incidents such as vehicle impact or vandalism shall be treated with CN timber oil according to Clause M4.1.

Treatment of burnt CCA treated timber shall be undertaken according to Clause M4.1. The handling and preparation of burnt CCA timber shall be undertaken according to Annexure L.

## M4.1 CN Timber Oil – (Copper Naphthenate Paint)

The treatment of CCA impregnated poles which have been damaged or scarfed above groundline (e.g. by a vehicle), which has removed the CCA impregnated sapwood is:

1) Clean up the damaged area removing any loose material.
2) Treat above ground damaged areas with CN timber oil – (Copper Naphthenate paint).
3) Treat any below groundline damage with Ausplast preservative paste.

Any above ground locations within the pole inspection area where the CCA treated timber has been damaged, such as where burnt CCA material has been cleaned off, shall be recoated with CN timber oil at each maintenance inspection.

Synthetic rubber or PVC gloves and eye protection shall be worn when handling or applying CN timber oil. CN timber oil shall only be applied with a brush.

## M5 Treatment of Knot Holes, Grub Holes and Barrel Checks

All hole defects shall be probed to discover the extent of any decay.

All decay shall be removed, and the knot or grub hole scarfed on the bottom to allow excess moisture to run out. Ausplast preservative paste shall then be injected from a cartridge into the defect, so the internal surface has about a 2mm coating over the whole surface. The defect shall then be sealed with a petromastic compound. Old equipment holes in the inspection area shall be treated with Preschem rods and sealed with plastic plugs or petromastic compound.

Barrel checks (vertical splits) shall not have any petromastic compound or preservative paste applied. They shall not be obstructed by debris which can trap moisture internally, thereby promoting fungal decay.

Where petromastic compound is found in barrel checks, it shall be removed.

## M6 Treatment of Reinforced Poles

Reinforced poles shall not to be treated with a below ground soft rot treatment (Bioguard or Ausplast).

Holes drilled for the measurement of wall thickness in the vicinity of reinforcement securing bolts or bands shall not be treated with Polesaver rods. These holes are typically drilled at 200mm, 800mm and 1 metre above groundline or 50mm above and below the top securing bands of longer splint reinforcements and shall be sealed with grey plugs (refer to Annexure P).

Any other above ground inspection holes shall be treated with Polesaver rods, including inspection holes that will be covered when a pole reinforcement is installed.

## M7 Preservative Treatment Stockcodes

**Table 13 – Preservative Treatment Stockcodes**

| Description | Stockcode |
|---|---|
| Boron/Fluoride Rods 10mm diameter<br>(PRESCHEM POLESAVER RODS (PS10)) | 145342 |
| Boron/Fluoride Rods 14mm diameter<br>(PRESCHEM POLESAVER RODS (PS14)) | 142018 |
| Bioguard Bandage<br>(PRESCHEM BIOGUARD) | 150367 |
| Ausmose 'Ausplast' Wrap (roll)<br>(AUSPLAST WOOD POLE PRESERVING COMPOUND) | 179462 |
| Ausmose 'Ausplast Preservative Paste' (cartridge)<br>(AUSPLAST WOOD POLE PRESERVING COMPOUND) | 179471 |
| CN Timber Oil – (Copper Naphthenate paint)<br>(PROTIM® SOLIGNUM® CN TIMBER OIL) | 146332 |

## Annexure N: Timber Poles - Termite Eradication and Treatment

### N1 General

All poles found to be infested with termites shall be treated within 30 days of the termite treatment order being generated.

When active termites are first identified, a termite tag shall be fixed to the pole according to Clause N11.

Where active Coptotermes species termites are positively identified at the time of inspection, the Asset Inspector may install a bait at that time or complete a termite notification and have a specialist pesticide officer complete the bait installation.

Glyptotermes species termite infestations have no treatment. Once their presence is confirmed, the pole shall be replaced.

Where any species of termite other than Coptotermes are found, the Asset Inspector shall complete a termite notification and have a specialist pesticide officer complete the termite treatment work. Specialist pesticide officers are Asset Inspectors who have received additional Certificate 3 training in chemical handling and meet the requirements of the EPA pesticide exemption and are individually authorised by Ausgrid.

### N2 Mandatory Training

The application of Pesticides around poles shall only be performed by licensed pest control personnel, or those qualifying for exemption as outlined in the EPA pesticide exemption order (refer to Clause 1.2 and Annexure O).

Specialist pesticide officers are Asset Inspectors who have received additional training Certificate 3 in chemical handling and meet the requirements of the EPA pesticide exemption order. They shall be individually authorised by Ausgrid.

### N3 Recording and Notification

Recording and notification of pesticide use associated with termite control shall be undertaken according to Clause 2.4.

### N4 Termite Prevention and Eradication

Termite eradication and prevention is achieved through the application of termiticides. The termite circumstances and type of termiticides to be used under those circumstances are shown in Table 14.

**Table 14 – Termiticide types**

| Type | Products Used | Effective Against | Priority |
|---|---|---|---|
| **Baits** | Nemesis<br>Termatrix | Specifically for Coptotermes Species | Eradication |
| **Dusts** | Fipforce | Subterranean termites | Eradication |
| **Liquids** | Termidor®<br>Fipronil 100SC | Subterranean termites | Prevention and eradication |

Termiticide applications shall be performed according to the product label and manufacturer's instructions. Chemicals shall be handled according to the relevant safety data sheet. Liquid termiticide shall not be applied to poles where there is water flowing into the excavated below ground inspection area - these poles shall be treated using dust termiticide.

No treatment shall be applied in areas where the pesticide could enter water catchments, in or near water bodies, or such that they are likely to enter a waterway or drain. All pesticide applications shall be performed according to the relevant Acts and Regulations.

If active termites are found in the pole at the 12-month follow up inspection, or at any later time, a new 3 segment termite treatment tag shall be fitted immediately below the previous tag (preferred

location) and the process repeated. It is possible that a pole may have multiple termite treatment tags, similar to the tag shown in Figure 54 (d), fitted over the course of its life.

Termite eradication and prevention is achieved through the following treatment processes:

- Process 1 using bait and liquid termiticides (refer to Clause N8), or
- Process 2 using dust and liquid termiticides (refer to Clause N9), or
- Process 3 using liquid termiticide only (refer to Clause N10).

When using dual treatments (i.e. Process 1 or Process 2), the bait or dust shall be applied first and the liquid is applied later. Under no circumstances shall the two treatments to be applied at the same time.

## N5 Bait Termiticides

### N5.1 General Information

The success of baiting depends heavily on achieving minimal disturbance to the termites and their workings, so that the level of termite activity is maintained. Therefore, to ensure maximum effectiveness, the bait shall be installed by the Asset Inspector at the time of initial inspection when the termites are first identified. Termite baits are only effective when they are placed in a position where termites initiate direct contact with the bait material. Bait termiticides shall only be applied when active Coptotermes species termites are positively identified.

Termites will abandon the area where the bait is installed without consuming the bait if they perceive a threat to their activity, or if sufficient disturbance allows entry of any black ants that may be on the pole. It has been observed that if black ants discover the termites when the termite galleries are broken for inspection, the likelihood of the termites consuming the bait is greatly reduced. Therefore, the pole inspection procedure shall stop when active termites are discovered.

If the active termites are not Coptotermes species termites, the inspection procedure shall continue because disturbance does not significantly affect the treatment process used on other species. However, every effort shall be made to not damage the external termite galleries where Nasutitermes are infesting the pole.

If Coptotermes species termites are found, the above ground inspection or initial below ground inspection (if partial excavation has commenced) is to be performed but sounding or additional excavation shall not be performed, other than that necessary to prove the integrity of the pole (refer to Clause G4.1). If full excavation around the pole has been completed before the termites are discovered, the full pole inspection procedure shall be completed because significant disturbance has already occurred. In this instance, a bait shall still be installed because active termites have been identified and a bait can be placed in direct contact with them.

When a bait installation cannot be performed at the time of initial inspection and the intent is to install a bait after the initial termite identification and active termites are not found at that later date, a bait shall not be installed. The pole shall be fully inspected and treated with Termidor liquid only when termites have previously been positively identified but no active termites are be found at the time of treatment.

It has been observed that when termites totally consume the bait material the colony will ultimately die, however because the termiticide acts as an insect growth regulator, this may take several months depending on the time of year and the health of the colony. Also, termites will divert their activity from consuming the cellulose material of a timber pole to consuming the bait material once installed. This means that the destructive effect of the termites on the pole will be concentrated on and around the bait box, and destruction of the pole will decrease from that point, ultimately ceasing as the workers die. Towards the end of the process only soldiers will be observed as the worker termites will die first. These soldier termites will ultimately starve because there will be no workers to feed them.

Baits installed in summer will, in general, be consumed quicker than those installed in winter, when termites are less active and the termites remain closer to the nest. Therefore, baits installed in winter will generally take longer to be consumed than those installed in warmer months and may therefore need to remain on the pole longer to complete their job. Where this issue (retarded termite activity in colder months) may impact on achieving success by baiting due to limitations

imposed by product label requirements an alternative approved treatment targeting destruction of the nest should be considered.

## N5.2 Bait Containers

The bait containers currently being used contain 2 plastic bags of a termiticide called 'Nemesis' termite bait with an active constituent: 1.0g/kg Chlorfluazuron. Each plastic bag contains 100 grams. The bait is not toxic to humans however, Chlorfluazuron is toxic to aquatic life (e.g. all fish species) and shall not be allowed to contaminate streams, rivers or waterways.

The termiticide Nemesis is an insect development inhibitor type insecticide for use as part of a termite interception and baiting system, an integrated system for the management of subterranean termite infestations (except Mastotermes darwiniensis).

The two plastic bags of Nemesis are housed inside a plastic bait container. The bait containers are made from grey plastic and are approximately 300mm long and 80mm wide and are sealed at both ends with end caps. The bottom face of the bait container that attaches to the pole is slotted to allow termites to enter.

An alternate product to Nemesis termite bait also currently being used is 'Termatrix' termite bait. Once stock holdings of the existing Nemesis products are depleted, Termatrix will be the only approved product for baiting.

**Figure 48 – Installed Nemesis Bait**

**Figure 49 – Installed Termatrix Bait**

## N5.3 Bait Installation

Nemesis and Termatrix baits shall be installed in strict compliance with the product label. Where the instructions in this Standard are inconsistent with the product label, the product label has legal standing and shall be followed. To install the bait:

1) Use a knife to cut both bait bags inside the box, exposing the bait material contained within.
2) Spray the bottom of the bait container with one light spray of pure water (not tap water as it contains chemicals such as chlorine and fluoride).
3) Fix the bait container to the pole such that the exposed bait material is in direct contact with the termites, or over the location where they were identified.
4) Attach the bait box to the pole with 2 - 100mm x 14g bugle head class 2 wood screws, or equivalent, (refer to Table 17) driven through the plastic bait box and into the pole.

The bait container shall be fully sealed around its circumference where it attaches to the pole with Selleys 'No more gaps' sealant (refer to Table 17). No other type of sealant shall be used. Use of sealant is critical in the success of the baiting procedure and shall fully seal the bait to the pole.

The purpose of the sealant is to retain moisture and provide mechanical protection to the area where the termites will leave the pole to enter the bait container. It is crucial that this area be sealed from predators such as ants and that moisture be retained so a favourable environment can be created for termite activity.

The name of the Asset Inspector who installs the bait, and date of installation, shall be written clearly onto the bait container using a permanent waterproof marking pen, for later audit purposes. This may be written on the face of the bait that contacts the pole, or on the bottom cap, so as not to be visible to the public – but shall be permanent and easily read.

## N6 Dust Termiticides

### N6.1 General Information

The success of termite dusting depends heavily on achieving minimal disturbance to the termites and their workings so that the level of termite activity continues while maximising the quantity of termites dusted. The pole inspection procedure must stop when active termites are discovered.

In the case of Nasutitermes or Glyptotermes species termites, the inspection procedure shall continue because disturbance is not as important, however every effort shall be made not to damage the external termite galleries where Nasutitermes are infesting the pole.

Where Coptotermes species termites are found during the above ground inspection or partial excavation, no further sounding or additional excavation shall be performed, other than that necessary to prove the integrity of the pole (refer to Clause G4.1). If full excavation around the pole has been completed before the termites are discovered, the full pole inspection procedure shall be completed because significant disturbance has already occurred.

### N6.2 Dust Treatment Procedure

The dust termiticide which shall be used on Ausgrid's poles is 'Fipforce Dust Termiticide & Insecticide' (Fipforce). The active ingredient in Fipforce dust is 5g/kg FIPRONIL. 'Termidor' dust has been used previously and is acceptable for continued use until current stocks are depleted.

Termidor and Fipforce dust shall be used as supplied and shall be applied strictly according to the product label.

Before treatment, check that a Termite Treatment tag is attached to the pole. If a Termite Treatment tag is not attached, a Termite Treatment tag shall be attached to the pole according to Clause N11. This is essential to warn others that a termite eradication process is in place and that termites may still be present.

When carrying out termiticidal dusting it is important that only a light dusting is applied, and that the dust contacts as many worker termites as possible. Not all poles are suitable for a dusting treatment. Dust shall be reapplied if active termites are evident four weeks after the initial application and strictly according to the product label. The equipment used to apply Fipforce and Termidor dusts are shown below.


**Figure 50 – Equipment used for the Dusting of Termites using Fipforce Dust**


**Figure 51 – Equipment used for the Dusting of Termites using Termidor Dust**

## N7 Liquid Termiticides

### N7.1 Liquid Termiticide Treatment Procedure

The liquid termiticides which shall be used are 'Termidor® Residual Termiticide & Insecticide' (Termidor) and 'Pest Controllers Own FIPRONIL 100 SC Termiticide and Insecticide' (Fipronil 100SC). The active constituent in both products is 100 g/L FIPRONIL.

These liquid termiticides are used to treat subterranean termites in and around poles according to the product label instructions. Where soil is very dry, it may be necessary to wet the soil with water prior to termiticide application. Liquid termiticides (prepared sprays) are applied to either create a 'Vertical Treated Zone' according to Table 15 or by direct injection into a nest in a pole according to Table 16.

**Table 15 – Liquid Termiticide Application for 'Protection of poles and fence posts'**

| Product Used | Application Method | Mixing Rate (% a.i. mix) | Application Rate |
|---|---|---|---|
| **Termidor®** | Trenching and puddle treating the backfill. Soil injection (rodding) shall only be used where trenching and backfill treatment is not possible or practical. | 600ml in 100 litres of water. (0.06%) | 100 litres per cubic metre of soil |
| **Fipronil 100SC** | Trenching and puddle treating the backfill. Soil injection (rodding) shall only be used where trenching and backfill treatment is not possible or practical. | 600ml in 100 litres of water. (0.06%) | 100 litres per cubic metre of soil |

**Table 16 – Liquid Termiticide Application for 'Nests in poles'**

| Product Used | Application Method | Mixing Rate (% a.i. mix) | Application Rate |
|---|---|---|---|
| **Termidor®** | Drilling the pole to locate the nest and flooding the nest with prepared spray. | 600ml in 100 litres of water. (0.06%) | Depends on the size of the nest |

| | | | |
|---|---|---|---|
| **Fipronil 100SC** | Drilling the pole and flooding the nest with prepared spray. | 600ml in 100 litres of water. (0.06%) | Depends on the size of the nest |

Application shall be performed strictly according to the supplied product label. Where the instructions in this Standard differ from the product label, the instructions on the product label shall apply. Notification of any such discrepancy shall be provided to Ausgrid's Mains Engineering.

As a guide, between 7 and 20 litres of liquid termiticide shall be required to treat the soil around the pole, depending on pole size and width of the excavation. The soil around the pole shall be treated to a depth of 450mm forming a soil barrier at least 150mm wide.

If a nest is identified inside a pole, it may be flooded with termiticide according to the product label instructions.

Before treatment, check that a Termite Treatment tag is attached to the pole. If a Termite Treatment tag is not attached, a Termite Treatment tag shall be attached to the pole according to Clause N11. This is essential to warn others that a termite eradication process is in place and that termites may still be present.

The liquid termiticide shall be applied by full excavation of the pole to 350mm deep, injection into the bottom of the excavation (see figure below) to form a barrier below the excavated area, then puddling the termiticide around the pole as the soil is replaced according to the product label. The soil shall be replaced in approximately 4 equal quantities, not all at once, puddling termiticide into the mix and compacting the soil between each stage. The objective is to ensure an even distribution of termiticide through the backfilled material.

**Figure 52 – Injection Equipment for Inground Barrier and Internal Pole Nest Treatment**




**Figure 53 – Equipment used for Measurement of Application Rates and Quantity Delivered**

## N8 Termite Treatment Process 1: Bait and Liquid Termiticide

Baiting is only effective against Coptotermes species termites and shall only be used where these species have been identified. Baiting is not effective on CCA poles because the treated timber surface is repellent to the termites. Unless the installation process can reliably bring the termites from inside the pole, through the CCA treated timber into the bait, a dust / liquid process shall be used, or liquid only if the nest can be located.

Dusting shall be used in the colder months of the year instead of baiting.

### N8.1 First Inspection

Baits shall be monitored after installation according to the product label instructions.

When a treatment is successful a full pole inspection shall be performed, and the pole treated with Termidor or Fipronil 100SC liquid according to Clause N10.

When inspecting baits:

1) Remove the fixing screws and detach the bait container from the pole.

   Active termites may still be present in and behind the bait box, however if all the bait material has been consumed the colony will die.

2) Inspect the bait:

   - If all or most of the bait has been consumed shall be assumed that the treatment will be successful.
   - If the termites are still feeding on the bait and most of the bait material is yet to be consumed then either:
     - the bait shall be carefully re-attached and the bait scheduled for an additional inspection, or

- the bait shall be carefully re-attached and the infestation referred for treatment by dusting.

- If worker termites are active in the pole but not feeding on the bait then the infestation shall be scheduled for a treatment by dusting.

3) For baits which have been removed and will not be re-attached, write the pole number and bait removal date onto the bait container using a permanent waterproof marking pen and return the bait container to Ausgrid's Mains Engineering for audit.

4) Where treatments are deemed successful, record the findings then carry out a full pole inspection if not previously completed and treat with Termidor liquid according to Clause N10.

### N8.2 12-month Follow-up Termite Inspection

This inspection shall be carried out by an authorised pesticide officer only.

