Network Standard

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NW000-S0053 NS128 POLE INSTALLATION AND REMOVAL



ISSUE

For issue to all Ausgrid and Accredited Service Providers' staff performing work associated with the handling, positioning, erection and removal of concrete, fibre cement, fibre plastic, steel and wood poles, and is for reference by field, technical and engineering staff.

Ausgrid maintains a copy of this and other Network Standards together with updates and amendments on www.ausgrid.com.au.

Where this Standard is issued as a controlled document replacing an earlier edition, remove and destroy the superseded document

DISCLAIMER

As Ausgrid's standards are subject to ongoing review, the information contained in this document may be amended by Ausgrid at any time. It is possible that conflict may exist between standard documents. In this event, the most recent standard shall prevail.

This document has been developed using information available from field and other sources and is suitable for most situations encountered in Ausgrid. Particular conditions, projects or localities may require special or different practices. It is the responsibility of the local manager, supervisor, assured quality contractor, accredited service provider and the individuals involved to make sure that a safe system of work is employed and that statutory requirements are met.

Ausgrid disclaims any and all liability to any person or persons for anything done or not done, as a result of this Standard.

All design work, and the associated supply of materials and equipment, must be undertaken in accordance with and consideration of relevant legislative and regulatory requirements, latest revision of Ausgrid's Network Standards and specifications and Australian Standards. Designs submitted shall be declared as fit for purpose. Where the designer wishes to include a variation to a Network Standard or an alternative material or equipment to that currently approved the designer must obtain authorisation from the Network Standard owner before incorporating the variation to a Network Standard or alternative material into a design. All designers including external designers authorised as Accredited Service Providers will seek approval through the approved process as outlined in NS181 Approval of Materials and Equipment and Network Standard Variations. Seeking approval will ensure Network Standards are appropriately updated and that a consistent interpretation of the legislative framework is employed.

Notes: 1. Compliance with this Network Standard does not automatically satisfy the requirements of a Designer Safety Report. The designer must comply with the provisions of the Workplace Health and Safety Regulation 2011 (NSW - Part 6.2 Duties of designer of structure and person who commissions construction work) which requires the designer to provide a written safety report to the person who commissioned the design. This report must be provided to Ausgrid in all instances, including where the design was commissioned by or on behalf of a person who proposes to connect premises to Ausgrid's network, and will form part of the Designer Safety Report which must also be presented to Ausgrid. Further information is provided in Network Standard (NS) 212 Integrated Support Requirements for Ausgrid Network Assets.

2. Where the procedural requirements of this document conflict with contestable project procedures, the contestable project procedures shall take precedent for the whole project or part thereof which is classified as contestable. Any external contact with Ausgrid for contestable works projects is to be made via the Ausgrid officer responsible for facilitating the contestable project. The Contestable Ausgrid officer will liaise with Ausgrid internal departments and specialists as necessary to fulfil the requirements of this standard. All other technical aspects of this document which are not procedural in nature shall apply to contestable works projects.

INTERPRETATION

In the event that any user of this Standard considers that any of its provisions is uncertain, ambiguous or otherwise in need of interpretation, the user should request Ausgrid to clarify the provision. Ausgrid's interpretation shall then apply as though it was included in the Standard, and is final and binding. No correspondence will be entered into with any person disputing the meaning of the provision published in the Standard or the accuracy of Ausgrid's interpretation.

KEYPOINTS

This standard has a summary of content labelled "KEYPOINTS FOR THIS STANDARD". The inclusion or omission of items in this summary does not signify any specific importance or criticality to the items described. It is meant to simply provide the reader with a quick assessment of some of the major issues addressed by the standard. To fully appreciate the content and the requirements of the standard it must be read in its entirety.

AMENDMENTS TO THIS STANDARD

Where there are changes to this standard from the previously approved version, any previous shading is removed and the newly affected paragraphs are shaded with a grey background. Where the document changes exceed 25% of the document content, any grey background in the document is to be removed and the following words should be shown below the title block on the right hand side of the page in bold and italic, for example, Supersedes – document details (for example, "Supersedes Document Type (Category) Document No. Amendment No.").

KEY POINTS OF THIS STANDARD

Scope and Risks Addressed

This standard describes the requirements relating to the handling, positioning, erection and removal of concrete, fibre cement, fibre plastic, steel and wood poles. It has the following scope:

- ☐ Applies to wood, concrete, fibre cement, fibre plastic and steel poles throughout Ausgrid's network.
- ☐ Wood poles used by Ausgrid since the 1990s have been CCA pressure impregnated treated.
- ☐ CCA treated poles have special handling and disposal conditions.
- ☐ Wood poles should not be installed in reclaimed land, landfill sites, wetlands or similar locations.
- ☐ Thin wall structures (steel, fibre cement, fibre plastic) have special handling requirements
- ☐ Secured poles now require double lashing to ensure safety and stability.
- ☐ All materials used are to be free of asbestos or asbestos related products.
- ☐ Materials used must be approved or sourced from Ausgrid.

Where to for more information?

Section 1, 2, 5

Handling, Marking and Disposal of Poles

These sections include the following requirements:

- ☐ Responsibilities for design, supply of materials and construction are identified
- ☐ All personnel handling, storing and transporting poles are required to be familiar with equipment requirements, storing methods and minimum number of bearing points, etc.
- ☐ CCA poles that have surface damage must be treated to restore the termite barrier.
- ☐ Concrete, fibre cement, fibre plastic and steel poles to be lifted using appropriate lifting slings.
- ☐ Marking arrangements for poles to show length, design load and other details.
- ☐ Disposal of poles must comply with environmental legislation.
- ☐ Safe handling methods apply to the potential release of chemical toxins for wood poles.
- ☐ Disposal through transfer of ownership must include a disclaimer ensuring that no claim, inference or recommendation applies that the pole is suitable for any intended end use.

Where to for more information?

Section 6, 7, 8, 9

Tools and Forms

Annexure A - C

Earthing, Sinking of Holes and Pole Erection

The following requirements are included:

- ☐ The type of earth plate or rod required is specified on the reference drawings.
- ☐ Explosives not to be used to excavate holes for pole foundations in the Sydney basin.
- ☐ Comply with SafeWork guidelines and Ausgrid requirements when working near underground assets
- ☐ Utilise a designated underground asset information provider service prior to any excavation work.
- ☐ Excavate by hand or use non-destructive digging methods to a minimum of 900mm for the bore hole or as required by designated underground asset information provider requirements where utility services or obstructions exist until mechanical equipment can be used safely.
- ☐ Pole sinking depths specified in NS220 Overhead Design Manual and AS7000 Overhead Line Design.
- ☐ All poles to be inspected for defects prior to erection.
- ☐ Observe minimum safe working distances when working near live exposed conductors.
- ☐ Raking and staying of poles subjected

Where to for more information?

Section 10, 11, 12

Tools and Forms

Annexure E - F

Removal of Poles and Securing Condemned Poles

The following requirements are included:

- ☐ Poles should generally be removed by pushing vertically from the ground using hydraulic jacks.
- ☐ A mobile crane or borer erector is used to hold the pole (not to assist the hydraulic jacking)
- ☐ Pole butts to be removed where possible or where necessary cut off at least 250mm below ground level.
- ☐ Work on free standing poles should be minimised and be undertaken using an EWP where possible.
- ☐ Wood poles with steel reinforcing nails attached require special considerations.
- ☐ Surfaces must be restored after pole removal.
- ☐ Barricades must be erected until surfaces restored.
- ☐ Condemned poles, conditionally serviceable or suspect poles must not be worked on unless secured appropriately.
- ☐ Several methods of securing poles are identified.

Where to for more information?

Section 13, 14, 15

Tools and Forms

Annexure G - I

Network Standard
NS128
Pole Installation and Removal

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1.0 PURPOSE

NS128 describes the requirements relating to the selection, handling, positioning, erection and removal of poles.

2.0 SCOPE

This network standard applies throughout the Ausgrid network including work on existing poles and poles that will become part of the Ausgrid network.

This network standard does not apply to poles on private property (Service poles). The Service and Installation Rules of New South Wales apply to Private poles.

3.0 REFERENCES

3.1 General

All work covered in this document shall conform to all relevant Legislation, Standards, Codes of Practice and Network Standards. Current Network Standards are available on Ausgrid's Internet site at www.ausgrid.com.au.

3.2 Ausgrid documents

- Ausgrid "Lifesaver" rules
- ASP Level 1 Authorisation Agreement
- Bush Fire Risk Management Plan
- Company Form (Governance) - Network Document Endorsement and Approval
- Company Procedure (Governance) - Network Document Endorsement and Approval
- Company Procedure (Network) - Production / Review of Network Standards
- Customer Installation Safety Plan
- Design Contract – Connection Assets
- Electrical Safety Rules
- Electricity Network Safety Management System Manual
- HS008-P0500 Excavation Work
- HS008-P0501 Excavation Work - Coversheet
- HS008-P0500 Excavation Work Approach Limits
- HS018-P0200 Lifting Operations
- HS018-P0200 Load Lift Study
- Model Standing Offer (MSO) – Standard Connection Services for Contestable ASP/1 Premises Connection no greater than 11kV
- NS104 Specification for Electrical Network Project Design Plans
- NS119 Public Lighting Design and Construction
- NS122 Pole Mounted Substation Site Selection and Construction
- NS145 Pole Inspection and Treatment
- NS146 Inspection Procedure for Working on Poles
- NS156 Working Near or Around Underground Cables
- NS167 Positioning of Poles and Lighting Columns
- NS174 Environmental Procedures
- NS174C Environmental Handbook for Construction and Maintenance Work
- NS179 Vegetation Management
- NS181 Approval of Materials and Equipment and Network Standard Variations
- NS209 Operating Cranes & Plant in Proximity to Overhead Power Lines
- NS212 Integrated Support Requirements for Ausgrid Network Assets
- NS220 Overhead Design Manual
- NS260 Sub-transmission Feeder Earthing Design
- Policies for Developments