The post-treatment final inspection is to confirm that termites have been completely eradicated and have not re-infested the pole. It shall consist of an external and internal visual inspection of the pole, looking for active termites. It is generally not necessary to dig out and drill the pole below G/L. This is not a pole inspection, but a termite inspection. It is not necessary to carry out a full pole inspection according to Annexure D or Annexure F unless active termites are found, and it is suspected that further damage may have occurred.

The 12-month follow-up termite inspection shall be performed within the November-February period. However, if the termite treatment occurred within the three months prior to November (i.e. during August, September, October), the follow-up termite inspection shall be completed within the next November-February period.

The outcome of the inspection shall be a determination as to whether the pole is to be returned to normal service (pole is clear of termites) or whether the pole is to be re-inspected and re-treated (active termites identified).

Where a pole is repeatedly treated and re-infested, Ausgrid's Mains Engineering shall be contacted for advice/support.

## N9 Termite Treatment Process 2: Dust and Liquid Termiticide

Dusting for the control of termites shall only be carried out where baiting is not suitable for use or where it has been established that the termites would not consume the bait material.

Where dusting is determined to be the appropriate control method it shall be repeated so that a maximum of three treatments are attempted or until the termites appear to have been eradicated. If at the end of three treatments the termites are still active a liquid termiticide only treatment is to be applied along with the required inspections according to Clause N10.

### N9.1 First Inspection

Return to the pole 4 weeks after the treatment and inspect for active termites. Where active worker termites are identified, repeat the treatment and termite inspection process (refer to Annexure G). Where no worker caste termites are found, record the findings, then carry out a full pole inspection if not previously completed and treat with Termidor liquid as per Clause N10.

### N9.2 12-month Follow-up Termite Inspection

The 12-month follow-up termite inspection shall be performed according to Clause N8.2.

## N10 Termite Treatment Process 3: Liquid Termiticide Only

Termidor and Fipronil 100SC liquid termiticides are used to provide residual termite protection following previous treatments designed to eliminate the nest. They shall only be used as a single treatment where the nest can be located and flooded with termiticide, or as residual treatment where termites have been identified and treated or are no longer infesting the pole or where the routine three repeat treatments have occurred and have been unsuccessful.

The full pole inspection process may be completed prior to liquid termiticide treatment being carried out. This treatment may be performed in conjunction with the inspection of the pole, or at a subsequent date.

Liquid termiticide can also be utilised where only a small number of termites are identified and baiting or dusting would not be effective.

### N10.1 First Inspection

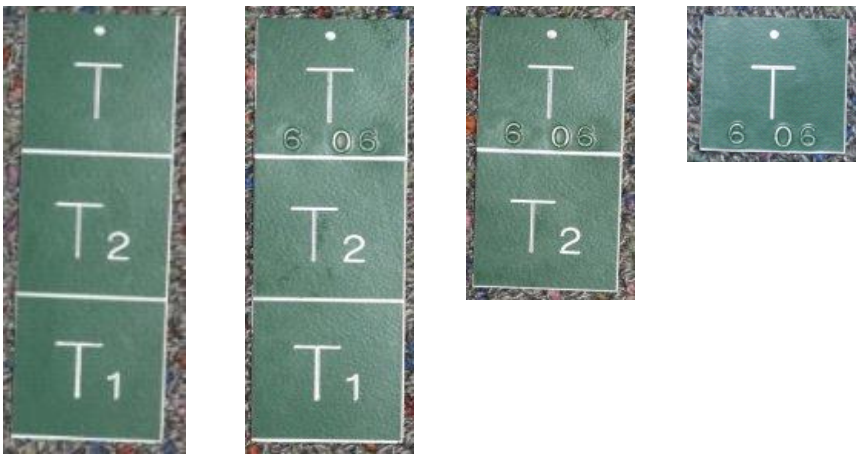
Return to the pole 12 weeks after the treatment to confirm initial control of termites. Inspect for termite activity according to Annexure G. If termites are still present, the pole shall be re-treated according to Clause N4 with the appropriate termite treatment option selected.

### N10.2 12-month Follow-up Termite Inspection

The 12-month follow-up termite inspection shall be performed according to Clause N8.2.

## N11 Identification of Termite Affected Poles Using Termite Tags

Ausgrid poles affected by termites shall be identified with a 3-segment tag that provides information on the current treatment process and permanently identifies the pole as having been affected by termites.




(a) (b) (c) (d)

**Figure 54 – Termite Identification Tags**

These tags replaced the circular 'T' disc previously used to identify termite-affected poles. The tags are powder coated aluminium, engraved to show the nail fixing location and the 'T', '$T_1$' and '$T_2$' markings, together with the segment snap points.

### N11.1 Initial Installation

Figure 54 (a) shows a tag that shall be fitted to a pole when termites are first detected. The tag shall be nailed to the pole with the nail being driven through the top tag at the engraved location point.

The termite treatment tags shall be located as follows:

- Below any tape markings and at least 2.2 metres above groundline.
- On the approach side face of the pole, this will normally be the roadside face.
- Where there is no clear approach side or adjacent road, the tag shall be located in the same axis as the pole ID disc.

### N11.2 At the Time of Initial Termite Treatment

The top segment of the tag (T) shall have the date of the initial treatment stamped with the month and year of that treatment (e.g. "6 06", 6 – June, 06 – 2006) onto the aluminium tag as shown in Figure 54 (b). Where a tag is installed prior to treatment, it shall be nailed to the pole so that it can be readily removed from the pole at the time of initial treatment to facilitate recording the treatment date onto the tag.

When the tag is finally fixed to the pole, the termite tag shall be nailed using a 40mm twist nail to reduce the chance of detaching from the pole.

### N11.3 Completion of the First Successful Termite Inspection

The lowest section of the tag ($T_1$) shall be removed (broken off) at the successful completion of the initial inspection following treatment, when no further termite activity can be found (all termite activity has ceased). Refer to Figure 54 (c).

### N11.4 Completion of the Final Termite Inspection

The centre section of the tag ($T_2$) shall be removed at the 12-month follow up inspection provided no further termite activity can be found. Refer to Figure 54 (d).

The purpose of the top segment of the tag (T) is to provide a permanent identification on the pole that it has been affected by termites.

## N12 Termite Treatment Stockcodes

**Table 17 – Termite Treatment Stockcodes**

| Description | Stockcode |
|---|---|
| Termite Tag | 91975 |
| Nemesis Termite Baits for Poles | 179631 |
| Termatrix Termite Baits | TBA |
| Termidor Liquid<br>(TERMIDOR® RESIDUAL TERMITICIDE and INSECTICIDE) | 179962 |
| Fipronil 100SC Liquid<br>(PEST CONTROLLERS OWN FIPRONIL 100 SC TERMITICIDE and INSECTICIDE) | TBA |
| 100mm x 14g bugle head Class 2 screws | 179541 |
| 40mm Twist Nails | 175912 |
| Selleys No More Gaps | 179731 |
| Resealable Plastic Bag 400mm x 355mm ‘Zip Lock’ for Returning Baits | 38562 |

## Annexure O: Timber Poles - Pesticides Regulation 2022 Exemption Order

This exemption order, known as the Electricity Pole Inspection Licence Exemption Order, was published in New South Wales Government Gazette Number 581 on 16th December 2022.

**PESTICIDES REGULATION 2017 - EXEMPTION ORDER UNDER CLAUSE 8**

**Name of Order**

1. This Order is to be known as the *Electricity Pole Inspection Licence Exemption Order December 2022*.

**Authority for Order**

2. This Order is issued by the Environment Protection Authority pursuant to cl 8 of the Pesticides Regulation 2017 (the Regulation).

**Duration of Order**

3. This Order commences on the date of publication in the NSW Government Gazette and has effect until revoked by the Environment Protection Authority by notice published in the NSW Government Gazette.

**Revocation and replacement of previous Order**

4. This Order revokes and replaces the *Electricity Pole Inspection Exemption Order 2022* gazetted by the EPA on 22 July 2022.

**Objects of Order**

5. The objects of this Order are to:
   (a) Authorise those persons described in cl 8 of this Order to use approved pesticide products to control timber pests when inspecting timber electricity poles without the need to hold a pest management technician licence or a timber pest management technician licence, and
   (b) Specify the chemical accreditation required by those persons in cl 8 of this Order, who use pesticide products to control timber pests in timber electricity poles in NSW.

**Background**

6. Section 45 of the Pesticides Act provides that a person must not carry out prescribed pesticide work unless the person is the holder of a licence that authorises the person to carry out that kind of work. Pest management technician work and timber pest management technician work are prescribed pesticide work requiring a licence. Under cl 8 of the Regulation the EPA may exempt a specified person or class of persons from licensing requirements.

   The *Electricity Pole Inspection Exemption Order 2022* exempts employees or contractors of an electricity distributer using pesticides to control timber pests in timber electricity poles from the requirement to hold a pest management technician licence under s 45 of the *Pesticides Act 1999* (the Act) if they meet the training and other requirements set out in the order.

   The Regulation was amended in 2021 to introduce timber pest management technician work as a new category of prescribed pesticide work. As at the date of this Order, all persons working for an electricity distributor that use pesticides to control timber pests in electricity poles are required by the Regulation to hold either a timber pest management technician licence or a pest management technician licence.

**Exemption**

7. This Order exempts persons authorised under cl 8 of this Order from the requirement to hold a licence for pest management technician work or timber pest management technician work as required under section 45(1) of the Act, subject to the conditions in cl 9 of this Order.

**Persons authorised**

8. Persons authorised under this exemption are employees or contractors of an electricity distributor who:
   a) meet the conditions in cl 9(2) of this Order;
   b) are supervised by a supervisor who either:

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i) meets the conditions in cl 9(1) of this Order; or

ii) holds a licence for pest management technician work or timber pest management technician work;

c) have been determined by the electricity distributor to be competent to carry out pole asset inspections; and

d) use approved pesticides products to control timber pests in timber electricity poles in NSW.

**Conditions**

9. The exemption in this Order only applies if the following conditions are met:

(1) A person who is the supervisor of employees and/or contractors who are authorised under cl 8 of this Order must:

(a) have obtained a Level 4 Chemical user's qualification issued in accordance with the Australian Qualifications Framework that includes either:

(i) the competency units AHCCHM404 Develop procedures to minimise risks in the use of chemicals and AHCCHM405 Plan and implement a chemical use program; or

(ii) an equivalent competency that supersedes or is superseded by AHCCHM404 and AHCCHM405;

(b) have obtained one of the following qualifications or an equivalent qualification that supersedes or has been superseded by one of the following qualifications:

(i) Pole Inspectors Training Course (TAFE Course No. 27510 or 357-27510V02);

(ii) UET20621 Certificate II in ESI – Asset inspection and testing and competency unit UETDRAI004 Treat poles;

(iii) Competency unit UETTDRIS57 Conduct visual checking and treatment of power system poles and structures;

(iv) Competency units UETTDRAI001 Inspect and test poles at and below ground level and UETDRAI004 Treat poles;

(v) Competency units UETTDRAI002 Inspect poles, hardware and electrical apparatus and UETDRAI004 Treat poles;

(vi) Competency unit UETTDREL18 Inspect and treat poles and inspect electrical apparatus; or

(vii) An EPA-approved pole inspector training course developed and delivered by an electricity distributor that gives employees or their contractors specific training in undertaking pole inspections and using pesticides to control timber pests in electricity poles. To obtain EPA approval, the electricity distributor must submit the training course to the EPA for evaluation with evidence that the course aligns with TAFE Course No. 27510 or 357-27510V02; or UET20621 Certificate II in ESI – Asset inspection and testing or competency unit UETTDRIS57; or competency units UETDRAI004 and UETTDRAI001; or competency units UETDRAI002 and UETTDRAI004; or competency unit UETTDREL18. Any conditions of the approval must be complied with;

(c) instruct persons authorised under cl 8 of this Order on how to safely use pesticides and how to be compliant with the requirements of the Act and its regulations; and

(d) ensure persons authorised under cl 8 of this Order are made aware of the application and limitations of this Order.

(2) A person authorised under cl 8 of this Order to use pesticides to control timber pests must:

(a) not be less than eighteen (18) years of age;

(b) have obtained Level 3 Chemical user's qualification issued in accordance with either:

(i) the Australian Qualifications Framework AHCCHM307 Prepare and apply chemicals

to control pest, weeds and disease and AHCCHM304 Transport and store chemicals; or

(ii) an equivalent competency that supersedes or has been superseded by AHCCHM307 and AHCCHM304;

(c) have obtained one of the following qualifications or an equivalent qualification that supersedes or has been superseded by one of the following qualifications:

(i) Pole Inspectors Training Course (TAFE Course No. 27510 or 357-27510V02);

(ii) UET20621 Certificate II in ESI – Asset inspection and testing and UETDRAI004 Treat poles;

(iii) Competency unit UETTDRIS57 Conduct visual checking and treatment of power system poles and structures;

(iv) Competency units UETTDRAI001 Inspect and test poles at and below ground level and UETDRAI004 Treat poles;

(v) Competency units UETTDRAI002 Inspect poles, hardware and electrical apparatus and UETDRAI004 Treat poles;

(vi) Competency unit UETTDREL18 Inspect and treat poles and inspect electrical apparatus; or

(vii) An EPA approved pole inspector training course developed and delivered by an electricity distributor that gives employees or their contractors specific training in doing pole inspections and using pesticides to control timber pests in electricity poles. To obtain EPA approval the electricity distributor must submit the training course to the EPA for evaluation with evidence that the course aligns with TAFE Course No. 27510 or 357-27510V02; or UET20621 Certificate II in ESI – Asset inspection and testing; or competency unit UETTDRIS57; or competency units UETDRAI001 and UETTDRAI004; or competency units UETDRAI002 and UETTDRAI004; or competency unit UETTDREL18. Any conditions of the approval must be complied with;

and

(d) be able to communicate to a level that enables them to perform their duties safely.

**Definitions**

10. In this Order -

**Approved pesticide product** means any chemical product registered by the Australian Pesticides and Veterinary Medicines Authority (APVMA), or chemical product approved for use under an APVMA permit.

**Australian Qualifications Framework** has the same meaning as in section 7 of the *Higher Education Act 2001*.

**Electricity distributor** means the following electricity transmission or distribution network operators who are responsible for maintaining the electricity pole and wire infrastructure in NSW: Ausgrid Operator Partnership (ABN 78 508 211 731), Endeavour Energy Network Operator Partnership (ABN 11 247 365 823), Essential Energy (ABN 37 428 185 226) and TransGrid (NSW Electricity Networks Operations Pty Ltd ACN 609 169 959 as trustee for the NSW Electricity Networks Operations Trust). Should any of these companies change or modify their company name, or the functionality in regard to servicing electricity poles be bestowed upon another company, then that company name also applies for the purpose of this Order.

**EPA** means the NSW Environment Protection Authority.

**Pest management technician work** has the same meaning as in the Regulation.

**Supervisor** means a person who is responsible for overseeing and instructing employees and contractors on operational procedures in respect to the use of pesticides. Supervision can be indirect only where the supervisor has established an employee or contractor is competent to

use pesticides without direct (onsite) supervision.

**Timber pest** means any insect or fungal organism that is structurally damaging timber electricity poles.

**Timber pest management technician work** has the same meaning as in the Regulation.

**Use** of a pesticide means "use" and "possession" as each of those terms is defined in the Act.

**KAREN MARLER**

Director Environmental Solutions - Chemicals Land and Radiation

NSW Environment Protection Authority

(as delegate of the EPA)

## Annexure P: Timber Poles - Sealing Inspection and Defect Holes

### P1 Inspection Holes

All inspection holes shall be sealed according to Table 18.

**Table 18 – Sealing Plug Usage**

| Inspection Hole Description | Plug Type |
|---|---|
| Holes drilled as part of the current pole inspection activity | Blue PP12 |
| Existing abaxial holes | Black PP16 |
| Other existing holes (excluding holes for reinforced poles) | Black PP12 |
| Holes to inspect reinforced poles | Grey |

Treatment plugs shall be driven into each drill hole in such a manner that they seal the hole, but: still allow the plug to be removed in the future.

Plugs installed in inspection holes that will be covered by an external bandage or wrap shall be driven flat to ensure that the bandage will remain in contact with the pole surface. The external preservative bandage shall be installed flush with the pole so the chemicals in the bandage will pass into and preserve the timber.

### P2 Defect Holes

All hole defects such as knot holes and grub holes shall be sealed with petromastic compound after they have been inspected and treated according to Clause M5.

### P3 Sealing Materials Stockcodes

**Table 19 – Sealing Materials Stockcodes**

| Description | Stockcode |
|---|---|
| Blue 30mm long with a 16 to 10mm taper – Preschem 01 PP12 | 179451 |
| Black 30mm long with a 16 to 10mm taper – Preschem 01 PP12 | 179052 |
| Grey Plug | Special Preschem order |
| Black 30mm long with a 18 to 14mm taper (with sealing lip) – Preschem PP16 | 66084 |
| Petromastic Compound (Denso Mastic) | 75481 |

## Annexure Q: Steel Poles, Standards and Columns - Inspection Process

### Q1 General Requirements

The pole inspection process for steel poles, standards and columns consists of:

- Implementation of appropriate safety precautions according to Annexure A.
- Above groundline visual inspection and sounding according to Clause Q2.2, Q3.2 or Q4.2.
- Partial excavation and initial below ground inspection according to Clause Q2.3 or Q3.3.
- Full excavation and below ground inspection and strength assessment according to Clause Q2.5 or Q3.5.
- Inspection finalisation according to Clause Q2.6, Q3.6 or Q4.3.

Above ground inspection shall be performed on all steel poles, standards and columns according to the following Clauses. Below ground inspection shall be performed on steel poles standards and columns (excluding those defined in Clause 6.1.2) according to the following Clauses.

Corrosion of the steel wall may be internal or external and therefore a severely corroded wall may appear to be in good condition when visually inspected. A rust stain by itself with no loss of metal or bubbling is not a defect but could be an indication that a defect exists behind a thin exterior coating of material such as paint or galvanising. A rust stain could also be an indicator of a possible future rust defect. Any rust bubbling or staining needs to be carefully investigated visually and physically with a hammer to assess any metal loss or flaking.

The inspection (except for direct buried 6.5m Water pipe columns) shall include a strength assessment by direct wall thickness measurement using an Ultrasonic meter. The area with the worst damage in the above ground region, and again in the below ground region, shall be assessed by comparing its remaining wall thickness value with a nominal (original) thickness above ground sample region. Where previous nominal wall thickness values are available from earlier inspections, it is not necessary to perform another reading during the current inspection.

Extreme caution shall be exercised when excavating around all steel poles, standards or columns. It shall not be assumed that internal or external cables (including earth cables) enter vertically from a depth below 350mm or perpendicular to the pole, standard or column from an adjacent asset, or that any cable is clear of the remaining inspection area around the pole, standard or column. These cables can be easily damaged by digging implements and this may cause a hazardous situation. Refer to Clause U1 and NS156 for further details.

If perforations (holes of any size) or folds become evident at any point during the inspection on a steel pole, standard or column or on a steel reinforcing sleeve (where fitted), the site shall be secured to ensure the safety of the public and property in the event of a pole failure, and the situation reported to the nominated Ausgrid representative immediately.

Steel poles, standards and columns previously identified as defective and which are marked according to Annexure V shall not be inspected without confirmation from the nominated Ausgrid representative that the inspection shall proceed.

### Q2 Inspection and Treatment Process - Direct Buried Steel Poles and Standards

### Q2.1 General Requirements

The inspection and treatment process for direct buried steel poles and standards (excluding direct buried 6.5m ‘water pipe’ columns) shall be performed according to the following Clauses. The below ground section of direct buried steel poles and standards shall only be exposed for inspection if the above ground inspection indicates that it is safe to proceed.

All new direct buried steel poles or standards are fitted with a protective epoxy coating in the below ground section of the pole. This coating is designed to lengthen the life of the pole or standard and shall not be removed or damaged under any circumstances.

### Q2.2 Above Ground Inspection Procedure

The above ground inspection procedure for direct buried steel poles and standards shall be performed as follows:

1) Implement safety precautions according to Annexure A.
2) Remove any advertising or loose surface material from within the inspection area of the pole or standard.
3) Perform a visual inspection of the full length of the pole or standard (without climbing) for the following defects:
    - Depth in Ground - look for evidence of pole or standard movement at ground level and evidence on the pole or standard of an old 'ground level' mark, or 'high tide' mark to indicate that the pole or standard is no longer as deep in ground as originally installed. For steel standards, also look for exposed conduits or cable entry holes as an indicator of ground level changes. Note that conduits may intentionally be exposed in substation switchyards.
    - Corrosion - inspect the pole or standard for evidence of corrosion including rust stains, pitted or scaling rust and surface bubbling (refer to Clause Q9).
    - Rusting, loose or damaged fittings and attachments, etc - look for loose or damaged attachments, such as luminaires or earthing connections. Loose earth connections shall not be tightened and shall be immediately reported to the nominated Ausgrid representative.
    - Damage - inspect the pole or standard for damage including vehicle damage, fire damage, unauthorised attachments, vandalism, and graffiti.
    - Missing or severely damaged access covers – when these defects are identified they shall be immediately reported to the nominated Ausgrid representative and the defect recorded in the DPA sheet. Where an access cover cannot be fully closed or secured with gaps of 12mm or more (excluding missing covers), multiple layers of 50mm electrical insulating tape shall be applied around the full circumference of the pole or column to secure the cover against unauthorised access.
    - Vertical alignment (lean) - where a pole or standard is leaning, the angle of the lean shall be accurately measured using a digital level. Estimates of lean taken by eye or measurement using a mobile phone app will not be accepted. Where a pole or standard is identified as leaning excessively (ie, more than 10 degrees from the vertical position) look for causes of the leaning – causes may include subsidence, erosion or alterations to the natural ground level.
    - Dents and bending - look for denting or bending of the column. Where dents or bending is identified, measure the dent or bend according to Clause Q6. Immediately report the pole or standard to the nominated Ausgrid representative (and record the defect in the DPA sheet) where the steel pole or standard is dented such that:
        - the dented section of the pole or standard is 50% or more of the diameter of the column at that height, or
        - a 1 metre steel straight edge placed along the back of the pole or standard where a dent is located shows a bend in the column.
    - Folds or perforations – where these defects are identified they shall be immediately reported to the nominated Ausgrid representative and the defect recorded in the DPA sheet.
    - Stays – check that the stay has a firm footing in the ground and carry out visual inspection looking for defects including corrosion of the steel rod. Check that the stay wire is tight and look for broken wire strands and corrosion at the anchor attachment as well as at the attachment to the insulator. If corrosion is evident on the steel rod or at groundline, excavate to a depth of 200mm to assess the extent of corrosion. Where corrosion is identified assess steel condition according to Clause 6.5.
4) Measure the nominal (original) wall thickness of the direct buried steel pole/standard at 300mm above groundline using an ultrasonic meter (refer to Annexure R). This measurement shall be used as the reference for the below ground inspection in Clause Q2.5.

- When measuring the nominal wall thickness, the area on or immediately around the access cover shall not be used to measure the wall thickness because the steel wall in this area is reinforced and may be thicker than normal.
- A minimum of four measurements shall be taken, evenly spaced around the steel column at 300mm above groundline to establish the nominal wall thickness. The four measurements shall be added together and divided by 4 to give the nominal wall thickness. Any single individual measurement of wall thickness greater than 5.5mm shall be ignored and a figure of 5.5mm used. If all measurements taken are greater than 5.5mm, the average of these readings shall be recorded as the nominal wall thickness.

5) Where visible above ground corrosion is present it shall be completely removed according to Clause Q8.1 and an additional wall thickness measurement taken at that location. To determine the strength of the pole at that level, three additional readings shall be taken in the same horizontal plane as the first measurement. These four readings shall be evenly spaced (approximately 90° apart). All four measurements shall be recorded on the Defective Pole Action sheet and in SAP together with their distance from groundline and respective quadrant indicated.
6) Where poles have manufactured inspection holes, look for internal rust using a borescope. Poles with internal cables (for example, street light columns) shall not be internally inspected.
7) Sound the pole or standard according to Clause Q7.
8) Calculate the residual above ground wall thickness according to Clause Q5.1.
9) Compare the above ground inspection results against the serviceability criteria for steel poles and standards in Clause 6.5 to determine whether or not the pole is defective prior to excavation and below ground inspection. If the pole does not meet the safe to excavate criteria in Clause Q2.3, finalise the pole inspection according to Clause Q2.6.

### Q2.3 Safe to Excavate Criteria

Excavation and below ground inspection shall only be performed if the pole or standard meets all of the following criteria;

- The calculated residual strength of a pole or standard is equal to or greater than 50%, and
- The pole or standard is not considered to be loaded close to or beyond its structural capacity (indicated by excessive lean or bending of the pole), and
- The pole or standard does not have any steel condition rating of less than or equal to 30% according to Clause 6.5, folds or perforations, and
- Pole or standard stability will not be affected by, or suspected to be affected by, excavation of the pole.

If a pole or standard is identified as potentially unsafe prior to excavation or during excavation:

- Do not proceed with excavation of the pole or standard – finalise the inspection according to Clause Q2.6, and
- Report the potentially unsafe pole or standard immediately to the nominated Ausgrid representative.

### Q2.4 Partial Excavation Procedure

Partial excavation and initial below ground inspection shall be performed around the direct buried pole or standard prior to performing full excavation. The purpose of partial excavation is to allow an initial examination of part of the below-ground section of the pole or standard for rust, folds in the steel wall or perforations (holes of any size) to determine if it is safe to fully excavate. Direct buried steel poles and standards commonly corrode very close to groundline, however where substantial corrosion exists near groundline, it is not always visible above groundline.

The partial excavation and initial below ground inspection procedure for direct buried steel poles and standards shall be performed as follows only when the above ground inspection indicates that it is safe to proceed (refer to Clause Q2.3):

1) Excavate to a depth of 100mm below groundline according to Clause U1 in either;

- an unloaded or supported axis (neutral axis - refer to Annexure C) if overhead mains are installed on the pole or standard, or
- a groundline area on one side of the pole if overhead mains are not installed on the pole or standard. If rust is detected above ground and near the groundline, excavate directly below the rust.

2) Inspect the pole or standard for evidence of corrosion or folds in the steel wall. Where corrosion is identified, assess the steel condition according to Clause 6.5. If the pole or standard has any steel condition rating of less than or equal to 30% according to Clause 6.5, folds or perforations do not continue with the below ground inspection - finalise the inspection according to Clause Q2.6.

### Q2.5 Full Excavation and Below Ground Inspection Procedure

The full excavation and below ground inspection procedure for direct buried steel poles and standards shall be performed as follows only when the partial excavation and initial below ground inspection indicates that it is safe to proceed (refer to Clause Q2.3):

1) Excavate the full circumference of the pole or standard to a depth of 350mm below groundline according to Clause U1. If folds or perforations are detected while excavating do not continue with excavation or the below ground inspection - finalise the inspection according to Clause Q2.6.
2) Brush soil and debris from the surface of the pole or standard. Tools which may damage the surface of the pole shall not be used.
3) Inspect the surface of the full circumference of the pole or standard for evidence of corrosion, folds in the steel wall or perforations from the base of the excavation to immediately above groundline. Where corrosion is identified, assess the steel condition according to Clause 6.5.
4) Inspect the surface of the full circumference of the pole or standard for evidence of corrosion (particularly scaling or pitted rust) which extends beyond a depth of 350mm below groundline. Do not excavate beyond a depth of 350mm below groundline. Where corrosion is identified, assess the steel condition according to Clause 6.5.
5) Sound the pole or standard according to Clause Q7.
6) If corrosion is evident during the inspection, clean the surface further with a chipping hammer, metal scraper and/or steel wire brush to ensure it is free from loose contaminants and rust. Pay particular attention to areas of deep corrosion (scaling or pitted rust) or bubbling under prior treatments. Do not remove surface material that shows no signs of corrosion and, in particular, do not damage the epoxy coating. The epoxy coating is a protective layer designed to prolong the life of the galvanised coating, and while ever the epoxy coating is intact, the galvanised surface underneath will also be intact.
7) At the location that displays the deepest corrosion four wall thickness measurements (evenly spaced around the pole) shall be taken using an ultrasonic meter in this horizontal plane. The deepest corrosion points shall be measured. Measurements of wall thickness shall only be made from the external surface of the steel pole or standard. All four measurements shall be recorded on the Defective Pole Action sheet and in SAP together with their distance from groundline, and their respective quadrant indicated.

### Q2.6 Finalising the Inspection Process

After the above ground and below ground inspection procedures have been completed, the inspection process for direct buried steel poles and standards (excluding 6.5m water pipe columns) shall be finalised as follows:

1) Record (photograph) the following external defects:
   - Pole lean, pole dents / bending or evidence of pole movement at groundline.
   - Corrosion, folds or perforations.
   - Fire and third-party damage, including painted poles.
   - Missing or damaged access covers.

- Stay wire and anchor defects.

2) Treat the above ground areas where rust has been removed according to Clause Q8.
3) Restore the excavation according to Clause U2.
4) Calculate the residual below ground wall thickness according to Clause Q5.2. The ratio of the average of the four measurements to the nominal wall thickness (taken in Clause Q2.2), is the below ground residual strength of the steel pole or standard. If no metal loss and/or corrosion is evident the below ground residual strength is 100%.
5) Compare the above ground and below ground inspection results against the serviceability criteria for direct buried steel poles and standards in Clause 6.6 to assess whether the pole remains serviceable or corrective action is required.
6) If the pole or standard was assessed at any stage as defective, clearly mark the pole as defective (condemned or conditionally serviceable) according to Annexure V and complete a 'Defective Pole Action' sheet and enter details into SAP.
7) Record inspection results and defects in the Ausgrid Asset Management System. This shall be performed using relevant forms (refer to Annexure W) or direct entry into a MAM device.
8) Report defects or defective poles or standards to the nominated Ausgrid representative.

Notify the nominated Ausgrid representative immediately if:

- The pole or standard appears to be in danger of collapse, or
- The access cover is missing or cannot be secured to prevent unauthorised access, or
- Perforations or folds are evident at any point during the above ground or below ground inspection, or
- Corrosion has penetrated, such that the average residual wall thickness calculated from the four readings is 25% or less of the original wall thickness, or
- Reinforcing sleeves with any steel condition rating of less than or equal to 30% according to Clause 6.5, or
- Any steel condition rating of less than or equal to 30% according to Clause 6.5 which extends beyond 350mm below the groundline.

## Q3 Inspection Process - Direct Buried 6.5m Water Pipe Columns

### Q3.1 General Requirements

The inspection and treatment process for direct buried 6.5m water pipe type columns shall be performed according to the following Clauses.

Direct buried 6.5m water pipe type columns have comparatively poor durability and shall not have their wall thickness measured.

Where evidence of scaling or pitted rust, folds or perforation is found at or below groundline on a direct buried 6.5m water pipe type column, the column shall be assessed for its suitability for reinforcing with a sleeve and shall be given a severity rating according to the serviceability criteria for 6.5m water pipe columns in Clause 6.6. Columns that are to be replaced shall be marked according to Annexure V. The date of the sleeve application and nominated column replacement date shall be recorded on the DPA sheet and in SAP.

### Q3.2 Above Ground Inspection Procedure

The above ground inspection procedure for direct buried 6.5m water pipe columns shall be performed as follows:

1) Implement safety precautions according to Annexure A.
2) Remove any advertising or loose surface material from within the inspection area of the column.
3) Perform a visual inspection of the full length of the column for the following defects:

- Depth in Ground - look for evidence of pole movement at ground level and evidence on the column of an old 'ground level' mark, or 'high tide' mark to indicate that the column is no longer as deep in ground as originally installed. Also look for exposed conduits or cable entry holes as an indicator of ground level changes.
- Corrosion - inspect the full length of the column and above ground areas of the steel sleeve (where fitted) for evidence of corrosion. Where corrosion is identified, assess the steel condition according to Clause 6.5. Sleeves with any steel condition rating of less than or equal to 30% according to Clause 6.5 shall be immediately reported to the nominated Ausgrid representative.
- Rusting, loose or damaged fittings, etc – look for rusted, loose or damaged attachments (such as luminaires).
- Damage - inspect the column for damage including vehicle damage, fire damage, unauthorised attachments, vandalism and graffiti.
- Vertical alignment (lean) - where a column is leaning, the angle of the lean shall be accurately measured using a digital level. Estimates of lean taken by eye or measurement using a mobile phone app will not be accepted. Where a column is identified as leaning excessively (ie, more than 10 degrees from the vertical position) look for causes of the leaning – causes may include subsidence, erosion or alterations to the natural ground level.
- Dents and bending – look for denting or bending of the column. Where dents or bending is identified, measure the dent or bend according to Clause Q6. Immediately report the column to the nominated Ausgrid representative (and record the defect in the DPA sheet) where the column is dented such that:
  - the dented section of the column is 50% or more of the diameter of the column at that height, or
  - a 1 metre steel straight edge placed along the back of the column where a dent is located shows a bend in the column.
- Folds or perforations (holes of any size) – where these defects are identified they shall be immediately reported to the nominated Ausgrid representative and the defect recorded in the DPA sheet.

4) Sound the column according to Clause Q7.

5) Compare the above ground inspection results against the serviceability criteria for 6.5m water pipe columns in Clause 6.6 to determine whether or not the column is defective prior to excavation and below ground inspection. If the column does not meet the safe to excavate criteria in Clause Q3.3, finalise the inspection according to Clause Q3.6.

### Q3.3 Safe to Excavate Criteria

Excavation and below ground inspection shall only be performed if the column meets all of the following criteria;

- The column is not considered to be loaded close to or beyond its structural capacity (indicated by excessive lean or bending of the column), and
- The column does not have any steel condition rating of less than or equal to 30% according to Clause 6.5, folds or perforations, and
- The reinforcing sleeve (where fitted) does not have any steel condition rating of less than or equal to 30% according to Clause 6.5, and
- Column stability will not be affected by, or suspected to be affected by, excavation of the column.

If a column is identified as potentially unsafe prior to excavation or during excavation:

- Do not proceed with excavation of the column – finalise the inspection according to Clause Q3.6, and

- Report the potentially unsafe column immediately to the nominated Ausgrid representative.

### Q3.4 Partial Excavation Procedure

Partial excavation and initial below ground inspection shall be performed on 6.5m water pipe columns prior to performing a full excavation. The purpose of partial excavation of unreinforced columns is to allow an initial examination of part of the below-ground section of the column for corrosion, folds (buckling) or perforations (holes of any size) in the steel wall to determine if it is safe to fully excavate.

The purpose of partial excavation of reinforced (sleeved) columns is to allow an examination of the reinforcing sleeve for degradation – sleeved columns shall not be fully excavated. 6.5m water pipe columns and sleeves commonly corrode very close to groundline, however where substantial corrosion exists near groundline, it is not always visible above groundline.

The partial excavation and initial below ground inspection procedure for 6.5m water pipe columns shall be performed as follows only when the above ground inspection indicates that it is safe to proceed (refer to Clause Q3.3):

1) Excavate to a depth of 100mm below groundline according to Clause U1 either:
   - in a groundline area on one side of the column if the column is not reinforced with a sleeve. If rust is detected above ground and near the groundline, excavate directly below the rust, or
   - around the full circumference if the column is reinforced with a sleeve.
2) Inspect unreinforced columns for evidence of corrosion and folds or perforations in the steel wall. Where corrosion is identified, assess the steel condition according to Clause 6.5. If the column has any steel condition rating of less than or equal to 30% according to Clause 6.5, folds or perforations do not continue with the below ground inspection - finalise the inspection according to Clause Q3.6.
3) For reinforced columns, inspection the sleeve for corrosion. Where corrosion is identified, assess the steel condition of the sleeve according to Clause 6.5.