- Public Electrical Safety Awareness Plan
- Public Lighting Management Plan
- Supply Policy - Electrical Standards (ES range of documentation) and NECF Connection documentation
- Tree Safety Management Plan

3.3 Other standards and documents

- AS/NZ1289 Soil Testing - Compaction on Density
- AS 1604.1 Specification for preservative treatment – Sawn and round timber
- AS/NZ1605 Methods for sampling & analysing Timber Preservative – treated timber
- AS 1720.2 Timber Structures – Part 2: Timber Properties
- AS/NZS 2878 Timber – Classification into strength groups
- AS 3566.2 Self-drilling screws for the building and construction industries Part 2: Corrosion resistance requirements
- AS 3818.11 Timber – Heavy Structural Products – Utility Poles
- AS/NZ 4065 Concrete Utility Services Poles
- AS/NZS 4491 Timber – Glossary of terms in timber related Standards
- AS/NS 4677 Steel Utility Service Poles
- AS 5604 Timber – Natural durability ratings
- AS/NZ 7000 Overhead line design
- AS/NZ 9000 Quality Management System
- AS/NZ 60300 Dependability Management
- ENA Doc 001-2019 National Electricity Network Safety Code
- ENA Doc 015–2006 National Guidelines for Prevention of Unauthorised Access to Electricity Infrastructure
- The Guide for Bush Fire Prone Land Mapping (NSW Rural Fire Services)
- ISSC 3 Guide for the Management of Vegetation in the Vicinity of Electricity Assets
- NENS 09 Guide for the Selection, Use & Maintenance of Personal Protective Equipment for Electrical Hazards
- Relevant Industry (including ENA NENS and ISSC documentation), SafeWork Guides and Codes of Practice
- Service and Installation Rules of New South Wales

3.4 Acts and regulations

- All pertinent Environmental Regulations and Acts.
- Electricity Consumer Safety Act 2004
- Electricity Supply Act 1995
- Electricity Supply (General) Regulation 2014 (NSW)
- Electricity Supply (Safety and Network Management) Regulation 2014 (NSW)
- Protection of Environment Operations Act 1997
- Protection of Environment Operations Regulations
- Work Health and Safety Act 2011 and Regulation 2017 (NSW)

4.0 DEFINITIONS

Refer to NS001 Glossary of Terms

5.0 INTRODUCTION

5.1 General

In general, Ausgrid uses the following types of poles:

- CCA treated timber poles
- Desapped Durable Species Timber Poles
- Steel poles
- Concrete poles
- Composite fibre poles (either a composite of glass fibre and cement or glass fibre and plastic).

All poles used on Ausgrid's network must be approved. Reference clause 6.0 and Ausgrid's Approved Materials List (AML) and NS181 Approval of Materials and Equipment and Network Standard Variations.

Non-conductive poles (i.e. poles other than steel or concrete) are generally to be used to support distribution circuits.

Ausgrid will only accept conductive pole installations (Concrete and steel poles) where earth potential rise risks are mitigated (Reference clause 6.2).

Generally, poles for transmission and sub-transmission circuits will be specified on an individual basis in accordance with design constraints and the requirements of this standard.

Desapped durable species timber poles were the most common pole used by Ausgrid pre-early 1990's. Almost all timber poles purchased since the early 1990's have been full length CCA pressure impregnated treated. Many desapped durable species timber poles can still be found in Ausgrid network but now they are generally only purchased for bushfire areas.

The following precautions must be observed when working with CCA treated poles:

- The handling, drilling and cutting of all CCA treated poles requires special consideration to ensure that the outer treated surface is not damaged.
- Burning CCA treated poles emit toxic arsenic and chromium laden smoke and ash. If you are not required in the area of operations, while burnt or burning material is being handled, stay out of the immediate area and up wind. In general, no employee or contractor is to handle or disturb burnt CCA treated material unless:
    - the burnt material must 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 personal protective equipment.
- Only appropriately trained workers should disturb CCA treated timber that is burning or has been burnt. However, all burnt or partially burnt CCA treated poles must be immediately reported to the Ausgrid Project Officer / Contract Officer / Customer Operations Officer to ensure appropriate action is taken (ie. containment / removal). For the handling of Burnt and Burning CCA treated timber poles refer to NS145 Pole Inspection and Treatment Procedures.

Precaution must be taken when drilling concrete, composite fibre cement, or composite fibre plastic (fibreglass) poles to reduce dust generation. Appropriate PPE must be worn.

Where no distinction has been made between wood, steel, fibre cement, fibre plastic or concrete poles by a subheading in this standard, the information contained under that heading is common to all types of poles.

Wood poles should not be installed in reclaimed land, landfill sites, wetlands or similar locations. Also, note the requirements of NS145, and consider the cost of pole inspection and maintenance when installing poles in difficult locations.

5.2 SafeWork - Code of Practice: Work near overhead power lines

Work on Ausgrid's electricity network assets where the work is carried out in accordance with the requirements of the Electricity Supply (Safety and Network Management) Regulation 2014 and the work is either:

- by or for an electricity network operator, or
- by an Accredited Service Provider, or
- by a telecommunications network operator who is excluded from this code of practice.

The SafeWork code of practice applies to work other than that listed above which is carried out near overhead power lines and associated electrical apparatus.

6.0 POLE SELECTION

All poles used on Ausgrid's network must be approved. For the purposes of the application of this standard an approved pole is a:

- Timber pole that has been passed by Ausgrid's timber inspector as meeting Ausgrid's specification.
- Composite fibre, concrete or steel pole that is listed on Ausgrid's approved materials list (AML).

Selection of the appropriate type of pole to be used on Ausgrid's network for any particular situation is to be made in accordance with the following sections. Refer to Annexure H for guidance on pole selection.

Each material has its advantages and disadvantages which are explored further in this chapter. The line designer should select the pole material which best fits the project need with due regard for all-of-life hazards including construction, commissioning, operations, maintenance, decommissioning and demolition/removal into the future as required as an integral part of safety-in-design. In addition, the whole-of-life costs must be assessed to determine the overall least cost option for implementation.

Regardless of the material selected, poles must be sized such that their strength always exceeds the applied mechanical load The use of an un-stayed higher strength pole is preferable to a lower strength pole that is stayed.

Note: 11kV two pole H-structures are not preferred. The use of an un-stayed single pole installation should be considered after a whole of life cost analysis is carried out to select a pole type/material.

While additional pole length may help achieve clearances from ground and between circuits, the designer should not increase pole length beyond what is reasonably required. Longer poles are more expensive to source, transport and erect, and more susceptible to lightning strikes. Also, they may make access to and operation of pole-top plant more difficult. For this reason, pole heights used for new designs shall be limited to the pole sizes in Ausgrid's current pole specifications.

6.1 Pole Placement

Pole positioning is to consider the risks associated with mechanical damage. Poles are **not** to be placed in a position where they may be damaged by moving vehicles. e.g. located close to the kerb where they are likely to be struck by heavy vehicles travelling on a road carriageway or moving in or out drive way access area.

6.2 Earth Potential Rise (EPR).

Generally, designs for new, substantially new or new sections of lines, should employ the same material type (conductive or non-conductive) throughout.

Conductive poles must not replace timber poles in lines that do not have an OHEW.

Where conductive poles replace timber poles in a line with an OHEW, earthing risks for all conductive pole installations must be managed in accordance with NS260.

6.3 Timber Poles

Timber poles can be used on Ausgrid's network where design pole loading requirements can be achieved.

Timber poles (CCA treated or untreated desapped durable species) are not to be used in the following situations:

- where access to a significant section(s) of the circumference of the base of the pole is restricted such that complete ground line inspection and treatment cannot be carried out, e.g. the pole is to support multiple UGOHs (more than 3 UGOHs of any type) or the pole is installed in close proximity to a wall or other structure.
- in locations where the pole being replaced have been defected due to termite activity and the termite activity has not been able to be stopped.
- in locations where the pesticides that Ausgrid uses to treat timber poles cannot be used e.g. environmentally sensitive areas, refer Ausgrid Environmental Guideline EG210 – Pesticides.
- in agricultural areas requiring certification or recertification for being pesticide free.
- as specified in clause 6.6 requiring a composite fibre pole.

Where a Timber pole is not to be used, a Composite Fibre Pole shall be installed. Refer clause 6.6.

At Ausgrid, the strength of a timber pole is specified in terms of its 'working strength'. To reference the 'ultimate strength' of a timber pole:

Timber pole 'Ultimate Strength' = 4 x Timber pole 'Working Strength'

For example, a 12kN timber pole has an unfactored 'ultimate strength' of 48kN. Refer to Network Standard NS 220 for applicable strength reduction factors.

In general, higher strength poles (8kN or 12kN) are used for terminations and line deviations, whereas lower strength poles (6kN) are used for intermediate in-line sites. Note: 4kN poles are no longer used. For poles supporting heavy plant such as pole substations, reclosers, or regulators refer to NS122 for details of pole working strength.

6.3.1 CCA treated timber poles

CCA-treated timber poles are currently the most commonly used material for distribution poles because of their cost effectiveness. They are the preferred pole type suitable for general use in distribution constructions (low voltage and/or high voltage up to and including 22kV).

CCA treated timber poles are suitable for general use where:

- The maintenance requirements of NS145 can be fully complied with.
- The pole is supporting distribution construction (Low voltage & High Voltage up to and including 22kV). Under special circumstances, 33kV distribution construction may be allowed with approval by Ausgrid.
- The pole is supporting sub-transmission or transmission construction (33kV and above) and the pole is to be located in an existing non-conductive pole designed line.
- Emergency replacement of damaged poles are required due to bush fire.

CCA treated poles are more prone to being ignited and sustaining burning once ignited, than the equivalent desapped durable species pole.