### Q3.5 Full Excavation and Below Ground Inspection Procedure

The full excavation and below ground inspection procedure for 6.5m water pipe columns (excluding columns reinforced with a sleeve) shall be performed as follows only when the partial excavation and initial below ground inspection indicates that it is safe to proceed (refer to Clause Q3.3):

1) Excavate the full circumference of the column to a depth of 350mm below groundline. If folds or perforations are detected while excavating do not continue with excavation or the below ground inspection - finalise the inspection according to Clause Q3.6.
2) Brush soil and debris from the surface of the column. Tools which may damage the surface of the column shall not be used.
3) Inspect the surface of the full circumference of the column for evidence of corrosion and folds or perforations in the steel wall from the base of the excavation to immediately above groundline. Where corrosion is identified, assess the steel condition according to Clause 6.5.
4) Inspect the surface of the full circumference of the column for evidence of corrosion (particularly scaling or pitted rust) which extends beyond a depth of 350mm below groundline. Do not excavate beyond a depth of 350mm below groundline. Where corrosion is identified, assess the steel condition according to Clause 6.5.
5) Sound the column according to Clause Q7.
6) If corrosion is evident during the inspection, clean the surface further with a chipping hammer, metal scraper and/or steel wire brush to ensure it is free from loose contaminants and rust. Pay particular attention to areas of deep corrosion or bubbling under prior treatments. Do not remove surface material that shows no signs of corrosion.

### Q3.6 Finalising the Inspection Process

After the above ground and below ground inspection procedures have been completed, the inspection process for 6.5m water pipe columns shall be finalised as follows:

1) Record (photograph) the following external defects:
   - Pole lean, pole dents / bending or evidence of pole movement at groundline.
   - Corrosion, folds or perforations.
   - Fire and third-party damage, including painted poles.
   - Reinforcing sleeve damage or degradation.
2) Treat the above ground areas where rust has been removed according to Clause Q8;
3) Restore the excavation according to Clause U2;
4) Compare the above ground and below ground inspection results against the serviceability criteria for direct buried 6.5m water pipe columns in Clause 6.6 to assess whether the column remains serviceable or corrective action is required.
5) If the column was assessed at any stage as defective, clearly mark the column as defective (condemned or conditionally serviceable) according to Annexure V and complete a 'Defective Pole Action' sheet and enter details into SAP.
6) Record inspection results and defects in the Ausgrid Asset Management System. This shall be performed using relevant forms (refer to Annexure W) or direct entry into a MAM device.
7) Report defects or defective columns to the nominated Ausgrid representative.

Notify the nominated Ausgrid representative immediately if:

- The column appears to be in danger of collapse, or
- Perforations or folds are evident on the column at any point during the above ground or below ground inspection, or
- Any steel condition rating of less than or equal to 30% according to Clause 6.5 is evident on sleeves, or
- Any steel condition rating of less than or equal to 30% according to Clause 6.5 extends beyond 350mm below the groundline.

## Q4 Inspection and Treatment Process – Rag-bolt and Pile Mounted Steel Poles and Standards

### Q4.1 General Requirements

The inspection and treatment process for rag-bolt and pile mounted steel poles and standards shall be performed according to the following Clauses. It is not necessary to excavate and inspect rag-bolt and pile mounted steel poles and standards below groundline if the mounting bolts and nuts of the rag-bolt or pile have not been buried by the surrounding ground as the heavy section steel rag-bolt or pile assembly and hot dipped galvanised coating is expected to outlast the above ground section of the pole.

Any corrosion evident above groundline shall be completely removed. The surface shall be treated according to Clause Q8.

### Q4.2 Above Ground Inspection Procedure

The above ground inspection procedure for rag-bolt mounted steel poles and standards shall be performed as follows:

1) Implement safety precautions according to Annexure A.
2) Remove any advertising or loose surface material from within the inspection area of the pole or standard.
3) Perform a visual inspection of the full length of the pole or standard (without climbing) for the following defects:
   - Corrosion - inspect the pole or standard for evidence of corrosion. Where corrosion is identified, assess the steel condition according to Clause 6.5.

- Rusting, loose or damaged fittings, etc - look for loose or damaged attachments, such as luminaires or earthing connections. Loose earth connections shall not be tightened and shall be immediately reported to the nominated Ausgrid representative.
- Damage - inspect the pole or standard for damage including vehicle damage, fire damage, unauthorised attachments, vandalism and graffiti.
- Missing or severely damaged access covers – where these defects are identified they shall be immediately reported to the nominated Ausgrid representative and the defect recorded in the DPA sheet. Where an access cover cannot be fully closed or secured with gaps of 12mm or more (excluding missing covers), multiple layers of 50mm electrical insulating tape shall be applied around the full circumference of the pole or column to secure the cover against unauthorised access.
- Vertical alignment (lean) - where a pole or standard is leaning, the angle of the lean shall be accurately measured using a digital level. Estimates of lean taken by eye or measurement using a mobile phone app will not be accepted. Where a pole or standard is identified as leaning excessively (ie, more than 10 degrees from the vertical position) look for causes of the leaning – causes may include subsidence, erosion or alterations to the natural ground level.
- Dents, folds and bending - look for denting, folding or bending of the column. Where dents or bending is identified, measure the dent or bend according to Clause Q6. Immediately report the pole or standard to the nominated Ausgrid representative (and record the defect on the DPA sheet) where the steel pole or standard is dented such that:
  - the dented section of the column is 50% or more of the diameter of the column at that height, or
  - a 1 metre steel straight edge placed along the back of the column where a dent is located shows a bend in the column.
- Folds or perforations (holes of any size) – where these defects are identified they shall be immediately reported to the nominated Ausgrid representative and the defect recorded in the DPA sheet.

4) Perform a visual inspection of the base plate and rag-bolt or pile mounting for the following defects:

- Depth in Ground - look for evidence of reduced ground level around the rag-bolt or pile mounting. Also look for exposed conduits or cable entry holes as an indicator of ground level changes. Note that conduits may intentionally be exposed in substation switchyards.
- Buried base plate and rag-bolt mounting – if the surrounding ground has covered the base plate or the rag-bolt hold-down bolts / threaded foundation rods or nuts, remove any surrounding materials covering these components.
- Missing nuts – look for missing nuts on the rag-bolt or pile mounting. Missing nuts shall be replaced. If two or more rag-bolt nuts are missing and they cannot be replaced, immediately report the pole to the nominated Ausgrid representative and record the defect in the DPA sheet.
- Corroded hold-down bolts / threaded foundation rods and nuts - inspect these components for evidence of corrosion including rust stains or scaling corrosion. Where corrosion is identified, assess the steel condition according to Clause 6.5. Any steel condition rating of less than or equal to 30% according to Clause 6.5 shall be immediately reported to the nominated Ausgrid representative.
- Cracked or corroded base plate / base plate welds - inspect these components for evidence of corrosion (rust stains or scaling corrosion) or cracked welds. Where corrosion is identified, assess the steel condition according to Clause 6.5. Any steel condition rating of less than or equal to 30% according to Clause 6.5 of the base or cracked welds around the baseplate shall be immediately reported to the nominated Ausgrid representative.
- Degraded grouting - look for grouting that is degraded (not intact) or which is not capable of sealing the column from the ingress of vegetation. Grouting is to be replaced according

to Clause Q4.4 when these defects are identified. Inspect the hold-down bolts below the mounting plate for signs of corrosion whenever grouting is replaced.

5) Check that the rag-bolt or pile nuts are tight using a spanner. Loose nuts are to be tightened.

6) Measure the nominal (original) wall thickness of the rag-bolt or pile mounted steel pole/standard at 300mm above groundline using an ultrasonic meter (refer to Annexure R).

   - When measuring the nominal wall thickness, the area on or immediately around the access cover shall not be used to measure the wall thickness because the steel wall in this area is reinforced and may be thicker than normal.
   - A minimum of four measurements shall be taken, evenly spaced around the steel column at 300mm above groundline to establish the nominal wall thickness. The four measurements shall be added together and divided by 4 to give the nominal wall thickness. Any single individual measurement of wall thickness greater than 5.5mm shall be ignored and a figure of 5.5mm used. If all measurements taken are greater than 5.5mm, the average of these readings shall be recorded as the nominal wall thickness.

7) Where visible above ground corrosion is present it must be completely removed according to Clause Q8.1 and an additional wall thickness measurement shall be taken. To determine the strength of the pole at that level, three additional readings shall be taken in the same horizontal plane as the first measurement. These four readings shall be evenly spaced (approximately 90° apart). All four measurements shall be recorded on the Defective Pole Action sheet and in SAP together with their distance from groundline and respective quadrant indicated.

8) Where poles have manufactured inspection holes, look for internal rust using a borescope. Poles with internal cables (for example, street light columns) shall not be internally inspected.

9) Sound the steel pole or standard according to Clause Q7.

### Q4.3 Finalising the Inspection Process

After the above ground and rag-bolt / pile inspection procedures have been completed, the inspection process for rag-bolt or pile mounted steel poles and standards is to be finalised as follows:

1) Record (photograph) the following external defects:

   - Pole lean, pole dents / bending or evidence of pole movement at groundline.
   - Corrosion, folds or perforations.
   - Fire and third-party damage, including painted poles.
   - Missing or damaged access covers.
   - Rag-bolt or pile damage or degradation.

2) Treat the above ground areas where rust has been removed according to Clause Q8.

3) Calculate the residual wall thickness according to Clause Q5.2.

4) Compare the above ground inspection results against the serviceability criteria for rag-bolt or pile mounted steel poles and standards in Clause 6.6 to assess whether the pole or standard remains serviceable or corrective action is required.

5) If the rag-bolt or pile mounted pole or standard was assessed at any stage as defective, clearly mark the pole or standard as defective (condemned or conditionally serviceable) according to Annexure V and complete a ‘Defective Pole Action’ sheet and enter details into SAP.

6) Record pole inspection results and defects in the Ausgrid Asset Management System. This shall be performed using relevant forms (refer to Annexure W) or direct entry into a MAM device.

7) Report defects or defective poles to the nominated Ausgrid representative.

Notify the nominated Ausgrid representative immediately if:

- The pole or standard appears to be in danger of collapse, or
- The access cover is missing or cannot be secured to prevent unauthorised access, or
- Perforations or folds are evident at any point during the above ground inspection, or
- Any steel condition rating of less than or equal to 30% according to Clause 6.5 or defects of the pole, standard, rag-bolt or pile mounting that may result in imminent failure of the pole or standard.

### Q4.4 Re-grouting Below the Baseplate of Rag-bolt Mounted Steel Poles and Standards

Missing or defective grouting below the column base on rag-bolt mounted columns shall be replaced by the Asset Inspector as part of the inspection.

Any remaining grout shall be removed, together with any vegetation, and the area between the base of the steel column and the top of the concrete holding the rag-bolt assembly shall be cleaned out and prepared prior to replacement of the sand/cement grouting. Inspect the hold-down bolts / threaded foundation rods below the mounting plate for signs of corrosion when the existing grout is fully removed.

The space beneath the rag-bolt mounting baseplate of the standard shall be filled with cement grout according to the following specification:

- With the four bolts or threaded foundation rods of the rag-bolt assembly used as a frame, a 2mm thick strip of cardboard shall be wrapped twice around the four bolts and taped in place. The cardboard shall be placed between the underside of the standard mounting baseplate and the top of the specified fill for the rag-bolt assembly.
- The space around the outside of the cardboard former shall be filled with a 6:1 sand and cement mix, or suitable commercial premixed grout as approved by Ausgrid. The sides of the cement mix fill shall be trowelled from the outside edge of the baseplate to the ground at an angle of 45 degrees. This plinth is to prevent the entry of grass, weeds and foreign objects into the standard.
- If vandalism or slumping of the cement mix is a problem, a 350mm square former (inside dimension) with vertical sides, may be used to form the outside of the plinth.

## Q5 Formula Calculations – Steel Poles

### Q5.1 Calculation of Residual Above Ground Wall Thickness

The residual above ground wall thickness shall be calculated using the following formulae:

$$\frac{T1a+T2a+T3a+T4a}{4} \Big/ \frac{T1n+T2n+T3n+T4n}{4}$$

Where:

T1n – is the first wall thickness reading taken 300mm above G/L for determining nominal wall thickness.

T2n, T3n and T4n – are the remaining 3 wall thickness readings taken 300mm above G/L for determining nominal wall thickness.

T1a – is the 1st wall thickness reading taken at the location of the worst defect found above groundline.

T2a, T3a and T4a– are the remaining 3 wall thickness readings taken in the same horizontal plane as T1a but spaced around the pole approximately 90° apart.

If no metal loss and/or corrosion is evident the above ground residual wall thickness is 100%. If corrosion is evident above the point of reach, indicate this on the Defective Pole Action sheet and in SAP.

Where above ground corrosion is detected, treat the corrosion according to Clause Q8.1.

### Q5.2 Calculation of Residual Below Ground Wall Thickness

The residual below ground wall thickness shall be calculated using the following formulae:

$$\frac{T1b+T2b+T3b+T4b}{4} \Big/ \frac{T1n+T2n+T3n+T4n}{4}$$

Where:

T1n – is the first wall thickness reading taken 300mm above G/L for determining nominal wall thickness.

T2n, T3n and T4n – are the remaining 3 wall thickness readings taken 300mm above G/L for determining nominal wall thickness.

T1b – is the 1st wall thickness reading taken at the location of the worst defect found below groundline.

T2b, T3b and T4b– are the remaining 3 wall thickness readings taken in the same horizontal plane as T1b, but at 3 other points where it appears there is a significant defect, or 90° apart if no other obvious significant defects.

### Q6 Measuring Above Ground Dents and Bends in Steel Poles, Standards or Column

Steel poles, standards and columns may become dented or bent due to damage by vehicles or third parties, or due to mechanical stresses from wind or overhead mains. Bending typically occurs on the directly opposite side of a dent in a pole, standard or column. Damage or mechanical stresses may also cause deformation (folds) in the steel cross-section. Where dents or bending are identified during inspections, they shall be measured as follows (refer to Figure 55):

- Dents shall be measured horizontally using a ruler or measuring tape on the flattened face of the pole, standard or column and compared against the original diameter of the pole in the same horizontal plane as the middle of the dent.
- Bends shall be measured vertically using a straight edged tool not shorter than 1 metre in length. The straight edged tool is to be held against the side of the pole, standard or column to assess whether there is any bending of the pole.

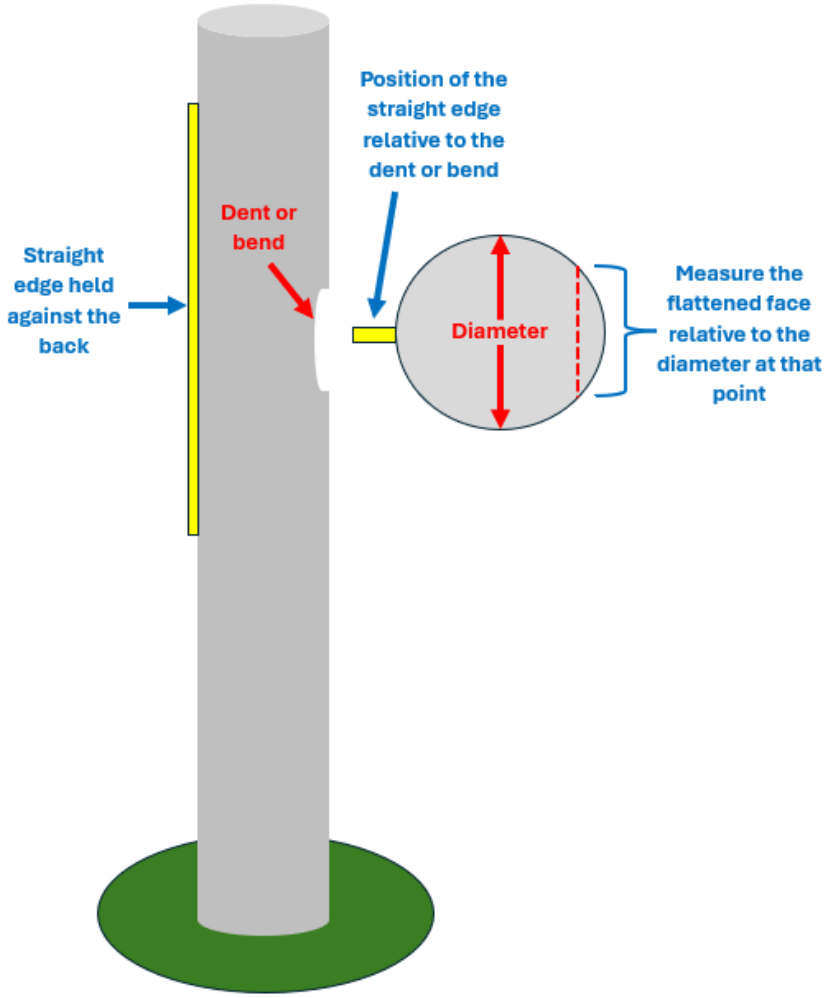



**Figure 55 – Steel Pole Dent Measurements**

## Q7 Sounding Steel Poles, Standards and Columns

### Q7.1 General Requirements

Each steel pole, standard or column shall be sounded as part of the above ground inspection, and again as part of the below ground inspection. Poles shall be sounded sufficiently to detect any defect present.

Sounding shall not be performed if dents, bending, folds or perforations have been identified during the above ground inspection or when the pole, standard or column is being excavated. Where sounding creates a dent, fold or perforation within the steel material, further sounding or inspection of the pole shall not proceed.

Where steel pole, standards or columns have steel above ground or below ground that is in as new condition a reduced amount of sounding may be appropriate. However, it is the Asset Inspector's responsibility to make sure sufficient sounding is performed to detect all defects in the inspection area.

### Q7.2 Guidance on Sounding

The purpose of sounding steel poles, standards and columns is to dislodge both internal and external rust and to expose any perforations in the steel. Sounding shall be performed above groundline and also below groundline when the pole, standard or column is fully excavated,

When performing sounding of a steel pole, standard or column an Asset Inspector shall concentrate on:

- Listening for falling or dislodged internal rust.
- Looking for dislodged external rust and dislodged galvanising / paint exposing rust.
- Looking for denting or perforating of the steel when the hammer strikes.

Steel poles, standards and columns shall be sounded by tapping the steel gently with the flat face of the hammer as the galvanised or painted surfaces may be damaged if the pole is hit too firmly. Pay close attention to the area from groundline to within 50mm above groundline when sounding as this is where corrosion typically occurs however, it is not always visible above groundline.

Sounding prior to excavation (above ground sounding) shall be performed as follows (refer to Figure 56);

- 1 or 2 soundings (strikes) around the area just above groundline, and
- additional sounding at each location where surface bubbling, rust stains or scaling / pitted rust has been identified or is suspected.