CCA treated timber poles shall not be installed in high bushfire risk areas. High bushfire risk areas are considered to be those with areas of forest, woodlands, heaths, forest wetlands or timber plantations. These areas are typically designated as a vegetation category 1 as per Rural Fire Service mapping (Refer to Annexure I for definitions). CCA treated timber poles may be suitable for use where planned installation of a pole is to occur in bushfire areas of lower risk, including vegetation category 2, 3 or buffer areas. The assessment of bushfire risk can be determined at an individual location with the vegetation category mapping used as a guide to aid in assessment.

Table 1 General timber pole length information

Length	Typical Application
9.5m	Cross-street service poles-(Restricted future use permitted – See Note 2)
10m	Stay poles
11m	LV poles
12.5m	11kV or 22kV poles
14m	HV UGOH poles
17m	Sub-transmission poles

Notes:

1. Table 1 is intended as a general guideline only. Designers need to choose pole lengths to suit the topography, number of circuits (initial and future), type of pole-top construction, cable attachment height, street light mounting requirements, embedment depth etc.
2. Where a cross-street service is required for the safe connection of a service to a customer's premises, customers should provide a suitable connection point (e.g. a pole) on their premises. Refer to Section 7.4 of NS124 for more information. Cross-street service poles may be used where:

- existing cross-street poles require replacement
- the customer refuses to put in a private pole, the work is not funded by the customer (in accordance with the Service and Installation Rules of NSW) and all efforts have been exhausted to achieve clearances by other means such as terminating the service higher on the line pole
- vegetation is avoided (minimising vegetation maintenance); or
- cross-property issues are avoided.

6.3.2 Desapped Durable Species Timber Poles

Desapped durable species timber poles are untreated i.e. they are not full-length preservative treated with any chemical preservative.

Desapped durable species timber poles can be used where for technical reasons, a CCA pole is not appropriate.

Such situations include but are not limited to:

- planned work in designated bushfire hazard areas;
- narrow footpaths where a smaller diameter pole is necessary;
- for urban sub-transmission constructions (33kV and above).
- situations where poles need to meet the requirements of other authorities (e.g. railway crossings).

All use of desapped durable species poles in situations other than those listed above are to by exception and review by use of the NS181 variation request mechanism.

6.4 Steel poles

Steel poles can be used on Ausgrid's network where timber poles have technical constraints. As with concrete poles, steel poles can be used to manage high mechanical loads without the use of stays, and they also provide for an easy-to-install interface with driven piles or ragbolt footings. Compared with concrete poles, steel poles are lighter and can support a higher sustained load than a concrete pole with equivalent rating. Consideration should also be given to the potential for poles to be made of multiple sections/pieces and benefits that may be derived in site access and construction.

Steel poles can be used in areas with difficult access, for example, water-only or air-only access, locations too restrictive to allow the use of mobile plant (hand installations), or for locations where expensive access track work is required for delivering and installing heavier poles like timber or concrete.

The strength of a steel pole is specified in terms of its 'ultimate strength'. In general, higher strength poles (80kN or above) are used for terminations, mid-strength poles (40kN or 60kN) are used for large line deviations, and lower strength poles (24kN or 32kN ultimate strength) are used for intermediate situations.

Steel poles are conductive and their use is to comply with the requirements of clause 6.2.

Steel poles are not to be used in areas where the soil is, or may become, acid sulphate.

In addition, steel poles should be considered for use where there is a difficult access issue to overcome such as a situation where the construction (lower weight or multiple piece) of the steel pole enables:

- reduced handling risk (e.g. For hand stand situations)
- reduced cost (e.g. reduction in Helicopter install costs or potential to use alternatives to helicopters).

6.5 Concrete poles

Concrete poles can be used on Ausgrid's network where timber poles have technical constraints. They can be used to manage high mechanical loads without the use of stays, and they provide for an easy-to-install interface with driven piles or ragbolt footings.

The strength of a concrete pole is specified in terms of its 'ultimate strength'. In general, higher strength poles (80kN or above) are used for terminations, mid-strength poles (40kN or 60kN) are used for large line deviations, and lower strength poles (24kN or 32kN ultimate strength) are used for intermediate situations.

Concrete poles are conductive, and their use is to comply with the requirements of clause 6.2.

Concrete poles may be used in areas where the soil is, or may become, acid sulphate with control methods recommended by the manufacturer.

6.6 Composite fibre poles

Composite fibre poles can be used on Ausgrid's network where Ausgrid's wood pole maintenance activities cannot be complied with. Composite fibre poles are non-conductive.

In addition, composite fibre poles should be considered for use where there is a difficult access issue to overcome such as a situation where the construction (lower weight) of the composite pole enables:

- reduced handling risk (e.g. for hand stand situations)
- reduced cost (e.g. reduction in Helicopter install costs or potential to use alternatives to helicopters).

Consideration should be given to the potential for poles to be made of multiple sections/pieces and benefits that may be derived in construction.

The type of composite fibre pole is to be chosen based on clauses 6.6.1 & 6.6.2.

These poles have two basic types:

- Composite fibre-reinforced (polymer modified) cement; and
- Glass fibre-reinforced plastic resin ("fibreglass")

6.6.1 Fibre reinforced cement poles

Fibre reinforced-cement poles (FRCP) can be used on Ausgrid's network.

The strength of a pole is specified in terms of its 'ultimate strength'. In general, a 24kN pole is used for a termination, substation, equipment and a 16kN pole is used for an intermediate line situation.

FRCP are to be used:

- where the maintenance requirements of NS145 cannot be fully carried out such as when:
    - accessing the exterior of the pole for inspections is severely limited due to multiple UGOHs (3 or more), partial coverage of pole by adjacent concrete structures or a combination of similar issues;
    - the use of pesticides for treatment is not an option due to environmental restrictions;
- a pole is being replaced due to termite activity and the termite activity has not been able to be stopped.
- in marine environments or land subject to inundation;
- in bushfire prone areas (Vegetation Category 1 only);
- where the expected installation cost for a FRCP is equivalent to or less than a timber pole.

FRCP should be considered for use where delivering and installing heavier poles like timber or concrete is problematic:

- difficult access issues such as water-only, air-only access or access track transportation constraints;
- locations too restrictive to allow the use of mobile plant (hand installations such as laneways and private land).

Note: The fibre-reinforced cement poles specified and used by Ausgrid pass the required bushfire tests and are suitable for use in all bushfire prone areas.

6.6.2 Fibreglass reinforced pole

A lightweight pole option is the fibreglass-reinforced pole (FRP). Similarly, for FRCP, where approved, Fibreglass reinforced poles can be used on Ausgrid's network for areas with difficult access or locations too restrictive to allow the use of mobile plant.

Approved fibreglass reinforced poles have passed modified bushfire testing and are not to be used in category 1 bushfire areas. Their use is restricted to category 2, category 3 and all buffer zones. (The categories and buffer zones are as defined in the NSW Rural Fire Service publication 'The Guide for Bush Fire Prone Land Mapping') They are non-conductive, eliminating step and touch potential issues. They are the lightest of all the poles used by Ausgrid however their longevity is highly dependent on the protective outer coatings. The use of fibreglass reinforced poles is restricted to applications where hand-standing is necessary and in particular where the use of glass fibre-reinforced cement poles is not appropriate

The strength of an FRP is specified in terms of its 'ultimate strength'. In general, a 24kN FRP is used for a termination and a 16kN pole is used for an intermediate line situation.

7.0 POLE HANDLING PRECAUTIONS

7.1 Asbestos

All materials and equipment used for construction of Ausgrid's assets are to be free from Asbestos and or Asbestos related products. Suppliers are expected to comply with the Work Health and Safety Act 2011 (NSW) together with the Work Health and Safety Regulation 2017 (NSW) and confirm in writing that all products supplied to Ausgrid contain no Asbestos related material.

7.2 Handling, storing or transporting poles

All poles must be unloaded at the site under controlled conditions using a pole loader (generally only suitable for timber poles) or a crane (suitable for any pole type). In extreme circumstances where a pole loader or a crane cannot be used a risk analysis approach utilising Ausgrid's safety management risk assessment process should be followed, ensuring the safety of all workers and that there is no damage to the pole.

Handling and transporting methods used for poles must manage the following issues:

- Protection of workers from risks associated with; moving plant and loads, contact with live electrical network infrastructure and vehicle movement
- Licencing, qualifications, training and competence for plant operators and persons slinging loads
- Use of appropriate and compliant plant and equipment
- Compliance to Road Transport Regulations with regard maximum vehicle, load dimensions and any required permits or signage
- Prevention of damage to poles
- Prevention of damage to adjacent property or network infrastructure
- Compliance with the relevant pole manufacturers requirements for transport and handling
- Compliance with the National Transport Commission and Roads & Transport Authority of NSW – Load Restraint Guide
- Safe transport of fire damaged CCA poles reference clause 6.3 for additional information
- Prevention of the obstruction of access to driveways
- Prevention of the creation of hazards for pedestrians or road users.

All personnel handling, storing or transporting poles, including Accredited Service Provider's will be required to be familiar with the details of preferred lifting and handling techniques, including any special equipment required, recommended storing methods, the minimum number of bearing points for each particular type of pole (for transporting and storage) and the minimum dimension recommended for each bearer, together with the maximum unsupported overhang permitted during transportation.

Note: Do not use "scissor grips" when handling poles.

7.2.1 Slinging/lifting poles

Slinging/lifting poles must be carried out using methods not to damage the pole.

All reasonable precautions/controls identified in the pre-work risk assessment processes need to be taken with the slinging/lifting work associated with the installation, removal and correcting alignment of poles.

Note: When a Crane is taking the strain of the load there must be NO hand contact with the slings or chains e.g. when rotating a pole using a sling/chain.

7.3 Wood poles

If a CCA treated pole is damaged in a way that involves significant loss of the chemical barrier, appropriate action as detailed in clause 12.1 must be undertaken. For Ausgrid works, the Ausgrid Project Officer, or for contestable work, Ausgrid's Compliance Officer must be advised as to the extent of the damage.

Standard leather gloves must be worn when handling CCA treated poles. When drilling holes for a kingbolt, or mounting a street-lighting bracket, additional eye and airway protection is required in the form of safety glasses and disposable half-face particulate filter respirators.

For the handling of fire-damage and burning CCA treated timber poles refer to NS145 Pole Inspection and Treatment Procedures. Ausgrid's staff can find additional information in NEG-SE09 Management of CCA Impregnated Wood - Including Burning/Fire-Damaged CCA Poles).

7.4 Concrete poles

Concrete poles are very heavy structures and safe lifting and handling of these poles must be carried out in accordance with manufacturers' instructions.

Lifting tubes are provided on concrete poles sections. Drawings/details of lifting bars, lifting bar assembly and lifting procedures are available from the manufacturer upon request.

Information on inspection and treatment of concrete poles refer to clause 12.2.2.

7.5 Steel poles

Steel poles are thin walled structures, and as such are highly susceptible to being damaged from excessive wall pressure. Therefore, care must be exercised during handling as these poles are not solid and cannot be handled like timber poles.

Appropriate lifting slings should be used when handling a steel pole such as Pole Strop slings or synthetic slings so as not to damage the outer surface and reduce the protective coating. Lifting clamps can be used for lifting streetlight standards supplied with an attached outreach.

Information on inspection and treatment of steel poles refer to clause 12.2.3.

7.6 Composite fibre poles

Composite fibre poles are thin walled structures, and as such are highly susceptible to being damaged from excessive wall pressure. Therefore, care must be exercised during handling as these poles are not solid and cannot be handled like timber poles

Appropriate lifting slings should be used when handling composite fibre poles such as synthetic slings so as not to damage the outer surface.

For information on pre-installation inspection and treatment of composite fibre poles refer to clause 12.2.4 .

8.0 MARKING OF POLES

8.1 Wood poles

Wood poles are identified in two ways:

- With an aluminium disc fixed 4 metres from the pole butt which gives the length, design load (kN rating), timber species, treatment type, treatment date;
- With the length, design load and timber-type painted on the butt by the supplier. The colour of the paint denotes the supplier.

For wood poles greater than 20 metres in length, the location of the aluminium disc will be specified.

Note: Ausgrid still have some older poles with no disc and other poles installed between 2015 and 2020 with the disc located 2 metres above the nominal ground line.

Ausgrid's Timber Inspector or deputy will stamp the pole butt with the initials "AG" if the pole is acceptable.

8.2 Concrete poles

The permanent marking must be impressed on a metal plate affixed to the pole to the requirements of clause 1.6 of AS 4065. The plate, plaque or indentations will appear on the 0 degree axis on the pole at a point 1.5 metres above the nominated embedment depth of the pole unless otherwise specified. A depth indication mark representing a ground line reference mark will be provided at an Ausgrid specified distance from the pole head.

The required information to be provided on the plate will include, name of the manufacturer, location of plant, year and month of manufacture, pole length (m), ultimate strength (kN), pole mass (kg), serial number, Purchaser's name and pole code.

8.3 Steel poles

All steel poles will have a permanent marking impressed on a metal plate affixed to each pole section which will include the mass for that section to the requirements of clause 1.6 of AS 4677 or an equivalent to the satisfaction of Ausgrid. The most critical pole marker will appear at a height between 0.8m and 2m above ground level, which should indicate other separable sections as well as details of its own section. Because the ground level can vary from pole to pole, Ausgrid will nominate a distance from the pole tip for the nameplate to be installed. The required information to be provided on the plate will include, name of the manufacturer, year of manufacture, length (m), mass (kg) of pole, load capacity (kN), and identification reference number.

All nameplates should remain visible and legible for the intended life of the pole and should have reasonable resistance to vandalism and removal.

Poles to be direct buried, are to be provided with a depth indication mark welded into the pole.

8.4 Fibre reinforced cement poles

All fibre cement line poles will have a metal plate affixed to each pole 2 metres above the nominal ground line and one on the butt. Pole Transformer & Equipment poles will have an additional red mark on the butt. The required information to be provided on the plate will include, name of the manufacturer, month/year of manufacture, length (m), mass (kg) of pole, load capacity (kN) and identification reference number.

All nameplates should remain visible and legible for the intended life of the pole and should have reasonable resistance to vandalism and removal.

8.5 Fibreglass reinforced poles

All fibreglass reinforced poles should have an aluminium ID tag affixed to each pole 2 metres above the nominal ground line. The required information to be provided on the ID tag will include, name of the manufacturer, month/year of manufacture, length (m), mass (kg) of pole, load capacity (kN), class and identification reference number. When a series of modular pole sections is being

supplied to meet a specific pole length and class each module will be identified with pertinent information including module number, production serial number and module mass.

A pole marker may appear at a height 0.91 metre above ground level for existing composite poles.

All nameplates should remain visible and legible for the intended life of the pole and should have reasonable resistance to vandalism and removal.

9.0 DISPOSAL OF POLES

Disposal of poles should comply with the Protection of Environment Operations Act and Regulations, and Work Health and Safety Regulations, and any current guidelines relevant to the activities involved.

The disposal of poles must be in accordance with Ausgrid's any Ausgrid requirements NS174 Environment Procedures, e.g. EG 120 Waste and Waste database. If additional information is required, please contact Ausgrid's Environmental Services.

The disposal of poles including transfer of ownership by sale or donation is organised by the Warehouse and Distribution Management.

Refer to NS146 for handling, removal and disposal of used Bioguard bandages.

10.0 EARTHING

The type of earth plate or rod will be specified on the reference drawings.

IMPORTANT: All conductive poles must be earthed.

11.0 SINKING OF HOLES

11.1 General

When working near underground assets comply with SafeWork Guideline to Work near Underground Assets and all Ausgrid requirements (e.g. HS008-P0500 Excavation Work, NS156 Working Near or Around Underground Cables).

Maximum use should be made of the mechanical plant available for sinking holes for poles. However, hand excavation or non-destructive digging must be used to a minimum depth of 900mm or as per the designated underground asset information provider requirements where utility services or obstructions exist; until it is clear that mechanical boring equipment can be safely employed.

Ausgrid personnel shall complete the HS008-P0501 excavation coversheet prior to commencing excavation work and have a copy of HS008-P0500 Excavation Work Approach Limits for persons and machines for reference onsite.

In paved or concreted surfaces or where poles have been concreted in, a rectangular area of 300mm from the pole which extends down to a depth of no less than 350mm below ground level is to be maintained free from concrete or pavers to facilitate inspections.

11.2 Rock excavation

Explosives are not used in the Sydney Basin to excavate for pole foundation.

Where rock is encountered, and excavation is difficult, and the borer is inadequate to cut the required hole, a vertical borer or a specialist contractor may be used. Outside the Sydney Basin where there is no other option a specialist contractor may consider using explosives to excavate difficult rock.

11.3 Utility services and obstructions

Be aware of the possibility of underground pipes, cables etc, belonging not only to Ausgrid but also to other utilities. Before digging into unknown ground, it is essential to positively identify the location of any underground services in the vicinity.

To determine if underground service assets exist in a particular location, contact the designated underground asset information provider. This is a free service, providing information on which utility has an interest in a particular location and the relevant contact details.

In all locations in Ausgrid's network franchise area the requirements of NS156 apply for routine/urgent/emergency pole hole sinking. When plans are not able to be sourced via a designated underground asset information provider enquiry, they are to be obtained directly from the asset owner, or other precautions taken to determine the presence of underground assets.

Where doubt exists as to the presence and location of obstructions, pipes, or cables, pre-digging should be carried out by hand digging or by other non-destructive digging methods to a depth of at least 900 mm, or until rock or shale is encountered.

Prior to the use of the mechanical borer do a final electronic scan of the sides and bottom of the bore hole with an electronic cable scanner where depth permits to assist in identifying any previously unidentified/detected services.

Before boring, check all the necessary utilities' underground construction plans, to identify where the underground construction is located, before hole sinking begins.

Whilst sinking the bore hole, an observer must be in place, checking for signs of underground assets each time the borer screw is lifted from the hole.

11.4 Pole sinking depths

Please refer to NS220, Overhead Design Manual and AS/NZS 7000, Overhead Line Design – Detailed Procedures.

11.4.1 Street lighting poles

In general, Ausgrid streetlights should be direct buried to minimise costs (e.g. installation and maintenance costs). In new subdivision developments (e.g. Greenfield sites) the preferred method shall be the rag-bolt mounted type. For additional information refer NS119 Street Lighting Design and Construction (e.g. rag-bolt foundation construction requirements – Drawing No 514087 Standard Construction Street Light Column Pile Footing Details).

12.0 POLE ERECTION

12.1 General

All pole positions shall be pegged prior to commencement of hole boring using Global Positioning System (GPS). If pole positions are found to be too close to underground services to allow safe excavation and alternative locations are suitable, then the pole position shall be relocated in consultation with the designer (not at the discretion of the hole borer), and the design amended.

12.2 Pre-installation inspection and treatment

12.2.1 Wood pole

Should there be damage of the sapwood which is impregnated with a chemical barrier or large pole butts that require trimming such as to expose untreated timber in the "below ground - line " section, then special treatment of the exposed area will be required. Exposed areas on CCA treated poles will be treated by hand painting with a preservative surface - treatment compound (copper naphthenate oil - CN timber oil).

12.2.2 Concrete pole

All concrete poles will be inspected and found to be free from any defects such as transport damage or surface cracks, honeycombing. Depressions or bulges must not exceed 2 mm in height or depth provided that the maximum cover is maintained, and the depressions or bulges do not exceed in any direction for more than 100 mm.

Drilling, cutting or grinding of a concrete pole will not be permitted unless specifically approved by a designated Ausgrid representative who is in attendance during the procedure.

12.2.3 Steel pole

All steel poles will be inspected and found to be free from any defects such as general transport damage, dents, surface cracks or coating defects.

Any steel pole that has suffered a dent is not to be used as its strength has been compromised.