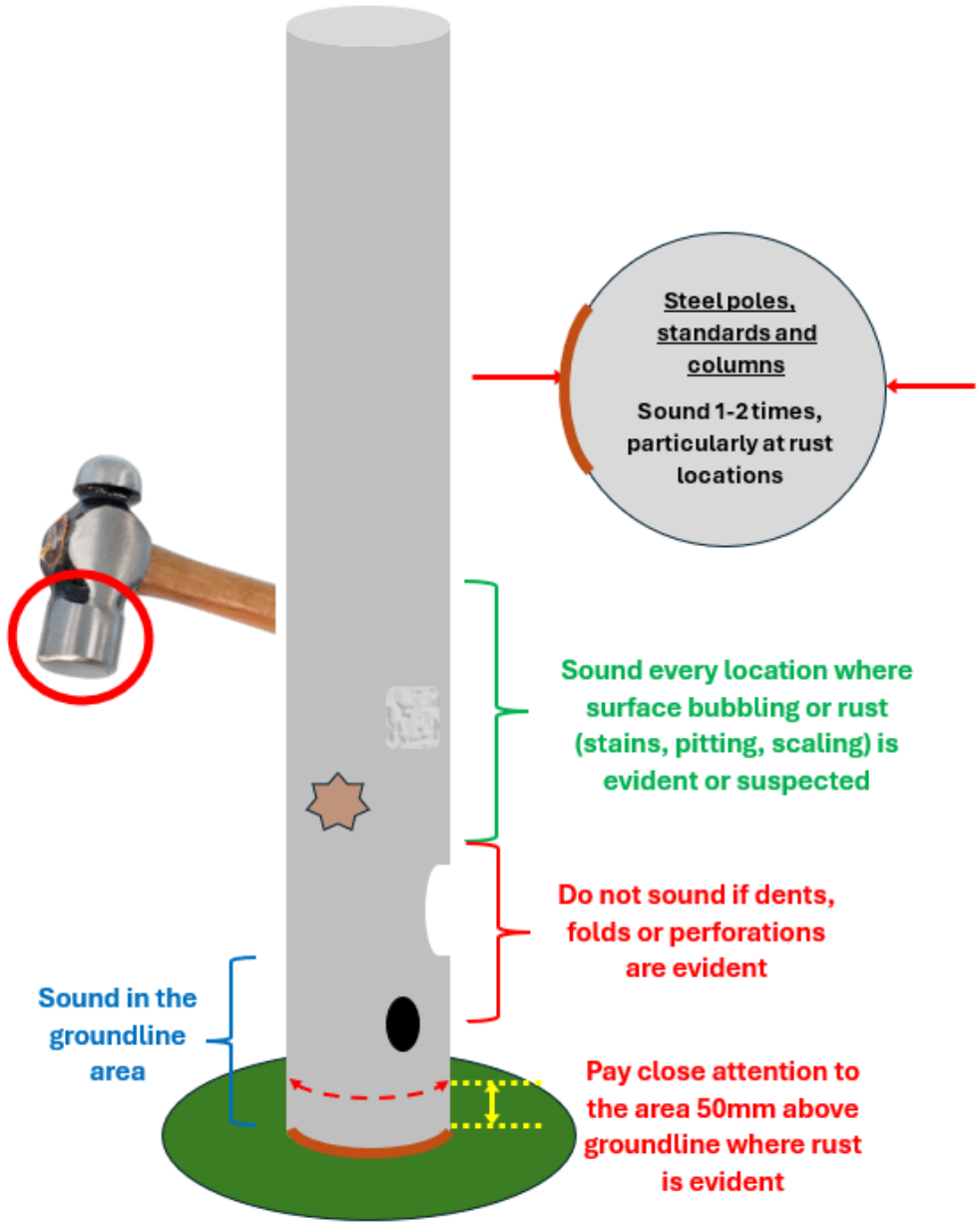



**Figure 56 – Sounding Steel Poles, Standards and Columns Above Groundline**

When the pole, standard or column has been fully excavated, sounding below ground shall be performed at each location where surface bubbling, rust stains or scaling / pitted rust has been identified or is suspected (refer to Figure 57).

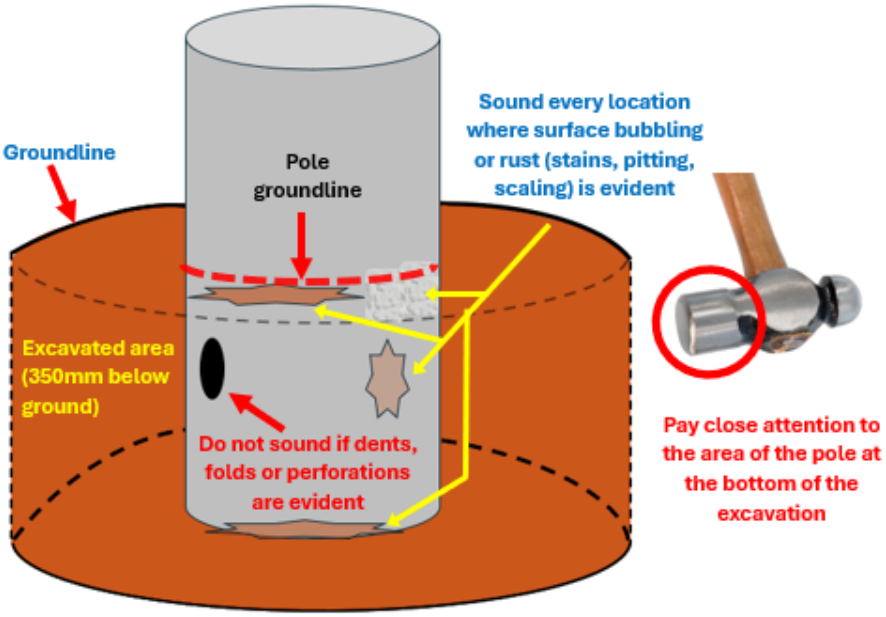



**Figure 57 – Sounding Steel Poles, Standards and Columns Below Groundline**

## Q8 Corrosion Treatment

### Q8.1 Treatment of poles, standards and columns

Where above ground scaling rust is found it shall be removed and the extent of the external metal loss measured.

Any corrosion evident 150mm or more above groundline shall be completely removed.

An angle grinder with sanding (flap) disc or metal grinding disc will typically be required to clean a rusted surface to a suitable state. Only the minimum amount of material shall be removed in order to achieve a contact patch for the meter. Use of any grinding attachment shall be confined to spot cleaning the localised areas for measurement as described above. General grinding of the pole face is not acceptable under any circumstance. The galvanised protective coating must not be ground off under any circumstances.

The above ground surface areas where rust has been removed shall be treated with cold galvanising spray (stockcode 176055). A sound galvanised surface shall not be coated with a galvanised paint as it will initiate pitting corrosion.

Treatment shall be applied and cured strictly according to the manufacturer's instructions. A clean dry prepared surface is essential for the treatment adhesion and performance. Apply one coat of cold galvanising according to the manufacturer's instructions over the prepared surface area, having a minimum dry film thickness of 100 microns.

### Q8.2 Treatment of Rag-bolt and Pile Mountings

Corrosion may occur on the base plate, nuts or hold-down bolts / threaded foundation rods of rag-bolt mountings, or the nuts or hold-down bolts of pile mountings.

Rusted nuts shall be replaced one at a time where they are able to be removed so as not to affect the stability of the pole, standard or column. Replacement of nuts shall only be performed if there is no evidence of scaling rust on the hold-down bolts or threaded rods. When rusted nuts can be removed, the hold-down bolts / threaded foundation rods shall be cleaned with a wire brush and treated with cold galvanising spray (stockcode 176055) before the new nut is installed.

Rusted base plates on rag-bolt mountings shall only be treated where there is no evidence of scaling rust or cracks in the base plate or welds – base plates with scaling rust or cracks shall be immediately reported to the nominated Ausgrid representative and shall not be treated. An angle

grinder with sanding (flap) disc or metal grinding disc will typically be required to clean a rusted surface to a suitable state - welded joints shall not be ground. Rust on base plates shall be treated with cold galvanising spray (stockcode 176055) before the new nut is installed.

Where the grout is required to be replaced below the base plate on a rag-bolt mounting, the threaded foundation rods are to be inspected for corrosion beneath the base plate and cleaned with a wire brush where possible. Rust on the threaded foundation rods shall be treated with cold galvanising spray (stockcode 176055) before the new nut is installed.

All treatment shall be applied and cured strictly according to the manufacturer's instructions. A clean dry prepared surface is essential for the treatment adhesion and performance. Apply one coat of cold galvanising according to the manufacturer's instructions over the prepared surface area, having a minimum dry film thickness of 100 microns.

### Q9 Common Steel Pole, Standard and Column Defects

Steel corrosion defects commonly found on the below ground section of steel poles, standards and columns are shown in Figure 58. This corrosion may also be found on above ground sections of steel poles, standards and columns, and also rag-bolt or pile mountings. The steel condition shall be assessed according to Clause 6.5 whenever corrosion is identified.

Figure 58 (a) and (b) shows surface rust. The steel is not pitted and there is no loss of the steel cross-section resulting in a steel condition rating down to approximately 80%. The surface can be cleaned and treated.

Figure 58 (c) and (d) shows deep surface rust with minor loss of the steel cross-section resulting in a steel condition rating of approximately 80%-60%. This can also be cleaned and treated. If a 6.5m water pipe column if found like this, it shall be sleeved,

Figure 58 (e) and (f) shows deep pitting and surface bubbling reducing the steel cross-section and strength of the pole resulting in a steel condition rating of approximately 60%-30%. These defects shall be immediately reported to the nominated Ausgrid representative.

Figure 58 (g) shows scaling rust and perforations, significantly reducing the steel cross-section and strength of the pole resulting in a steel condition rating of approximately 30%-0%. These defects shall be immediately reported to the nominated Ausgrid representative.

Figure 58 (h) shows a perforation and denting, both of which significantly reduce the strength of the pole resulting in a steel condition rating of approximately 30%-0%. These defects shall be immediately reported to the nominated Ausgrid representative.

**(a)**

**(b)**

(c)

(d)

(e)

(f)

(g)

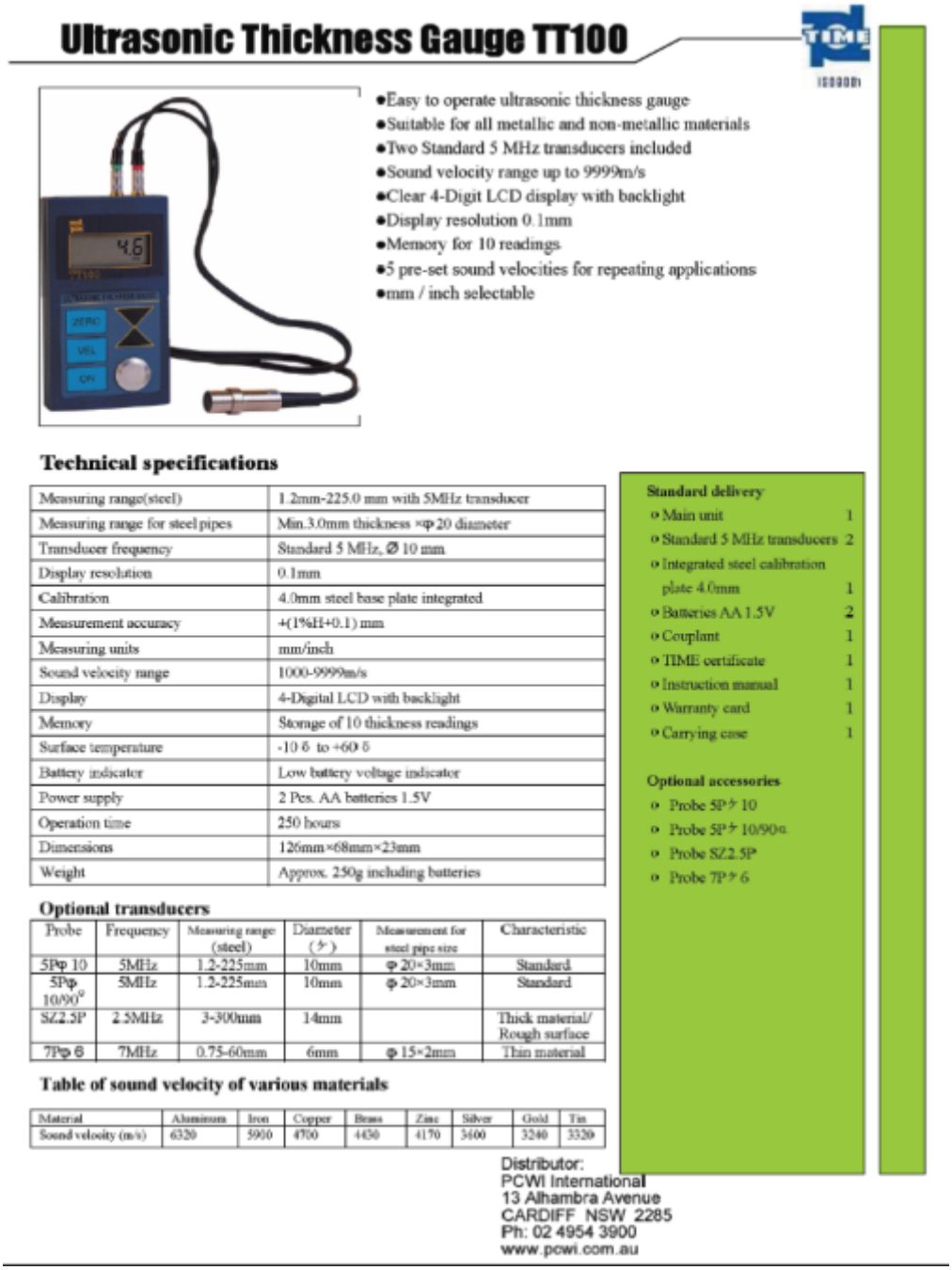
(h)

**Figure 58 – Common steel pole, standard and column Defects**

## Annexure R: Steel Poles and Standards - Ultrasonic Thickness Gauge

The recommended ultrasonic meter to be used for measuring the wall thickness of steel poles and standards is a “TIME Ultrasonic Thickness Gauge TT100” fitted with a 6 mm diameter sensor. Users are to read the manufacturers instruction manual for guidance on the use of this product. Obtaining a 2mm probe from the manufacturer of this instrument shall be considered where it is particularly important to minimise the amount of surface preparation required for rusted steel poles to achieve a suitable test site.

A smooth surface is required to obtain an accurate reading with an ultrasonic meter. An angle grinder with sanding (flap) disc or metal grinding disc will typically be required to clean a rusted surface to a suitable state. Refer to Clause Q8 for further details on cleaning rusted surfaces.



**Ultrasonic Thickness Gauge TT100**



- Easy to operate ultrasonic thickness gauge
- Suitable for all metallic and non-metallic materials
- Two Standard 5 MHz transducers included
- Sound velocity range up to 9999m/s
- Clear 4-Digit LCD display with backlight
- Display resolution 0.1mm
- Memory for 10 readings
- 5 pre-set sound velocities for repeating applications
- mm / inch selectable

**Technical specifications**

| | |
|---|---|
| Measuring range(steel) | 1.2mm-225.0 mm with 5MHz transducer |
| Measuring range for steel pipes | Min.3.0mm thickness ×Φ20 diameter |
| Transducer frequency | Standard 5 MHz, Ø 10 mm |
| Display resolution | 0.1mm |
| Calibration | 4.0mm steel base plate integrated |
| Measurement accuracy | +(1%H+0.1) mm |
| Measuring units | mm/inch |
| Sound velocity range | 1000-9999m/s |
| Display | 4-Digital LCD with backlight |
| Memory | Storage of 10 thickness readings |
| Surface temperature | -10 δ to +60 δ |
| Battery indicator | Low battery voltage indicator |
| Power supply | 2 Pcs. AA batteries 1.5V |
| Operation time | 250 hours |
| Dimensions | 126mm×68mm×23mm |
| Weight | Approx. 250g including batteries |

**Standard delivery**

| | |
|---|---|
| o Main unit | 1 |
| o Standard 5 MHz transducers | 2 |
| o Integrated steel calibration plate 4.0mm | 1 |
| o Batteries AA 1.5V | 2 |
| o Couplant | 1 |
| o TIME certificate | 1 |
| o Instruction manual | 1 |
| o Warranty card | 1 |
| o Carrying case | 1 |

**Optional accessories**

- o Probe 5PΦ10
- o Probe 5PΦ10/90o
- o Probe SZ2.5P
- o Probe 7PΦ6

**Optional transducers**

| Probe | Frequency | Measuring range (steel) | Diameter (Φ) | Measurement for steel pipe size | Characteristic |
|---|---|---|---|---|---|
| 5PΦ10 | 5MHz | 1.2-225mm | 10mm | Φ20×3mm | Standard |
| 5PΦ 10/90° | 5MHz | 1.2-225mm | 10mm | Φ20×3mm | Standard |
| SZ2.5P | 2.5MHz | 3-300mm | 14mm | | Thick material/ Rough surface |
| 7PΦ6 | 7MHz | 0.75-60mm | 6mm | Φ15×2mm | Thin material |

**Table of sound velocity of various materials**

| Material | Aluminum | Iron | Copper | Brass | Zinc | Silver | Gold | Tin |
|---|---|---|---|---|---|---|---|---|
| Sound velocity (m/s) | 6320 | 5900 | 4700 | 4430 | 4170 | 3600 | 3240 | 3320 |

Distributor:
PCWI International
13 Alhambra Avenue
CARDIFF NSW 2285
Ph: 02 4954 3900
www.pcwi.com.au

**Figure 59 – TIME Ultrasonic Thickness Gauge TT100**

# Annexure S: Concrete Poles and Columns - Inspection Process

## S1 General Requirements

The pole inspection process for concrete poles and columns consists of:

- Implementation of appropriate safety precautions according to Annexure A.
- Above groundline visual inspection according to Clause S2.2.
- Partial excavation and below ground inspection where defects extend below ground level according to Clause S2.3.
- Inspection finalisation according to Clause S2.5.

The design of concrete poles and columns is such that the bending strength of the pole or column is provided by the steel reinforcement within the concrete and the compressive strength by the concrete. The life of the steel reinforcement is heavily reliant on the depth of concrete coverage over the steel reinforcement.