Should there be damage to the galvanised coating of the pole the exposed area will be treated by hand painting with GALMET, Zinga or equivalent.

Steel poles can have epoxy mastic paint coverage or an insulated cover in the groundline region and great care should be taken not to damage the coating/cover.

Drilling, cutting, grinding or repairing by welding of a steel pole will not be permitted unless specifically approved by a designated Ausgrid representative who is in attendance during the procedure.

12.2.4 Composite fibre pole

All fibre cement poles will be inspected and found to be free from any defects such as general transport damage, dents, surface cracks or defects.

Damage to the exterior coating of fibreglass poles where this coating is breached must be repaired in accordance with the manufacturer’s instructions.

Damage to composite fibre cement poles is to be repaired in accordance with the manufacturer’s instructions.

Drilling of composite fibre poles is to be done in accordance with the manufacturer’s instructions.

Drilling of fibre plastic poles must be pre-approved by Ausgrid.

12.3 Erecting / Removing poles or columns in proximity to mains

12.3.1 Minimum safe distances for working near overhead power lines

The minimum safe working distances (MSWD) are distances which must be maintained by people, and their tools and equipment, when they are near live exposed conductors. Work on or near

Ausgrid's mains and apparatus may only be carried out in accordance with the Ausgrid's Electrical Safety Rules (ESR).

12.4 Raking and staying of poles with unbalanced loads

A pole which is to be subjected to a resultant horizontal force (e.g. angle or termination pole) should be raked (not more than 2 heads) so that the resultant force tends to pull the pole to the vertical. The finished (loaded) position of a pole is to remain within 10 degrees of vertical for the service life of the pole (assuming no static loading or foundation alterations).

A pole which is to be subjected to unbalanced loads which would exceed the permissible design load limits of the pole must be stayed in accordance with Ausgrid drawing standard designs, prior to attaching the unbalanced loads to the pole. If a concrete, fibre cement, fibre plastic or steel pole is used, this must be reported to Ausgrid in advance, so that any additional precautions to protect the pole from damage by the stay wire can be determined.

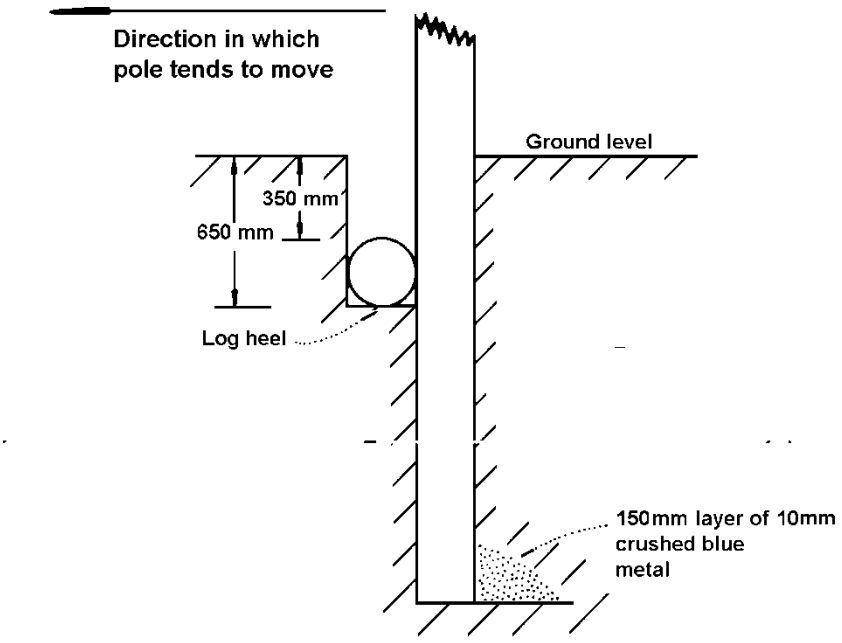
12.5 Footing strength

All pole foundations are to be designed in accordance with NS220. For lines designed to a standard pre-dating AS7000-2010 poles sunk to Ausgrid's standard sinking depth will have adequate footing strength for working loads in medium bearing strength soils (300kPa). Where existing pole loads are being modified, attempts must be made to ensure that the foundation strength of existing poles is adequate for the intended loads in accordance with NS220.

To achieve the intended design footing strength, poles must be backfilled in accordance with Clause 12.5 to ensure pole stability. Concrete must not be used as a substitute for poor pole stabilisation practises as it will hinder the routine pole inspection work and the ability to install a nail to increase the pole strength if required in the future.

12.6 Baulking

The figure below shows baulking using a log heel and a stone toe. This is provided as there are some legacy installations where baulking may have been used. Baulking should be considered only where other options are impractical, and it must be designed by a suitably qualified civil/structural engineer.



Baulking

12.7 Concreting butt

Concreting of direct buried pole foundations shall extend from the butt to a point 350 mm below final ground line. Poles must not be concreted to ground level. Concrete shall not be used for timber pole foundations.

Except in special circumstances poles will not be concreted in rock. Where an obstruction (e.g. water pipe) is also close to the butt of a pole, the obstruction shall be shielded from concrete encasement by a suitable barrier.

12.8 Vegetation clearing

Designers who design new overhead lines and poles must comply with the requirements of the Industry Safety Steering Committee document ISSC 3 – Guideline for Managing Vegetation Near Power Lines and NS179 Vegetation Management.

All new or replacement pole activity must not be carried out if it does not comply with the vegetation clearances requirements of ISSC3 and NS179. All potential vegetation clearance encroachments and appropriate mitigation are to be identified as part of the design activity. The mitigation measures for all vegetation encroachments caused as a result of the placement of a new of replacement pole are to be determined in part by appropriate consultation and the costs for all vegetation works included in the design costing.

This includes complying with the vegetation clearances to the power lines which are attached to these poles.

Vegetation clearance work must be carried out in accordance with Ausgrid's Electrical Safety Rules.

12.9 Restoration of surfaces after installation of poles

Ground surfaces which have been disturbed during excavation of pole holes and during installation of poles must be restored in accordance with this clause. This clause applies to the final backfill top-up and surface restoration after the pole hole has been backfilled in accordance clause 12.5, where applicable. All spoil that needs to be removed from the site shall be managed as per NS174C Environmental Procedures – Environmental Handbook for construction and maintenance.

Methods adopted for backfilling and restoring excavated areas around poles must achieve a clean and tidy result. This will reduce the number of customer complaints. Any complaint about the condition of a site must be attended within 24 hours of notification. If work has been performed by an Accredited Service Provider, the costs incurred in rectifying any complaint are to be borne by the Accredited Service Provider.

12.10 Back filling

To ensure the stability of erected poles, approved type back filling is to be used as nominated on the standard construction footing arrangement drawings.

The following drawings are to be referenced for construction and included within design plans for construction:

- Timber Pole Footing Arrangement drawing 508726 Arrangement 1/2/3
- Concrete Pole Footing Arrangement drawing 512331 Arrangement 1/2/3/4
- Steel Pole Footing Arrangement drawing 178123 Arrangement 1/2/3/4
- Composite Fibre (Titan) Footing Arrangement drawing 248464 Arrangement 1/2/3/4.

The pole is to be installed with the backfill type and depth nominated in the construction schedule. For as built certification, a pole and pillar data capture sheet are to be completed.

12.10.1 Timber poles

Timber poles shall be backfilled with one of the following methods based on construction type and design constraints;

1. Site spoil – for poles with no/minimal sustained loads such as intermediate, strain (as long as there is no unbalanced tension at time of installation) or 4-way poles. Site spoil may be used if suitable to achieve required compaction. If it is deemed unsuitable, select aggregate or cement stabilised backfill is to be used. Compaction shall be in accordance with clause 12.5.3.
2. Select Aggregate – for poles with minimal sustained loads such as stayed angles, terminations, tee-offs, etc. Backfill and compaction shall be in accordance with clause 12.5.3.
3. Cement stabilised – only to be used for poles with significant sustained loads such as unstayed angles, terminations, tee-offs, etc. where an appropriate foundation cannot be achieved by utilising a pole one size larger with additional embedment depth. Backfill and compaction shall be in accordance with clause 12.5.3. Cement stabilised backfill shall not be used for a pole to be located in a narrow footway (i.e. a footway less than 2m in width).

Note: Cement stabilised backfill is not concrete. Concrete backfill must not be used for wooden poles.

12.10.2 Concrete, steel & composite fibre poles

Concrete, steel and composite fibre poles shall be backfilled with one of the following methods based on the construction type and design constraints;

1. Site spoil – for poles with no/minimal sustained loads such as intermediate, strain (as long as there is no unbalanced tension at time of installation) or 4-way poles. Site spoil may be used if suitable to achieve required compaction. If it is deemed unsuitable, select aggregate or cement stabilised backfill is to be used. Compaction shall be in accordance with clause 12.5.3.
2. Select Aggregate – for poles with minimal sustained loads such as stayed angles, terminations, tee-offs, etc. Backfill and compaction shall be in accordance with clause 12.5.3.
3. Cement stabilised – for poles with significant sustained loads such as unstayed angles, terminations, tee-offs, etc. Backfill and compaction shall be in accordance with clause 12.5.3.

12.10.3 Foundation material and compaction requirements

The compaction level for the site spoil, select aggregate or cement stabilised backfill is to be 98% of Standard Compaction, within 1-2% optimum moisture content. Refer to AS 1289 Method of testing soils for engineering purposes (Soil compaction and density tests). For typical application of this, the following compaction specifications must be used.

Site spoils

Site spoil should only be used if suitable to achieve required compaction. If it is deemed unsuitable, select aggregate or cement stabilised backfill is to be used. Backfill is to be ram compacted every 150 mm thick to ground line and shall fill the hole.

The area between 350 mm below ground level to the actual ground level should be filled with clean stone-free sandy loam type soil to facilitate future inspections and avoid conditions for accelerated decay within the critical zone (timber poles only). The sandy loam is to be tamped down and sloped away from the pole that finished level at the pole is min 20 mm above the surrounding general ground level.