The most common degradation process occurs as a result of rusting of the steel reinforcing bars, which then cause the bars to expand and push out the concrete - this is commonly known as ‘spalling’. Spalling is cracking and outward movement of pieces of concrete caused by expansion of the internal reinforcing steel due to corrosion (rust). It is generally caused by water infiltrating through hairline cracks in the concrete resulting in rusting of the steel reinforcement. The pole’s susceptibility to corrosion is related to the depth of concrete cover over the reinforcement.

Significant strength loss does not occur until large sections of concrete have been displaced and one or more steel reinforcing bars become fully exposed. While a strength test on such a pole may prove the pole or column’s strength to be serviceable, it shall be condemned when at least one reinforcing bar is fully exposed because degradation and strength loss will rapidly progress from this point on.

Repair of concrete poles or columns is generally not recommended where a pole’s age is close to its design life, or the concrete coverage is less than specification, however the decision to repair is an economic decision partly based on the pole’s replacement cost and the cost of repair and estimated additional life afforded by that repair. Where testing reveals concrete coverage to be less than specified, repair of rusted section/s is generally not recommended because further corrosion is likely to appear in other areas of the pole.

Concrete poles and columns previously identified as defective and which are marked according to Annexure V shall not be inspected without confirmation from the nominated Ausgrid representative that the inspection shall proceed.

## S2 Inspection Process - Concrete Poles and Columns

### S2.1 General Requirements

The inspection process for concrete poles and columns shall be performed according to the following Clauses. Below ground excavation and inspection is only required if defects above groundline extend below ground level.

### S2.2 Above Ground Inspection Procedure

The above ground inspection procedure for concrete poles and columns shall be performed as follows:

1) Implement safety precautions according to Annexure A.
2) Remove any advertising or loose surface material from within the inspection area of the pole or column.
3) Perform a visual inspection of the full length of the pole or column (without climbing) for the following defects:
    - Depth in Ground - look for evidence of pole or column movement at ground level and evidence on the pole or column of an old ‘ground level’ mark, or ‘high tide’ mark to indicate that the pole or column is no longer as deep in ground as originally installed. Also

look for exposed conduits or cable entry holes as an indicator of ground level changes. Note that conduits may intentionally be exposed in substation switchyards.

- Spalling and/or cracking of the concrete – inspect the pole or column for spalling or cracking and whether this has caused the reinforcing bars to become fully exposed and full depth sections of the concrete wall to fall out (refer to Figure 60).
- Corrosion – inspect the pole or column for evidence of corrosion including rust stains or bubbling of the concrete surface.
- Rusting, loose or damaged fittings, etc – look for loose or damaged attachments, such as luminaires or earthing connections. Loose earth connections shall not be tightened and shall be immediately reported to the nominated Ausgrid representative.
- Damage - inspect the pole or column for damage including vehicle damage (checks in the concrete or signs of impact including cracks), fire damage, unauthorised attachments, vandalism and graffiti.
- Missing or damaged access covers – where these defects are identified they shall be immediately reported to the nominated Ausgrid representative and the defect recorded in the DPA sheet. Where an access cover cannot be fully closed or secured with gaps of 12mm or more (excluding missing covers), multiple layers of 50mm electrical insulating tape shall be applied around the full circumference of the pole or column to secure the cover against unauthorised access.
- Vertical alignment (lean) - where a pole or column is leaning, the angle of the lean shall be accurately measured using a digital level. Estimates of lean taken by eye or measurement using a mobile phone app will not be accepted. Where a pole or column is identified as leaning excessively (ie, more than 10 degrees from the vertical position) look for causes of the leaning – causes may include subsidence, erosion or alterations to the natural ground level.
- Stays – check that the stay has a firm footing in the ground and carry out visual inspection looking for defects including corrosion of the steel rod. Check that the stay wire is tight and look for broken wire strands and corrosion at the anchor attachment as well as at the attachment to the insulator. If corrosion is evident on the steel rod or at groundline, excavate to a depth of 200mm to assess the extent of corrosion. Where corrosion has been identified, assess the steel condition according to Clause 6.5.

4) Perform a visual inspection of the rag-bolt or pile mounting (where used) for the following defects:

- Depth in Ground - look for evidence of reduced ground level around the rag-bolt or pile mounting. Also look for exposed conduits or cable entry holes as an indicator of ground level changes. Note that conduits may intentionally be exposed in substation switchyards.
- Buried base plate and rag-bolt mounting – if the surrounding ground has covered the base plate or the rag-bolt hold-down bolts / threaded foundation rods or nuts, remove any surrounding materials covering these components.
- Missing nuts – look for missing nuts on the rag-bolt or pile mounting. Missing nuts shall be replaced. If two or more rag-bolt nuts are missing and they cannot be replaced, immediately report the pole to the nominated Ausgrid representative and record the defect in the DPA sheet.
- Corroded hold-down bolts / threaded foundation rods and nuts - inspect these components for evidence of corrosion including rust stains or scaling corrosion. Where corrosion is identified, assess the steel condition according to Clause 6.5. Any steel condition rating of less than or equal to 30% according to Clause 6.5 shall be immediately reported to the nominated Ausgrid representative.
- Cracked or corroded base plate / base plate welds - inspect these components for evidence of corrosion (rust stains or scaling corrosion) or cracked welds. Where corrosion is identified, assess the steel condition according to Clause 6.5. Any steel condition rating of less than or equal to 30% according to Clause 6.5 of the base or cracked welds around the baseplate shall be reported to the nominated Ausgrid representative.

- Degraded grouting - look for grouting that is degraded (not intact) or which is not capable of sealing the column from the ingress of vegetation. Grouting shall be replaced according to Clause S2.6 when these defects are identified. Inspect the hold-down bolts below the mounting plate for signs of corrosion whenever grouting is replaced.

5) Check that the rag-bolt or ground-level (reachable) pile nuts are tight using a spanner. Loose nuts are to be tightened.

6) Where concrete poles have manufactured inspection holes, look for internal concrete degradation using a borescope. Poles with internal cables (for example, street light columns) shall not be internally inspected.

## S2.3 Safe to Excavate Criteria

Excavation and below ground inspection shall only be performed if the pole or columns meets all of the following criteria;

- Concrete perforations or spalling does not extend beyond the reinforcing or cover 25% of the pole circumference, or
- Concrete cracking does not extend around the entire pole circumference, or
- The pole or column is not considered to be loaded close to or beyond its structural capacity (indicated by excessive lean or bending of the pole), and
- The base plate or rag-bolt / pile components of rag-bolt or pile mounted poles and columns do not have any steel condition rating of less than or equal to 30% according to Clause 6.5 or cracked welds, and
- Pole or column stability will not be affected by, or suspected to be affected by, excavation of the pole or standard.

If a pole is identified as potentially unsafe prior to excavation or during excavation:

- Do not proceed with excavation of the pole – finalise the pole inspection according to Clause S2.5, and
- Report the potentially unsafe pole immediately to the nominated Ausgrid representative.

## S2.4 Partial Excavation and Below Ground Inspection Procedure

Concrete poles and columns shall only be inspected below ground where there is evidence of concrete cracking or spalling at groundline, indicating that the defect or damage may extend to the below ground section of the pole or column.

Extreme caution shall be exercised when excavating around all concrete poles or columns. It shall not be assumed that internal or external cables (including earth cables) enter vertically from a depth below 350mm or perpendicular to the pole from an adjacent asset, or that any cable is clear of the remaining inspection area around the pole or column. These cables can be easily damaged by digging implements and this may cause a hazardous situation. Refer to Clause U1 and NS156 for further details.

The partial excavation and below ground inspection procedure for concrete poles shall be performed as follows only when the above ground inspection indicates that it is safe to proceed (refer to Clause S2.3):

1) Excavate to a depth of 100mm below groundline according to Clause U1 in either;
   - an unloaded or supported axis (neutral axis - refer to Annexure C) if overhead mains are installed on the pole or column, or
   - a groundline area on one side of the pole or column if overhead mains are not installed on the pole or column. If a defect is detected above ground and near the groundline, excavate directly below the defect.

2) Brush soil and debris from the surface of the pole. Do not use tools which may damage the surface of the pole.

3) Inspect the surface of the pole around its full circumference from the base of the excavation to immediately above groundline for the following defects:

- Spalling and/or cracking of the concrete and whether this has caused the reinforcing bars to become fully exposed or full depth sections of the concrete wall to fall out.
- Rust stains on the pole exterior.

4) Where a defect extends further around the circumference of the pole or column, or beyond a depth of 100mm and reinforcing bars are not exposed, excavate further to ascertain the extent of the defect. Do not excavate beyond a depth of 350mm below groundline.

## S2.5 Finalising the Inspection Process

After the above ground and below ground inspection procedures have been completed, the inspection process for concrete poles and columns is to be finalised as follows:

1) Record (photograph) the following external defects:
   - Pole lean, pole dents / bending or evidence of pole movement at groundline.
   - Corrosion, spalling or cracking of the concrete.
   - Fire and third-party damage, including painted poles.
   - Missing or damaged access covers.
   - Rag-bolt or pile damage or degradation.
   - Stay wire and anchor defects.
2) Restore the excavation (where performed) according to Clause U2.
3) Compare the inspection results against the serviceability criteria for concrete poles and columns in Clause 7.4 to assess whether the pole or column remains serviceable or corrective action is required.
4) Poles where concrete spalling is in the early stages of degradation and reinforcing bars are not fully exposed shall be reported to the nominated Ausgrid representative (including approximate area or percentage of the pole affected) according to the following guidelines so the poles can be professionally assessed for remedial treatment;
   - Significant cracking in concrete.
   - Cracking with rust stains from the cracks (refer to Figure 60 (a)).
   - Concrete bulging but not displaced.
5) If the pole or column was assessed at any stage as defective, clearly mark the pole or column as defective according to Annexure V and complete a ‘Defective Pole Action’ sheet and enter details into SAP.
6) Record inspection results and defects in the Ausgrid Asset Management System. This shall be performed using relevant forms (refer to Annexure W) or direct entry into a MAM device.
7) Report defects or defective poles / columns to the nominated Ausgrid representative.

Notify the nominated Ausgrid representative immediately if:

- The pole or column is potentially unsafe for excavation or appears to be in danger of collapse, or
- The access cover is missing or cannot be secured to prevent unauthorised access, or
- Attachments such as luminaires or earthing connections are loose or damaged, or
- Concrete is displaced with the top surface of steel reinforcement exposed (refer to Figure 60 (b)), or.
- Spalling has caused the reinforcing bars to become fully exposed and full depth sections of the concrete wall to fall out (refer to Figure 60 (c)), or
- Cracking extends around the entire pole circumference, or

- Any steel condition rating of less than or equal to 30% according to Clause 6.5 or defects of the rag-bolt or pile mounting may result in imminent failure of the pole or column.

## S2.6 Re-grouting Below the Baseplate of Rag-bolt Mounted Concrete Poles and Columns

Missing or defective grouting below the column base on rag-bolt mounted columns shall be replaced by the Asset as part of the inspection.

Any remaining grout shall be removed, together with any vegetation. The area between the base of the steel column and the top of the concrete holding the rag-bolt assembly shall be cleaned out and prepared prior to replacement of the sand/cement grouting. Inspect the hold-down bolts / threaded foundation rods below the mounting plate for signs of corrosion when the existing grout is fully removed.

The space beneath the rag-bolt mounting baseplate of the standard shall be filled with cement grout according to the following specification:

- With the four bolts or threaded foundation rods of the rag-bolt assembly used as a frame, a 2mm thick strip of cardboard is to be wrapped twice around the four bolts and taped in place. The cardboard is to be placed between the underside of the standard mounting baseplate and the top of the specified fill for the rag-bolt assembly.
- The space around the outside of the cardboard former is to be filled with a 6:1 sand and cement mix, or suitable commercial premixed grout as approved by Ausgrid. The sides of the cement mix fill are to be trowelled from the outside edge of the baseplate to the ground at an angle of 45 degrees. This plinth is to prevent the entry of grass, weeds and foreign objects into the standard.
- If vandalism or slumping of the cement mix is a problem, a 350mm square former (inside dimension) with vertical sides, may be used to form the outside of the plinth.

## S3 Common Concrete Pole and Column Defects

Figure 60 shows concrete degradation defects commonly found on concrete poles and columns.

Figure 60 (a) shows cracking of the concrete surface with rust stains starting to develop however spalling (ie, sections of the concrete surface which has broken away) has not yet occurred and reinforcing bars are not exposed. Cracking may be vertical (as shown in Figure 60 (a)) or horizontal. Horizontal cracking may be caused by loading applied by overhead mains or damage by vehicle contact. Where horizontal cracking is evident, the extent of the crack needs to be checked – cracking which extends around the full circumference of the pole shall be immediately reported to the nominated Ausgrid representative.

Figure 60 (b) shows cracking which has progressed to the point where surface spalling has occurred exposing the reinforcing bars and the reinforcing bars have corroded. The concrete spalling has not yet penetrated the full depth or cross-section of the concrete pole or column. These defects shall be immediately reported to the nominated Ausgrid representative when they are identified during the inspection of the pole or column.

Figure 60 (c) shows cracking which has progressed to the point where spalling has penetrated the full depth or cross-section of the concrete pole or column and the reinforcing bars are completely exposed. These defects shall also be immediately reported to the nominated Ausgrid representative when they are identified during the inspection of the pole or column.

(a) (b) (c)

**Figure 60 – Common Concrete Pole and Column Defects**

## Annexure T: Fibre Composite Poles - Inspection Process

### T1 General

The pole inspection process for fibre composite poles consists of:

- Implementation of appropriate safety precautions according to Annexure A.
- Above groundline visual inspection according to Clause T2.2.
- Excavation and below ground inspection where defects extend below ground level according to Clause T2.4.
- Inspection finalisation according to Clause T2.5.

The design of fibre composite poles is such that the column's bending strength is provided by the glass-fibre reinforcement. Ausgrid has two types of manufactured fibre composite poles found on its network:

- Fibre cement poles – these poles are installed in urban and rural areas, and
- Fibre plastic poles – these poles are predominantly installed in urban areas.

Fibre composite poles are thin-walled structures that are relatively lightweight compared to timber or concrete poles. They are highly susceptible to damage from applied excessive wall pressure. Both types of poles may be damaged by mechanical/physical impact, for example, contact by motor vehicle.

There is no natural degradation process known for fibre cement poles at the time this document was published however, there has been an instance of king bolt (the bolt which attaches a cross arm to the pole) 'pull through' on a fibre cement pole caused by factors other than pole condition (refer to Clause T3 for further details).

The natural degradation process for fibre plastic poles is ultraviolet (UV) deterioration over time caused by normal exposure to weather. Fibre plastic poles may also be damaged from exposure to fire.

While normally bonded within the cement or resin matrix, the fibres may become exposed (unbonded) due to deterioration of, or damage to, the pole material. Asset inspectors shall avoid contact with fibre composite poles with exposed fibres.

If a fibre composite pole is found with defects or mechanical or physical damage, it shall be reported to the nominated Ausgrid representative. Ausgrid's Mains Engineering will evaluate the pole for suitability for repairing.

Fibre composite poles previously identified as defective and which are marked according to Annexure V shall not be inspected without confirmation from the nominated Ausgrid representative that the inspection shall proceed.

### T2 Inspection Process – Fibre Composite Poles

#### T2.1 General Requirements

The inspection process for fibre composite poles shall be performed according to the following Clauses. Below ground excavation and inspection is only required if defects at or above groundline extend below ground level.

#### T2.2 Above Ground Inspection Procedure

The above ground inspection procedure for fibre composite poles shall be performed as follows:

1) Implement safety precautions according to Annexure A.
2) Remove any advertising or loose surface material from within the inspection area of the pole.
3) Perform a visual inspection of the full length of the pole (without climbing) for the following defects:
    - Depth in Ground - look for evidence of pole movement at ground level and evidence on the pole of an old 'ground level' mark, or 'high tide' mark to indicate that the pole is no longer as deep in ground as originally installed. Also look for exposed conduits or cable

entry holes as an indicator of ground level changes. Note that conduits may intentionally be exposed in substation switchyards.

- Missing cement or resin matrix (including assessment of the depth of penetration into the pole surface) – if defects are identified, determine whether the defects are in the neutral axis or critical axis.
- Loose, cracked or weakened cement or resin matrix – if defects are identified, determine whether the defects are in the neutral or critical axis.
- Ultra-violet (UV) degradation of the resin matrix and fading of the pole surface.
- Fibre reinforcing which is unbound / exposed from the cement or resin matrix.
- Rusting, loose or damaged fittings, etc - look for loose or damaged attachments, such as luminaires or earthing connections. Loose earth connections shall not be tightened and shall be immediately reported to the nominated Ausgrid representative.
- Damage - inspect the pole or column for damage including vehicle damage (checks in the concrete or signs of impact including cracks or deformation), fire damage, unauthorised attachments, vandalism and graffiti.
- Vertical alignment (lean) - where a pole is leaning, the angle of the lean must be accurately measured using a digital level. Estimates of lean taken by eye or measurement using a mobile phone app will not be accepted. Where a pole is identified as leaning excessively (ie, more than 10 degrees from the vertical position) look for causes of the leaning – causes may include subsidence, erosion or alterations to the natural ground level.
- Stays – check that the stay has a firm footing in the ground and carry out visual inspection looking for defects including corrosion of the steel rod. Check that the stay wire is tight and look for broken wire strands and corrosion at the anchor attachment as well as at the attachment to the insulator. If corrosion is evident on the steel rod or at groundline, excavate to a depth of 200mm to assess the extent of corrosion. Where corrosion is identified, assess the steel condition according to Clause 6.5.

### T2.3 Safe to Excavate Criteria

Excavation and below ground inspection shall only be performed if the pole meets all of the following criteria;

- Missing, loose or weakened / softened matrix (cement or resin) is less than 40mm in size, is not located in the critical axis and does not penetrate beyond the fibre reinforcing, and
- Cement matrix is not damaged, including the area behind or surrounding king bolts; and
- Resin matrix is not damaged (folds or deformation) and does not have large areas of ultraviolet degradation or exposed (unbonded) fibres, and
- The pole is not considered to be loaded close to or beyond its structural capacity (indicated by excessive lean, cracks or folds in the pole), and
- Pole stability will not be affected by, or suspected to be affected by, excavation of the pole or standard.