Cement stabilised backfill

Cement stabilised backfill shall be a blend of 3% by volume GB cement (60% cement, 40% flyash) thoroughly mixed with the spoil or imported material. The aim is to achieve a minimum unconfined compression strength of 1MPa at 3 days.

Backfill is to be ram compacted every 150 mm thick to 350 mm below ground line.

The area between 350 mm below ground level to the actual ground level should be filled with clean stone-free sandy loam type soil to facilitate future inspections and avoid conditions for accelerated

decay within the critical zone (timber poles only). The sandy loam is to be tamped down and sloped away from the pole that finished level at the pole is min 20 mm above the surrounding general ground level.

Select aggregate

For select aggregate, the hole is to be back filled with DGS-20 Roadbase or other approved type of back filling supplied in accordance with RMS specification 3051-DGS-20. A well graded maximum size 20 mm aggregate is to be used.

Backfill is to be ram compacted every 150 mm thick to 350 mm below ground line.

The area between 350 mm below ground level to the actual ground level should be filled with clean stone-free sandy loam type soil to facilitate future inspections and avoid conditions for accelerated decay within the critical zone (timber poles only). The sandy loam is to be tamped down and sloped away from the pole that finished level at the pole is min 20 mm above the surrounding general ground level.

Concrete backfill

Concrete backfill shall be minimum 20MPa GP concrete with maximum 10 mm aggregate and a slump of 80-120 mm.

The concrete shall be mechanically vibrated in maximum 400 mm lifts. Vibration should continue to the point where water is just starting to rise through the surface.

The area between 350 mm below ground level to the actual ground level should be filled with clean stone-free sandy loam type soil to facilitate future. The sandy loam is to be tamped down and sloped away from the pole that finished level at the pole is min 20 mm above the surrounding general ground level.

Where an obstruction (e.g. water pipe) is also close to the butt of a pole, the obstruction shall be shielded from concrete encasement by a suitable barrier.

12.10.4 Paved areas

Any concrete or decorative paving must terminate a minimum of 300 mm from the face of a timber pole, to facilitate pole inspection and maintenance.

In paved areas, the depression around the pole is to be restored firstly with approved backfill material complying with clause 12.5. Stones and vegetation must be removed from the backfill material. The backfill material is to be firmly tamped with a suitable tool so that it finishes approximately 50 mm below the level of the pavement. All excess backfill material is to be cleaned from the surface of the pole and from the edges of the surrounding paving.

Where the pavement is paving tiles, the tiles are to be cut as required and placed to fit neatly around the pole. The tiles are to be laid on a sand bed and the finished surface is to join level with the surrounding undisturbed paving tiles and be slightly higher at the pole. Any small gaps between the paving tiles are to be filled with sand.

Where the paved surface is other than paving tiles, the top surface of the inspection area around the pole is to be reinstated with cold bituminous pre-mix material. The bituminous pre-mix material is to be tamped down and sloped away from the pole so that the finished level at the pole is 20 mm above the surrounding pavement level. The bituminous pre-mix material is to be finished slightly above the level of the surrounding paving to allow for settling, but not to the extent that a trip hazard would be created. The work area is to be cleaned with a broom and all surplus material is to be removed from the site.

The reinstatement of paved areas is to be completed as detailed above within 24 hours of the installation being carried out.

Permanent restoration of the affected paved areas will also be in accordance with the requirements of the local road authority.

Part of the work performed by an *Accredited Service Provider* includes the permanent reinstatement and restoration of the paved areas.

12.10.5 Equipotential earthing pad

Where conductive poles are to be replaced, it is necessary to determine whether an equipotential concrete earthing pad needs to be installed at the base of the pole. These pads shall be installed in accordance with the Ausgrid approved earthing design. Refer standard drawing 183192.

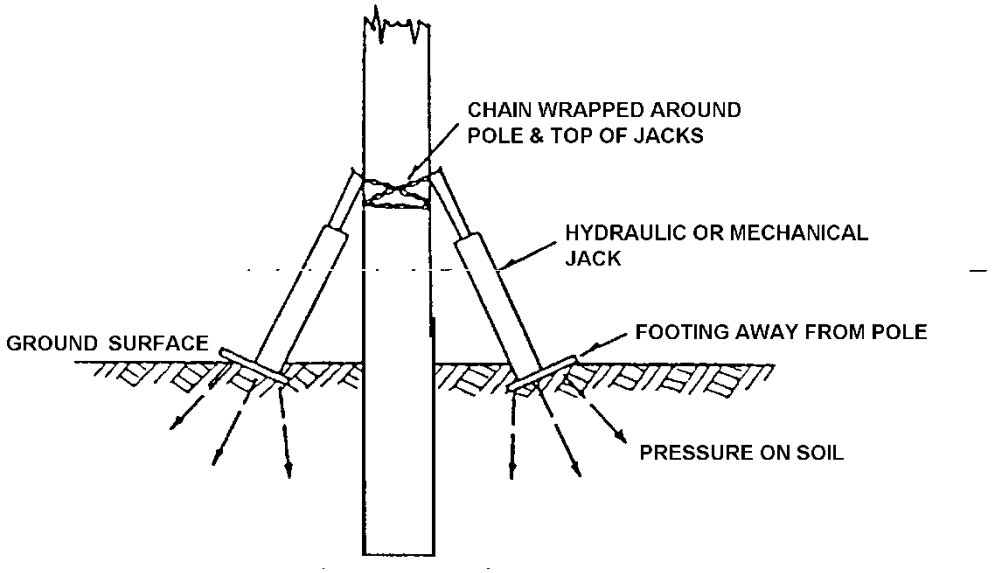
13.0 REMOVAL OF POLES

13.1 General

When a pole is to be removed, it should be "pushed" from the ground by two hydraulic extraction jacks or similar process, while a mobile crane or borer erector vehicle is attached at or just above the point of balance. Two jacks, installed diametrically opposite, are used to ensure that the pole emerges vertically out of the ground and can be easily lifted directly onto a pole jinker. The mobile crane or borer erector vehicle must not attempt to assist the hydraulic jacks in the removal of the pole. The mobile crane or borer erector vehicle function is to steady the pole and receive it after extraction from the ground.

Note: Mobile cranes are not permitted to pull against unknown extraction forces. Borers shall not be used to extract poles via slew/jib actions.

Before extracting an older pole whose butt has been concreted, a check should be made for possible underground utility construction close to the pole. Damage to pipes or cables will result if they are encased in concrete and pulled up with the pole butt.



Correct Use of Hydraulic Jacks

13.2 Removal of pole butts

All pole butts shall be removed where practicable. When removal of the butt is not practicable (e.g. a pole concreted in rock) the butt is to be cut off not less than 250 mm below ground level. If the butt is infested with termites, Ausgrid Contract Operations (telephone: (02) 9410 5466) is to be notified so a suitable treatment can be carried out.

13.2.1 Unpaved areas

In unpaved areas, the depression around the pole is to be restored firstly with approved backfill material complying with clause 12.5. Stones and vegetation must be removed from the backfill

material. The backfill material is to be firmly tamped down with a suitable tool so that it finishes slightly below the general ground level. The top surface is then to be filled with clean stone-free sandy loam. The sandy loam is to be tamped down and sloped away from the pole so that the finished level at the pole is 20 mm above the surrounding general ground level. The work area is to be cleaned with a broom and all surplus material is to be removed from the site.

13.3 Removal of pole attachments

The normal risk management process must be undertaken. Work on free-standing poles should be kept to a minimum. In some circumstances all attachments will be removed while working from an elevated work platform (EWP) and possibly the head of the pole sawn-off below the existing conductors; and in other circumstances as many attachments as possible would be left on the pole with the removal of the remaining attachments done after the pole has been removed. There are many variables that could affect the safety of the work and each circumstance needs to be carefully assessed before a decision is made on the procedure for the removal of the pole's attachments. When a borer erector is used for the removal of a pole (see clause 14.0) consideration should be given to the removal of all attachments so as not to foul the jaws of the borer erector.

Note: The pole identification number MUST remain with the pole, and any new pole has a new identification label installed.

The strength of the pole and the loads which are applied to that pole is critical and must be assessed. Before a pole is made free-standing, it must be inspected in accordance with NS146 Safe Inspection Procedure for Working on Poles. If an authorised person is dissatisfied with the pole condition, or the pole is shown by the inspection to be unsound, or if the pole is suspect, or condemned, the pole must not be climbed and stripped unless it is stayed or supported in accordance with Section 14.0

13.4 Disposal of wood poles with steel reinforcing 'nails' attached

This clause provides information on pole reinforcement with steel 'nails' and outlines the procedures which must be followed when poles with steel reinforcing nails attached are recovered from service.

13.4.1 Pole reinforcement

Ausgrid currently reinforces all wood poles where timber degradation at or below groundline has reduced the residual strength of the pole to 50% or less, and the condition of the above ground section of the pole is suitable for a minimum of 10 years' service. Poles suitable for reinforcement are nominated by Network Contracts for the Pole Reinforcement Contractor to attach steel reinforcing nails.

Occasionally, the presence of below ground obstructions, such as baulks, concrete or rock, may prevent pole reinforcement nailing from being completed after the task has commenced. The Pole Reinforcement Contractor has been instructed to not remove any reinforcing nails that cannot be driven to the required depth, because removal could destabilise the pole. When the nailing is unsuccessful, the Pole Reinforcement Contractor must notify the relevant Network Contracts Officer who will arrange to have the nail removed and the pole replaced. The Pole Reinforcement Contractor can be present at the removal to collect the nail, or the nail can be stored for collection later by the Contractor. In these cases, Ausgrid is not charged, however the nail remains the property of the Pole Reinforcement Contractor and Ausgrid is obliged to provide for its collection.

13.4.2 Reinforced poles removed from service

When the above ground condition of a reinforced pole deteriorates to the point where replacement is required, the pole and reinforcing nail are removed from the ground as a unit, where possible. The bolts are not to be removed. Reinforcing nails are designed to last 20 years with no maintenance and may last considerably longer when corrosion prevention maintenance has been carried out. They may be re-used a number of times depending on environmental and other conditions, and therefore must not be discarded when removed from service.

In situations where the pole cannot be jacked out of the ground, it may be necessary to cut the pole below ground and use oxy-acetylene equipment to cut the nail below ground. Where the nails are cut off, the cut piece should be discarded.

13.4.3 Storage of poles with reinforcing 'nails' attached

Poles removed from service with reinforcing nails attached, are to be stored in a designated storage area where the Pole Reinforcement Contractor can attend and safely remove the nails from the poles.

After the nails have been removed from poles, the poles can then be disposed of in the usual manner.

13.5 Restoration of surfaces after removal of poles

Pole holes and ground surfaces which have been disturbed during removal of poles, or where poles have been cut off, must be restored in accordance with this clause.

To prevent danger to the public, barricades must be placed at sites where poles have been removed or cut off, until the surfaces are restored in accordance with this clause.

Methods adopted for backfilling pole holes and restoring excavated areas around pole holes must achieve a clean and tidy result. This will reduce the number of customer complaints. Any complaint about the condition of a site must be attended to within 24 hours of notification. If the work has been done by an Accredited Service Provider, the costs incurred in rectifying any complaint are to be borne by the Accredited Service Provider.

Backfill material must comply with clause 12.5.

13.5.1 Unpaved areas

In unpaved areas, the pole hole is to be restored firstly with approved backfill material. The backfill material is to be firmly tamped down with a suitable tool so that it finishes slightly below the general ground level. The top surface is then to be filled with clean stone-free sandy loam. The sandy loam is to be tamped down and finished level with the surrounding general ground level. The work area is to be cleaned with a broom and all surplus material is to be removed from the site.

The reinstatement of unpaved areas is to be completed as detailed above within 24 hours of pole removal.

13.5.2 Paved areas

In paved areas, the pole hole is to be restored firstly with approved backfill material. The backfill material is to be firmly tamped with a suitable tool so that it finishes approximately 50 mm below the level of the pavement. All excess backfill material is to be cleaned from the surrounding paving.

The top surface is to be reinstated with cold bituminous pre-mix material. The bituminous pre-mix material is to be tamped down and finished slightly above the surrounding pavement level to allow for settling, but not to the extent that a trip hazard would be created. The work area is to be cleaned with a broom and all surplus material is to be removed from the site.

The reinstatement of paved areas is to be completed as detailed above within 24 hours of pole removal.

Permanent restoration of the affected paved areas will also be in accordance with the requirements of the local road authority.

Part of the work performed by an Accredited Service Provider includes the permanent reinstatement and restoration of the paved areas.

14.0 METHOD OF SECURING POLES

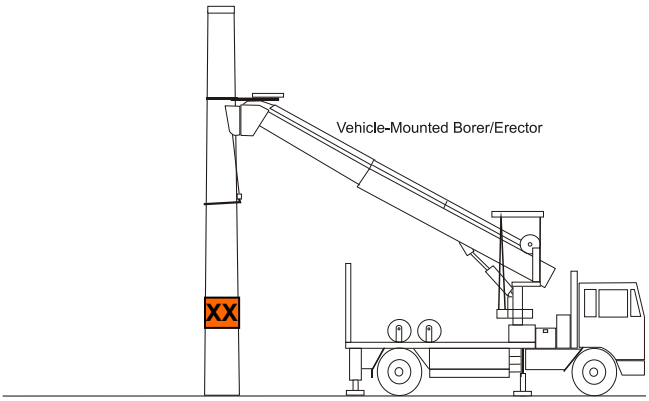
Condemned, conditionally serviceable or suspect poles must not be climbed or worked on unless secured in an approved manner (Refer to the following diagrams, their accompanying notes and NS146).

Condemned poles should be replaced as soon as practicable. Some factors which can restrict the removal of a condemned pole, is the existence of telecommunications infrastructure, availability of lineworkers and safety concerns (e.g. vehicle/pedestrian traffic, school zones etc).

Generally, poles must be secured using one of the following methods suitable to the prevailing conditions:

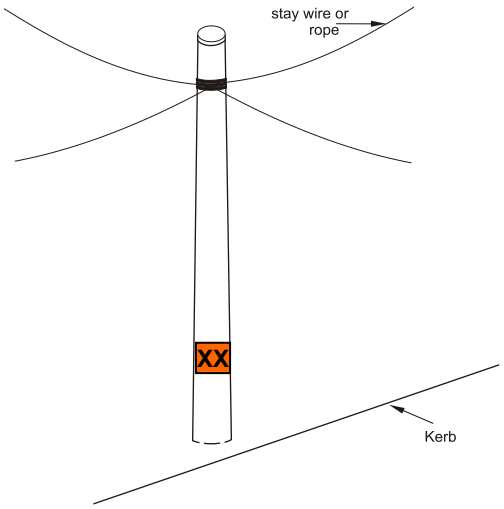
Workers must use an appropriate method to stabilise a pole or a combination of methods to mitigate the risk of pole movement. They must take in to account the direction of the load/s applied to the pole, the point which the load/s are applied to the pole and whether these loads will change.

Refer to the following diagrams, their accompanying notes and NS146.



Method 1

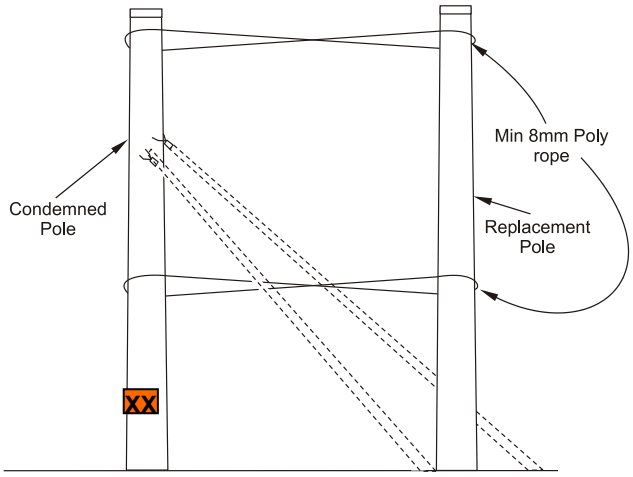
Hold the pole above the point of balance using a mobile crane or pole erecting vehicle.



Method 2

Erect a minimum of 3 stays to the top of the pole above the point of balance. The stays should consist of stay wire or rope and be solidly fixed to the pole and adjacent solid objects such as large trees or heavy vehicles. The stays must be placed at an angle of approximately 120 degrees apart for 3 stays or 90 degrees apart for 4 stays, and in such a manner that the pole cannot move under load.

In difficult locations where the normal risk assessment process allows a combination of stays and pole pikes may be used to secure the pole.



Method 3

Working from an EWP or from the new replacement pole, lash the condemned pole with polypropylene rope to prevent the condemned pole falling. (Refer to Annexure E and F for details.)

Method 1 or temporary stay(s) may be used for securing the pole to make safe before lashing.

In certain situations, pole pikes may be utilised to make the pole safe (Refer to Annexure F for using pikes).

15.0 STORES AND MATERIALS

Only approved materials and equipment may be used in the construction of infrastructure which ultimately forms part of Ausgrid's electrical network. The approved materials and equipment contained in this Network Standard are detailed in Ausgrid's Approved Material List (AML) with manufacturer and supplier information and Ausgrid stockcodes where appropriate. Ausgrid will consider adding alternative materials and equipment to the AML in accordance with NS181 - Approval of Materials & Equipment and Network Standard Variations.

ASPs may obtain approved materials and equipment items as listed in the AML from any source. Where an ASP wishes to use alternative materials and equipment, application to have the materials or equipment considered for approval is to be made in accordance with NS181. Alternatively, where approved materials and equipment are held as stock in Ausgrid's stores system, ASPs may purchase them from Ausgrid. All enquiries and requests for quotations should be directed by email to aspsales@ausgrid.com.au.

All materials used on Ausgrid's network must be new.

Wood poles must be as specified in Ausgrid's Specification for Overhead Line Supports (Poles).

Particular attention is drawn to the requirement for pre-acceptance inspection by Ausgrid's Timber Inspector at the point of supply. If the wood pole supplier does not ensure that this requirement is complied with, the reasonable cost of any subsequent pole inspection that Ausgrid may deem necessary shall be charged to the Accredited Service Provider.

For other pole types such as steel, concrete and composite fibre, poles shall be inspected in accordance with the requirements given in the relevant Ausgrid's pole specification.

Any poles erected which do not comply with Ausgrid's requirements will be defected and must be replaced at the Accredited Service Provider's cost prior to being connected into Ausgrid's network.

16.0 RECORDKEEPING

The table below identifies the types of records relating to the process, their storage location and retention period.

Table 2 – Recordkeeping

Type of Record	Storage Location	Retention Period*
Approved copy of the Network Standard	Document repository Network sub process Standard – Company	Unlimited
Draft Copies of the Network Standard during amendment/creation	Work Folder for Network Standards (Trim ref. 2014/21250/210)	Unlimited
Working documents (emails, memos, impact assessment reports, etc.)	Records management system Work Folder for Network Standards (Trim ref. 2014/21250/210)	Unlimited

* The following retention periods are subject to change e.g. if the records are required for legal matters or legislative changes. Before disposal, retention periods should be checked and authorised by the Records Manager.

17.0 AUTHORITIES AND RESPONSIBILITIES

For this network standard the authorities and responsibilities of Ausgrid employees and managers in relation to content, management and document control of this network standard can be obtained from the Company Procedure (Network) – Production/Review of Network Standards. The responsibilities of persons for the design or construction work detailed in this network standard are identified throughout this standard in the context of the requirements to which they apply.