If a pole is identified as potentially unsafe prior to excavation or during excavation:

- Do not proceed with excavation of the pole – finalise the pole inspection according to Clause T2.5, and
- Report the potentially unsafe pole immediately to the nominated Ausgrid representative.

### T2.4 Partial Excavation and Below Ground Inspection Procedure

Fibre composite poles shall only be inspected below ground where there is evidence of damage or defects at or above groundline which may extend to the below ground section of the pole.

The partial excavation and below ground inspection procedure shall be performed as follows only when the above ground inspection indicates that it is safe to proceed (refer to Clause T2.3):

4) Excavate to a depth of 100mm below groundline according to Clause U1 in either;
   - an unloaded or supported axis (neutral axis - refer to Annexure C) if overhead mains are installed on the pole or column, or
   - a groundline area on one side of the pole or column if overhead mains are not installed on the pole or column. If a defect is detected above ground and near the groundline, excavate directly below the defect.
5) Brush soil and debris from the surface of the pole. Do not use tools which may damage the surface of the pole.
6) Inspect the surface of the pole around its full circumference from the base of the excavation to immediately above groundline for the following defects:
   - Missing cement or resin matrix (including assessment of the depth of penetration into the pole surface).
   - Loose, or weakened cement or resin matrix.
   - Fibre reinforcing which is unbound / exposed from the cement or resin matrix.
7) Where a defect extends further around the circumference of the pole or column, or beyond a depth of 100mm, excavate further to ascertain the extent of the defect. Do not excavate beyond a depth of 350mm below groundline.

### T2.5 Finalising the Inspection Process

After the above ground and below ground inspection procedures have been completed, the inspection process for fibre composite poles is to be finalised as follows:

8) Record (photograph) the following external defects:
   - Pole lean, pole dents / bending or evidence of pole movement at groundline.
   - Damaged or degraded concrete or resin matrix (including king bolt pull-through).
   - Fire and third-party damage, including painted poles.
   - Unbound or exposed fibre reinforcing.
   - Stay wire and anchor defects.
9) Restore the excavation (where performed) according to Clause U2.
10) Compare the above ground inspection results against the serviceability criteria for fibre composite poles in Clause 8.4 to assess whether the pole remains serviceable or corrective action is required.
11) If the pole was assessed at any stage as defective, clearly mark the pole or standard as defective according to Annexure V and complete a ‘Defective Pole Action’ sheet and enter details into SAP.
12) Record pole inspection results and defects in the Ausgrid Asset Management System. This shall be performed using relevant forms (refer to Annexure W) or direct entry into a MAM device.
13) Report defects or defective poles to the nominated Ausgrid representative.

Notify the nominated Ausgrid representative immediately if:

- The pole or standard appears to be in danger of collapse, or
- Deformations or folds are evident at any point during the inspection, or
- Significant damage becomes evident at any point during the inspection, including the surface areas behind or surrounding cross arm king bolts, or
- Degradation of the cement or resin matrix which may result in imminent failure of the pole.

## T3 Fibre Cement Pole King Bolt ‘Pull Through’

Ausgrid has experienced an instance where a cross-arm king bolt has ‘pulled through’ the wall of a fibre cement pole, causing irreparable damage to the pole. While factors other than the design and manufacturer of the fibre composite pole contributed to this failure, this failure mode may cause damage on other fibre composite poles, particularly where long spans of overhead mains terminate at the cross arm on the pole.

Asset inspectors shall inspect (from ground level) the areas behind, and surrounding, cross arm king bolts on fibre cement poles for deformation in the wall of the pole (horizontal or vertical), or king bolts which have pulled through the wall of the pole (refer to Figure 61). Where these defects are identified they shall be immediately reported to the nominated Ausgrid representative.

**Figure 61 – Damage caused by cross arm king bolt ‘pull through’**

# Annexure U: Excavation and Restoration

## U1 Excavating around poles

### U1.1 General

Excavation is required around a pole to perform below ground inspections according to this Standard. Excavation may be 'partial excavation' to a shallow depth (typically done in a neutral axis on one side of a pole) to enable an initial below ground assessment of the pole condition, and 'full excavation' (where required) to perform a full assessment of the below ground condition of the pole.

Any excavation around a pole affects the stability of the pole to some extent. Electrical assets, including cables and earthing connections, as well as assets of other utilities, may also be attached to the pole, or in the ground near the pole, posing safety risks to the Asset Inspector. Due to these factors, extreme caution shall be exercised when excavating around a pole, particularly those poles that have cables and other items attached to them.

Obstructions that are close to or hard up against the below ground portion of the pole such as cables, cable covers, pipes and kerbs may assist moisture retention that causes pole degradation faster than other areas of the pole (particularly timber poles) and may prevent inspection of the full below ground circumference of the pole. These obstructions can also prevent good application of preservative treatments. All soil shall be removed from around these obstructions to fully expose the asset and the adjacent pole material to improve the effectiveness of the below ground inspection. Concrete kerbs shall not be cut or damaged by excavation.

Excavation shall be performed according to the following Clauses and only when the above ground inspection of the pole indicates that it is safe to proceed with excavation.

For immediately dangerous situations, Asset inspectors shall safeguard themselves and others against unsafe exposure to these hazards until the hazard has been removed or Ausgrid staff attend to remove the hazard.

### U1.2 Pole Depth and Stability

When poles are installed, they are 'sunk' to a depth sufficient to provide suitable stability against the effects of wind and pole-top loading due to overhead mains or other apparatus (refer to NS128 for the correct pole sinking depths). The stability of a pole can be severely affected by reductions in its depth in the ground as shown in Figure 62.

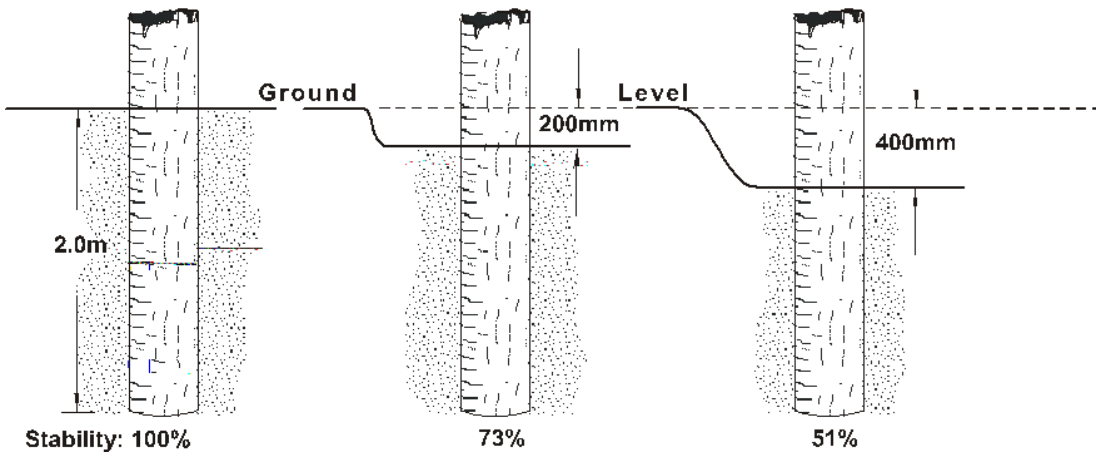



**Figure 62 – Effect of Depth in Ground on Pole Stability**

Reduced depth in ground compared to when the pole was originally installed can be caused by road re-alignment work, landscaping of the footpath, natural subsidence or erosion of the ground, and other causes. The position of the pole disc is a good indicator of pole sinking depth – refer to Clause B1 for detailed information regarding the pole disc height from groundline or the butt (bottom) of the pole. Excavation around a pole to perform below ground inspections also temporarily reduces pole stability and shall be restricted to the depths stated in the relevant

Clauses within this Standard. Reduced depth in the ground will typically result in the pole leaning and may eventually result in failure of the pole.

Asset inspectors shall assess pole depth in ground, pole lean (vertical alignment) and pole stability (including pole movement) prior to excavation and shall stop further excavation if there is any pole movement or evidence of pole instability while it is being excavated. Poles that are leaning 10 degrees or more, or where the depth in ground has been reduced by 350mm or more below the original ground line, shall be reported to the nominated Ausgrid representative and inspected before any excavation is carried out.

## U1.3 Excavating Around Electrical Assets

Where a cable enters the ground from a pole (for example, an underground to overhead connection, known as a UGOH), it shall not be assumed that the cable enters vertically from a depth below 350mm or perpendicular to the pole from an adjacent asset, or that it is clear of the remaining inspection area around the pole. These cables can be easily damaged by digging implements and this may cause a hazardous situation. Refer to NS156 for further details.

UGOH cables do not always run from the pole back to an adjacent distribution substation, pillar or customer in a straight line, nor do they always radiate out from the pole at 90°. UGOH cables may coil around the pole below ground to provide spare cable in case of a pole change-over or re-termination and they may be adjacent to poles that do not have these above ground cable installations (UGOHs) attached. Where it is suspected or confirmed that such cables exist near the pole that is being worked on, hand excavation shall be performed with care. If there is a high risk of cable damage, the pole inspection shall not proceed. The nominated Ausgrid representative or supervisor shall be contacted to determine the most appropriate course of action before work can proceed.

Excavation of steel, concrete and fibre composite poles, standards or columns shall be performed in a similar manner to UGOH cables. Cables and conduits may enter these assets from any side below ground, or from underneath rag-bolt mounted or pile mounted poles, standards or columns.

When excavating or cleaning a pole around electrical assets Asset Inspectors shall use non-conductive tools or tools with non-conductive handles or wear insulating gloves when working around electrical assets attached to a pole or electrical assets exposed below ground level.

Poles shall be thoroughly checked for defects immediately adjacent to attached cables (as the poles are not treated as effectively for fungal decay in these areas and is therefore more likely that defects will exist in these areas).

As underground LV cables may be subject to breakdown of insulation, the precautions detailed in the Ausgrid's Electrical Safety Rules shall be observed, including testing to confirm the absence of hazardous voltages.

Where a cable is observed as having damaged insulation (e.g. where the outer covering is partially removed exposing the underlying material) it shall be immediately reported to the nominated Ausgrid representative. Asset inspectors shall safeguard themselves and others against unsafe exposure to these hazards until the hazard has been removed or Ausgrid staff attend to remove the hazard.

## U1.4 Cable Protection Covers

Electrical assets installed underground are required to be covered with a cable protection cover. Asset Inspectors shall remove cable protection covers found in the excavation area surrounding a pole to enable the pole to be fully exposed for inspection and treatment.

Once a cable protection cover has been removed, further excavation near the cable/s shall not be completed with shovels or spades that require the use of two hands or other soil breaking implements. Only one-handed tools shall be used to remove the loose soil around the cables.


**Figure 63 – Cable Protection Covers**

## U1.5 Excavating Paved Surfaces

Direct buried poles shall be accessible for below ground inspection. Where they are found in locations where they cannot be correctly inspected (an example is shown in Figure 64), either the obstruction shall be removed to facilitate inspection, or the pole relocated.

Where the full pole inspection process cannot be performed, the situation shall be reported to the nominated Ausgrid representative.

**Figure 64 – Inaccessible Pole**

Paved surfaces around direct buried poles shall be removed to allow below ground inspection, however concrete kerbs shall not be cut or damaged.

Any pole that has continuous paving installed within 300mm of the pole shall have the paving saw-cut away to give a minimum clearance of 300mm around the pole and cold bituminous pre-mix material installed according to Clause U2.3 when the excavation is restored after the pole has been inspected. Cutting of paving to achieve the 300mm clearance is not required if it has been cut to obtain 200mm clearance during previous below ground inspections of the pole.

After completion of the inspection and treatment process, the paving tiles that have been shaped to fit neatly around the pole shall be put back as they were found. All other surface material inside the defined inspection area shall be removed from site.

Where decorative concrete driveways or paths exist within 300mm of direct buried poles, the customer and the nominated Ausgrid representative shall be notified, and agreement obtained

prior to any cutting and removal being undertaken. Cutting of decorative concrete driveways or paths to achieve the 300mm clearance is not required if they have been cut to obtain 200mm clearance during previous below ground inspections of the pole.

## U2 Restoring Excavations

### U2.1 General

When restoring the excavated area around poles it is essential that the methods adopted achieve a clean and tidy appearance, so as not to attract complaints. Sandy loam shall be used for backfill top-up and surface reinstatement in all unpaved residential areas.

Remove any rocks larger than 50mm diameter, vegetation or creosote-impregnated soil from the backfill material and any wood shavings resulting from the inspection and/or treatment processes, paper or other rubbish. These foreign materials disrupt soil compaction and may promote termite activity. Vegetation shall not be placed in the excavation and covered with soil under any circumstances.

For poles with no attached earth down leads or UGOHs the inspection area around the pole shall be restored with the backfill material.

For poles with an attached earth down lead or UGOH, that half of the excavation including the underground portion of these electrical assets shall be reinstated with sandy loam. This is a safety measure to reduce the need for mechanical aids when digging around and adjacent to these underground electrical assets. The part of the excavation opposite the underground electrical assets shall be reinstated with the excavated material after removal of any foreign material as described above.

Where cable covers are found when excavating they shall be reinstalled when restoring the excavation. Where cable covers are not found above cables when excavating, the Asset Inspector shall install a piece of cable cover over all cables in the excavated area when restoring the excavation.

Backfill the excavation in layers of 100mm, ramming each layer to firmly compact the soil until fully reinstated. Take care not to damage the external preservative bandage. The backfill material shall be firmly tamped with a suitable tool so that it finishes:

- Slightly below groundline for unpaved areas.
- Approximately 50mm below the level of the pavement for paved areas.

All spoil that needs to be removed from the site shall be managed according to NS174C. If additional information is required, contact Ausgrid Environmental Services.

### U2.2 Restoring Unpaved areas

The top surface shall be finished with clean stone-free sandy loam tamped down such that there is a 20mm slope away from the pole to groundline.

The PVC sealing tape used with preservative bandages shall not be visible above groundline (refer to Clause M3.2).

Where turf has been removed to allow excavation, it shall be neatly reinstated on top of the compacted soil.

The work area shall be cleaned and all surplus material removed from site.

On private properties in rural areas, local soil found on site may be used for surface reinstatement around the pole rather than importing clean sandy loam to site where:

- the property owners are concerned about the introduction of soil that may contain noxious seeds and weeds, or
- there is no vehicular access and it is impractical to carry soil to site.

The surrounding area shall be left in an ‘as found’ condition as far as possible following the gathering of soil for backfilling around a pole, and under no circumstances shall divots and potholes be created that may present a hazard.

### U2.3 Restoring Paved Areas

All excess backfill material shall be cleaned from the surface of the pole and from the edge of the surrounding paving.

The inspection area around the pole shall be reinstated with 50mm thick cold bituminous pre-mix material (refer to Figure 65) or, in the case of paving tiles which have been cut to fit neatly around the pole, these tiles shall be reused and left in an as found condition. Note: inspection area clearances from the pole may only be 200mm instead of 300mm in some circumstances (refer to Clause U1.5).

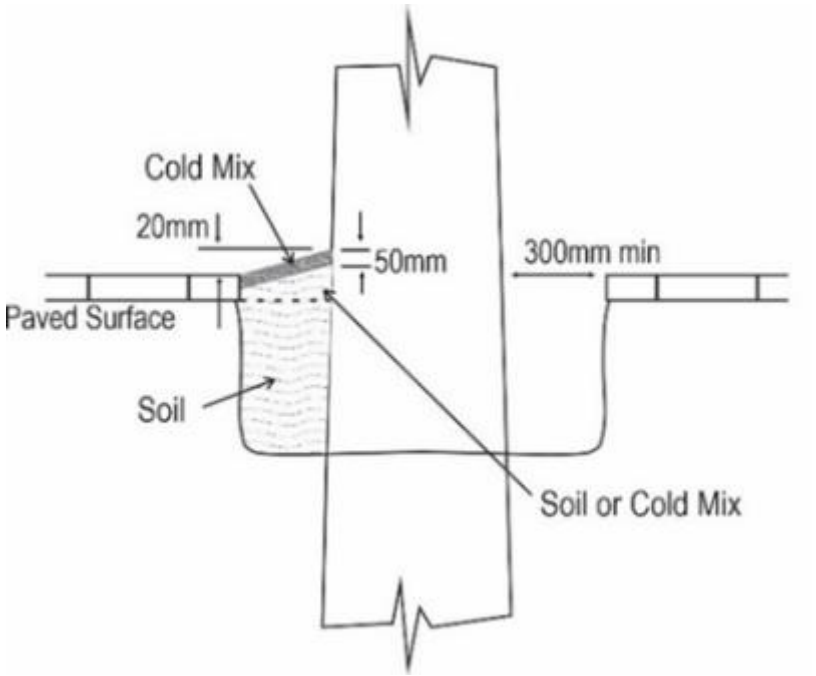



**Figure 65 – Cold Mix Installation**

If using cold bituminous pre-mix material, the pre-mix material shall be placed such that there is a 20mm slope away from the pole towards the pavement. The pre-mix material shall finish slightly above the pavement level to allow for subsidence.

The work area shall be cleaned with a broom and all surplus material removed from the site.

The reinstatement of paved areas shall be completed as detailed above within 24 hours of the inspection and treatment work being performed.

## Annexure V: Marking of Defective and Condemned Poles

### V1 Marking Defective Poles

Defective and condemned poles shall be identified by a single 70mm wide orange band which is marked with black 'X's, the Ausgrid name and the Ausgrid logo. The orange band is a safety warning device that shall be correctly and securely installed so that it cannot be interfered with or become dislodged. The band shall be secured around the full circumference of the pole at a minimum height of 2.4m above ground and no higher than 3m.

Defective poles suitable for reinforcement shall be marked with the orange band which is then removed after reinforcement has taken place.

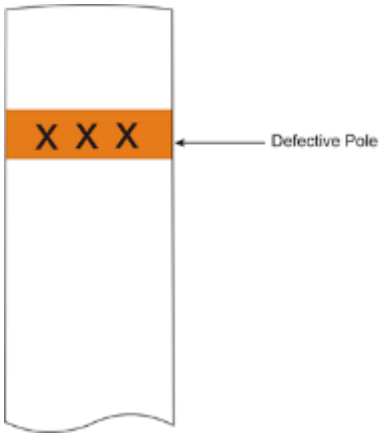



**Figure 66 – Defective and Condemned Pole Markings**

### V2 Types of Marking Bands

There are two types of marking bands (with stockcodes listed in Table 20):

- For timber poles - a 1220mm long PVC plastic strip (refer to Figure 67), and
- For concrete, fibre composite and steel poles - self-adhesive tape which comes in a roll (refer to Figure 68).

**Figure 67 – PVC Plastic Strip**


**Figure 68 – Self-adhesive Tape**

### V3 Installation of Marking Bands

The installation of the PVC plastic strip on timber poles shall be as follows:

1) Place the orange strip around the pole at the designated height, with the company logo correctly orientated, and fix in position using 40mm twist nails.

2) For large diameter poles it will be necessary to fit an additional length of plastic strip to ensure that an orange identification band fully encircles the pole.

The installation of the self-adhesive tape on concrete, fibre composite and steel poles shall be as follows:

1) Remove sufficient tape from the roll to encircle the pole at the designated height with an additional 50mm overlap.
2) Peel the backing paper from the selected portion of tape.
3) Place the self-adhesive tape around the pole at the designated height, with the company logo correctly orientated.
4) Fix the tape into position by pressing the tape against the pole surface to ensure contact of the adhesive with the pole and at the point of overlap on the ends of the tape.

## V4 Defective Pole Marking Materials Stockcodes

**Table 20 – Marking Material Stockcodes**

| Description | Stockcode |
|---|---|
| 1200mm long, 70mm wide Orange PVC Plastic Strip | 180191 |
| Roll of 70mm wide Orange Self-adhesive Tape | 179704 |
| 40mm Twist Nails | 175912 |

## Annexure W: Forms

# AUSGRID TERMITE TREATMENT REPORT FORM

**Form No:**

DISTRICT / REGION: _____

GRID REFERENCE: _____

DATE: _____

**Ausgrid Contact Details:**

Postal: GPO Box 4009 Sydney NSW 2001

Address: 24-28 Campbell St Sydney NSW 2001

Phone: 131365

**1. Report of Pole Infested with Termites**

Pole Identification No.: _____

Name of Private Owner/Occupier of Land (if applicable) _____

Name/description of affected sensitive area (e.g. school name) if applicable _____

Notification provided as required to appropriate affected party/s as identified above: YES / NO

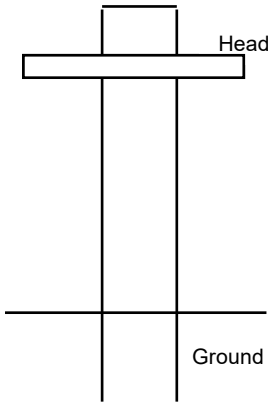
House / Lot No.: _____ Street: _____

Nearest Side / Cross Street : _____ Termite Disc Attached? YES/NO

Suburb: _____

Active Termites Detected: Above GL _____Below GL _____External _____Internal _____

A. TERMITE LOCATIONS

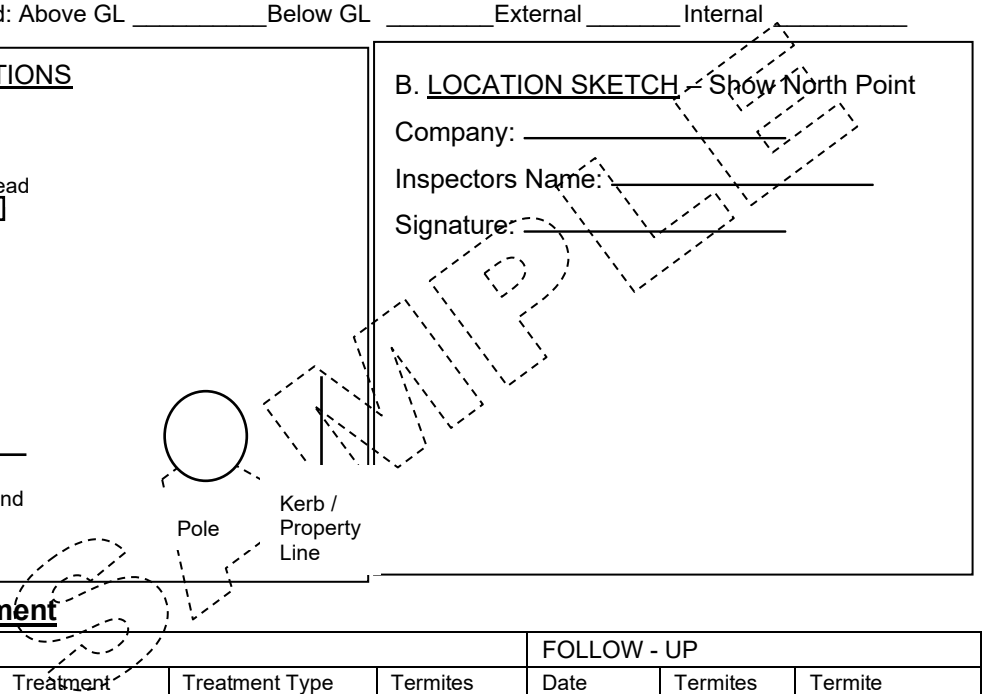



B. LOCATION SKETCH – Show North Point

Company: _____

Inspectors Name: _____

Signature: _____




## 2. Record of Treatment

| TREATMENT | | | | | FOLLOW - UP | | |
|---|---|---|---|---|---|---|---|
| Name (Initial followed by family name) | Date | Treatment Start/Finish Times | Treatment Type (bait, dust or liquid injection) | Termites Sighted? | Date | Termites Sighted | Termite Location |
| | | | | YES/NO | | YES/NO | |
| | | | | YES/NO | | YES/NO | |
| | | | | YES/NO | | YES/NO | |
| | | | | YES/NO | | YES/NO | |
| | | | | YES/NO | | YES/NO | |
| | | | | YES/NO | | YES/NO | |

**TERMITES ERADICATED? YES/NO** **TERMITE DISC REMOVED? YES/NO**

Copy of this form left with the notified affected party/s (as identified above): YES / NO

Name: _____ Signature: _____

Version 5.1

| TO: | DEFECTIVE TIMBER AND COMPOSITE POLE ACTION SHEET | ORIGINAL<br>DPA No.: |
|---|---|---|

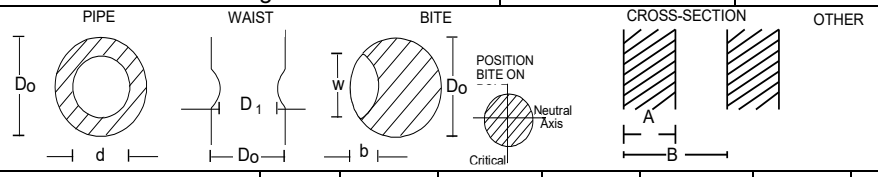
Date:……
Pole Number:……

**Location Sketch (show PT's, ABS's etc):**

Address:
House/Lot Nº:……
Street Name:……
Suburb:……

| | | | | | | |
|---|---|---|---|---|---|---|
| Pole Type: | ❑ Timber<br>❑ Composite | ❑ Reinforced | ❑ Splinted | | | |
| Defective Pole Assessment CAUSE: | ❑ Bad head – general deterioration<br>❑ Bushfire<br>❑ Corrosion<br>❑ Cracking/Splitting | ❑ Deteriorated Pole Reinstatement<br>❑ Deterioration<br>❑ Erosion<br>❑ Excessive Lean<br>❑ Failed Stay | ❑ Ground Level Changes<br>❑ Lightning Strike<br>❑ Overtense Conductor<br>❑ Pipe<br>❑ Rot – Brown | ❑ Rot – Soft<br>❑ Rot – White<br>❑ Rot – Unknown<br>❑ Termites – Unknown<br>❑ Termites – Sap (Nasut) | ❑ Termites – Dry (Glypto)<br>❑ Termites – Heart (Copto)<br>❑ Vehicle Impact<br>❑ Wall thickness <70mm | |
| Pole Details: | ➢ **Soil:**<br>➢ **Ground:** | ❑ Dry<br>❑ Bit/Concrete | ❑ Moist<br>❑ Pavers | ❑ Perm. Wet<br>❑ Grass/Soil | ➢ **Disc Height:**<br>……metres | |
| External Defects: | ➢ **Splits:** | ❑ Treated | | ➢ **Knots:** | ❑ Filled | |
| | ➢ **Loose sapwood:** | ❑ Removed | | ❑ Desapping required above 2m | | |
| | **Condition of Sleeve / Nail / Splint Serviceable / Defective** | | | | | |
| Vehicle Damage: | ➢ **Type of damage:**<br>➢ **Severity:** | ❑ Fracture<br>❑ Slight | ❑ Bite<br>❑ Moderate | ❑ Severe | ➢ **Height above ground:**<br>..... metres | |
| Alignment: | ➢ **Lean:** | ❑ Leaning dangerously | ❑ Leaning over curb alignment<br>❑ > 10 ° **Lean of ……..degrees** | | ❑ moved in ground | |
| Termite Damage: | ➢ **Active termites: Yes / No** | | | | **Report No.:** | ……. |
| | ➢ **Type:** | ❑ Copto | ❑ Nasut | ❑ Glypto | ❑ Unknown | |
| | ➢ **Location of the termite damage on the pole:**<br>❑ Pole considered dangerous due to termites | | | | ❑ Above GL<br>❑ Below GL | ❑ External<br>❑ Internal |
| Rot Damage: | ➢ **Type:** | ❑ Brown rot | ❑ Soft rot | ❑ White rot | ❑ Unknown | |
| | ➢ **Location of the rot on the pole:**<br>❑ Pole considered dangerous due to rot | | | | ❑ Above GL<br>❑ Below GL | ❑ External<br>❑ Internal |

Results of All Strength Calculations:




| Axis (C/N) | Height above / below GL | $D_0$ | A | B | $D_1$ - B | d | $D_1$ | W | b | S% |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | **DATA NOT FOR SAP** | | | | | | | |
| | 100mm Below | | | | | | | | | |
| | 200mm Below | | | | | | | | | |
| N | 200mm Above | | | | | | | | | |
| N | 800mm Above | | | | | | | | | |
| N | 1000mm Above | | | | | | | | | |

| | | | | |
|---|---|---|---|---|
| Treatment Applied: | ❑ **Heart Rot Treatment** | ❑ **Bandage** | ❑ **Wrap** | ❑ **Paste** ❑ **Nil** |
| Dangerous Pole: | **Reported To:** …… | | **Date:** ……**Time**:…… | |
| Inspectors Name: ……. Signature: …… | | | | |
| REMARKS: | | | | |

**Contract Officer / Inspector's Recommendation:** Serviceable / Re-inspect / Reinstate / Replace

**Remarks:** ……

**Contract Officer / Inspector**: Name: ……..Signature: ……...Date:…….

| TO: | DEFECTIVE STEEL / CONCRETE POLE ACTION SHEET | ORIGINAL DPA No.: |
|---|---|---|

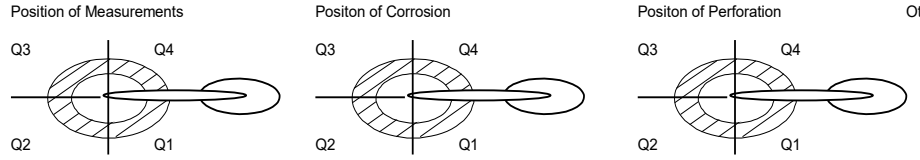
Date:……Pole Number:……

**Location Sketch:**

Address:
House/Lot N°:……
Street Name:... .....
Suburb:..... .....

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| Pole Type: | ❑ Steel – ❑ Concrete | ❑ Direct Buried ❑ Concrete/Bitumen Footing | ❑ Rag Bolt | | | | |
| Pole Assessment CAUSE | ❑ Lamp head – general deterioration ❑ Corrosion | ❑ Cracking / Splitting ❑ Damaged Access Cover | ❑ Deteriorated Pole Reinstatement ❑ Erosion ❑ Ground Changes | ❑ Spalling ❑ Vehicle Impact | | | |
| Pole Details: | ➢ **Soil:** ➢ **Ground** | ❑ Dry ❑ Bit/Concrete | ❑ Moist ❑ Pavers | ❑ Perm. Wet ❑ Grass/Soil | ❑ **Disc Height:** ……metres | | |
| Concrete/Steel Pole Defects: | ❑ Rust (Steel Pole) ❑ Fractures/Spalling (Concrete Pole) ❑ Pole exterior perforated ❑ Pole exterior folded | ❑ **Location** | ➢ Above ➢ Below | ❑ **Height** ❑ **Depth** | ….. m ….. m | ❑ Servc ❑ Defective | |
| | | ❑ Damaged Access Cover | | ❑ Missing Access Cover | | | |
| | | ❑ Pole considered dangerous due to electrical access | | | | | |
| Vehicle Damage: | ➢ **Type of damage:** ➢ **Severity:** | ❑ Fracture ❑ Slight | ❑ Bend ❑ Moderate | ❑ Dent ❑ Severe | ➢ **Height above ground:** …… metres | | |
| Alignment: | ➢ **Lean:** | ❑ Leaning dangerously | ❑ leaning over curb alignment ❑ > 10° **Lean of …… degrees** ❑ moved in ground | | | | |

Results of All Strength Calculations:




| Axis (C/N) | **Height above/below GL** | **Steel Thickness Measurements** | | | | | |
|---|---|---|---|---|---|---|---|
| | | **Location 1** | **Location 2** | **Location 3** | **Location 4** | **Average** | **Reference** |
| | 300mm Above | | | | | | |
| | | **Location 1** | **Location 2** | **Location 3** | **Location 4** | **Average** | **Average/ Ref %** |
| | mm Above | | | | | | |
| | mm Above/ Below | | | | | | |
| | mm Above/ Below | | | | | | |
| | mm Above/ Below | | | | | | |
| | mm Below | | | | | | |

| | | | |
|---|---|---|---|
| Treatment Applied: | ❑ **Cold Galvanising** | ❑ **Sealer & Topcoat** | ❑ **Nil** |
| Dangerous Pole: | **Reported To:** …… | | |
| | **Time:** …… | | **Date:** …… |

Inspectors Name: ..... Signature: .....

**Contract Officer / Inspector's Recommendation:** Serviceable / Re-inspect / Reinstate / Replace

**Remarks:** .....

**Contract Officer / Inspector**:

Name: .....Signature: ..... Date: .....

# HEAD OF POLE ACTION SHEET

| | | |
|---|---|---|
| **To:** Contract Officer<br>Regional Contract Services<br>**Region:** ..... | Were defects found that may indicate replacement is required?<br>Tick ✓one box **YES** ☐ **NO** ☐ | **ORIGINAL** |

**Date:** ..... **Pole ID:** .....

**Address:**
House/Lot N°: .....
Street Name: .....
Suburb: .....

**Location sketch (show PT's, ABS's etc.):**

| **Pole Type:**✓ | Timber | ☐ Not Reinforced ☐ Nailed ☐ Composite ☐ Splinted | Other | ☐ Steel ☐ Concrete ☐ Composite |
|---|---|---|---|---|

**Internal inspection** (If required)

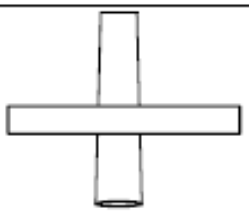
**Location of defect**

Below top of pole ..... mm

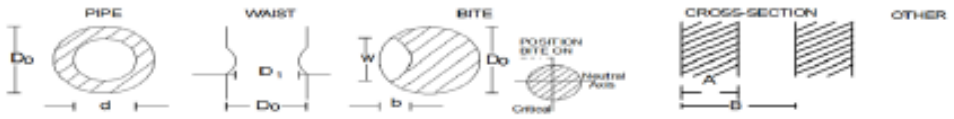
OR

Below lowest crossarm ..... mm

**Sketch of Defect (if required):**



**Results of All Strength Calculations**




| Axis (C/N) | Distance below Head of Pole | $D_o$ | A | B | $D_1$ - B | d | $D_1$ | W | b | S% |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | | | |
| | | | | | | | | | | |
| | | | | | | | | | | |

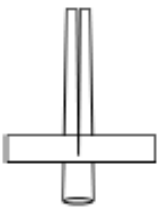
**Findings** ☐ Active termites ☐ Termite damage ☐ Fruiting bodies ☐ Knots ☐ Checks ☐ Splits ☐ Loose sapwood
Other: .....
.....

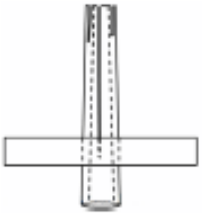
**Head of pole defect (Timber Pole)**

**NOTE**

If **All** boxes ticked in any column on the right then **Replacement Recommended**

| A **split** located at head of pole, **without** evidence of fungal decay or termite damage that: | A **split** located at head of pole, **with** evidence of fungal decay or termite damage that: | A **pipe** located at head of pole that: |
|---|---|---|
| ☐ extends across full diameter of the pole; | ☐ extends across full diameter of the pole; | ☐ pipe diameter ≥ half of pole diameter; |
| ☐ passes through the centre of the pole; | ☐ passes approximately through the centre of the pole | ☐ multiple splits that extend through the full width of the timber wall; |
| ☐ is in line with the axis of the attaching bolts; | ☐ Is roughly at right angle to the axis of the attachment bolts; | ☐ splits extend from the head to/beyond any attaching bolts. |
| ☐ extends to any attachment bolt aligned to the split; | ☐ extends a minimum of 300mm beyond any attachment bolt | |
| ☐ minimum 10mm wide at any point | ☐ minimum 10mm wide at any point | |





| **Recommendation:** ✓ | ☐ **Nil** (Pole is serviceable) | ☐ **Repair head of pole** | ☐ **Crop & cap** | ☐ **Replace pole** |
|---|---|---|---|---|

**Dangerous pole:** **Reported to:** ..... **Date:** ..... **Time:** .....

**Inspectors Name:** ..... **Signature:** ..... **Date:** .....

**Contract Officer Name:** ..... **Signature:** ..... **Date:** .....

**REMARK:** .....
.....

# Annexure X: (External Annexure) Private Poles in Ausgrid's Franchise Area

## X1 Private Poles

Annexure X is provided separate to this document and includes detailed information regarding private poles located in the Ausgrid supply area.