18.0 DOCUMENT CONTROL

Document Owner : Head of Asset Risk & Performance

Distribution Coordinator : Manager - Network Standards & Electrical Safety

Annexure A – Material Stock Code Numbers

Table A1

Item	Stockcode Number
Poles, line construction wood, preservative treated (Height/ tipload):	
9.5 m/6 kN	H23135
9.5 m/8 kN	146670
9.5 m/12 kN	H23151
10 m/25 kN (stay pole)	150565
10 m/35 kN (stay pole)	150938
11 m/6 kN	146688
11 m/8 kN	146696
11 m/12 kN	146704
12.5 m/6 kN	146712
12.5 m/8 kN	146720
12.5 m/12 kN	146738
14 m/6 kN	H23313
14 m/8 kN	146746
14 m/12 kN	146753
15.5 m/6 kN	H23371
15.5 m/8 kN	H23389
15.5 m/12 kN	152868
15.5 m/16 kN	174607
17 m/6 kN	H23559
17 m/8 kN	H23567
17 m/12 kN	157206
18.5 m/8 kN	150490
18.5 m/12 kN	152876
18.5 m/25 kN	127258
20 m/8 kN	176343
20 m/12 kN	150508
21.5 m/8 kN	176344
21.5 m/12 kN	150359
23 m/12 kN	174557

Item	Stockcode Number
Poles, line construction Desapped wood (Height/ tip load):	
9.5 m/6 kN	186095
9.5 m/8 kN	186096
10 m/25 kN (stay pole)	186097
10 m/35 kN (stay pole)	186098
11 m/6 kN	186099
11 m/8 kN	186100
11 m/12 kN	186101
12.5 m/6 kN	186102
12.5 m/8 kN	186103
12.5 m/12 kN	186104
14 m/6 kN	186105
14 m/8k N	186106
14 m/12 kN	186107
15.5 m/8 kN	186108
15.5 m/12 kN	186109
17 m/8 kN	186110
17 m/12 kN	186111
18.5 m/8 kN	186112
18.5 m/12 kN	186113
18.5 m/16 kN	186114
18.5 m/20 kN	186115
18.5 m/25 kN	186116
20 m/12 kN	186117
21.5 m/12 kN	186118
23 m/12 kN	186119
Poles, line construction Fibre Cement (Height/ tip load-(Ultimate strength)):	
9.5 m/16 kN (Ult. Strength)	183761
9.5 m/24 kN (Ult. Strength)	183764
11 m/16 kN (Ult. Strength)	183765
11 m/24 kN (Ult. Strength)	183766
12.5 m/16 kN (Ult. Strength)	183767
12.5 m/24 kN (Ult. Strength)	183768
14 m/16 kN (Ult. Strength)	183769
14 m/24 kN (Ult. Strength)	183770
15.5 m/16 kN (Ult. Strength)	183771

15.5 m/24 kN (Ult. Strength)	183772
17 m/16 kN (Ult. Strength)	183773
17 m/24 kN (Ult. Strength)	183774
18.5 m/16 kN (Ult. Strength)	183775
18.5 m/24 kN (Ult. Strength)	183776
20 m/16 kN (Ult. Strength)	183777
20 m/24 kN (Ult. Strength)	183778
21.5 m/16 kN (Ult. Strength)	183779
21.5 m/24 kN (Ult. Strength)	183780
Equipment pole, Fibre Cement (Height/tipload – (Ultimate strength)):	
14 m/24 kN (Ult. Strength)	185015
15.5 m/24 kN (Ult. Strength)	185016
Pole step kit 16mm Gal	184743
Surface coating repairs:	
Copper naphthenate base paint 2 litres	146332
Disposable bag, plastic (Length 1200 mm, Width 700 mm, Thickness 200 microns)	147645

Annexure B – Footway Allocations

For footway allocations, refer to NSW Streets Opening Coordination Council (SOCC) - Guide to Codes and Practices for Streets Opening 2018.

For Regional footway allocations prior to 2018, refer to NSW Streets Opening Conference - Guide to Codes and Practices for Streets Opening 2009.

Annexure C – Sample Checklist for New Pole Installation

C1	Site			
		Yes	No	N/A
1	Has the site been surveyed and pegged?	❑	❑	❑
2	Has the site been checked against 'Streets Opening' drawing?	❑	❑	❑
3	Has the site been checked for underground services as per the Designated Underground Asset Information Provider request that may impact on the proposed location of the pole hole including service connections?	❑	❑	
4	Have Parts A, B & C of HS008-P0501 Excavation Work – Coversheet been completed?	❑	❑	❑
5	Have all relevant acts, laws, standards and instructions been complied with?	❑	❑	
C2	Installation			
		Yes	No	N/A
1	Is access to the pole available?	❑	❑	
2	Have relevant Ausgrid permits been issued?	❑	❑	❑
3	Have all required drawings and details for these works been issued for approval?	❑	❑	❑
4	Has a full parts list including hardware been issued for approval? If required, is the third party service authority observer onsite as per Designated Underground Asset Information Provider requirements? Has Part D of HS008-P0501 Excavation Work – Coversheet been completed? Prior to commencing mechanical borer excavation.	❑	❑	❑
5	Has the pole been inspected, butt stamped and disced?	❑	❑	
6	Has the pole been inspected prior to erection?	❑	❑	
7	Does the LV OH wiring require Torapoli piping?	❑	❑	
8	Is HV or LV isolation required? Has a lift area exclusion zone been established and communicated? Has a Load Lift study been completed and recorded on the HAC as per HS018-P0200 Lifting Operations and HS018-P0202 Load Lift Study?	❑	❑	
9	Has the correct pole rake been set?	❑	❑	❑
10	Has the pole been back filled with DGB-10 road base or approved back fill from the butt to within 350 mm of ground level?	❑	❑	
11	Has specified staged compaction been achieved?	❑	❑	

12	Has the final 350 mm of hole been fitted with approved fine material (e.g. sand)?	❑	❑	
13	Was a pole required to be removed in conjunction with this new pole installation?	❑	❑	
14	Was pole removal carried out according to specification?	❑	❑	❑

Name: _____ Signature: _____ Date: _____

Annexure D – Pole Steps, Permanent Attachments and Prevention of Unauthorised Access

D.1 General

Installations must comply with the anti-climbing measures in the Energy Networks Association publication ENA DOC 015-2006 National Guidelines for Prevention of Unauthorised Access to Electricity Infrastructure, with special attention given to the presence of nearby objects, poles spaced closer than 1.5m apart, etc.

The following sections specify Ausgrid's additional requirements and restrictions on pole steps and other permanent attachments.

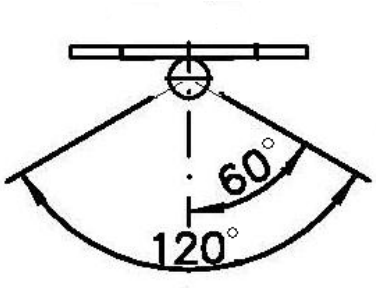
Permission for third party attachments to Ausgrid's poles is not implied or covered by this Annexure. This Annexure refers only to requirements and restrictions on the positioning of attachments.

D.2 Pole steps

With the exception of permanently installed fixed pole steps, facilities to assist climbing such as holes or plates for pole steps are not to be installed on any poles.

Poles of length 11 m or less are not normally to be fitted with pole steps. Poles of length 11 m or less which are not accessible from elevating work platforms, and which will need to be climbed (e.g. for attachment of services) may have pole steps fitted.

Where pole steps are fitted, they are to have a 450mm vertical spacing on the same axis as the King Bolt, with the lowest step approximately 3600 mm above ground level, and 900mm below the highest HV king bolt position.



The poles steps should be positioned on alternate sides of the axis positioned 120 degrees apart. One pole step will be 60 degrees off-centre on the right of the axis and the next pole step will be 60 degrees off-centre on the left of the axis. That is, pole steps on the right of the axis will be at 900 mm intervals.

For poles greater than 11 m in length, pole steps are to be installed as follows:

- **Pole mounted distribution substations** – Pole steps are to be installed in accordance with relevant drawings in NS122 or other relevant drawings.
- **11 kV link poles and link stick operated air break switch poles** – Pole steps are to be 450 mm apart, with the lowest step approximately 3600 mm above ground level, and the highest step not less than 1200 mm below the lowest high voltage crossarm or conductor.
- **11 kV down-rod operated air break switch poles** – Pole steps are not to be installed on poles which are readily accessible from elevating work platforms. On poles where climbing access is necessary, pole steps are to be installed as indicated below for 'other poles'.
- **Sub-transmission poles** – Except where indicated otherwise on line design drawings or sub-transmission pole drawings, pole steps are to be 450 mm apart, with the lowest step approximately 6000 mm above ground level.
- **UGOH poles –** Where 11kV UGOH poles are not accessible by EWP, pole steps are to be 450 mm apart, with the lowest step approximately 6000 mm above ground level, and the highest step 1200 mm below the lowest high voltage crossarm or conductor.

- **Other poles** – Pole steps are to be 450 mm apart, with the lowest step approximately 6000 mm above ground level, and the highest step 1200 mm below the lowest high voltage crossarm or conductor.

The requirements specified above for pole steps may need to be varied to comply with Notes 1, 2 and 3 of Clause E.3.

D.3 Other permanent attachments

Unless already existing prior to CIA 1139 A (dated 29/01/2001), third party attachments such as street signs, neighbourhood watch signs, meter boxes, waste bins, etc are not permitted on poles that may have to be climbed to operate equipment. This includes 11 kV link poles, link stick operated air break switch poles, low voltage link poles and distribution substation poles.

On other poles; street signs, neighbourhood watch signs and similar sign type attachments must be not less than 3 metres vertically above the ground. Poles with meter boxes or waste bins or other similar projections attached must comply with clause (b) below.

Subject to the specific exceptions indicated below, attachments in general (including pole steps) must comply with the following minimum requirements.

A projection or device capable of providing a person with a means of ascent shall not be attached to a pole or other support forming part of an overhead line unless:

(a) the projection or device is attached to a point not less than 3 metres above the ground (measured vertically); or

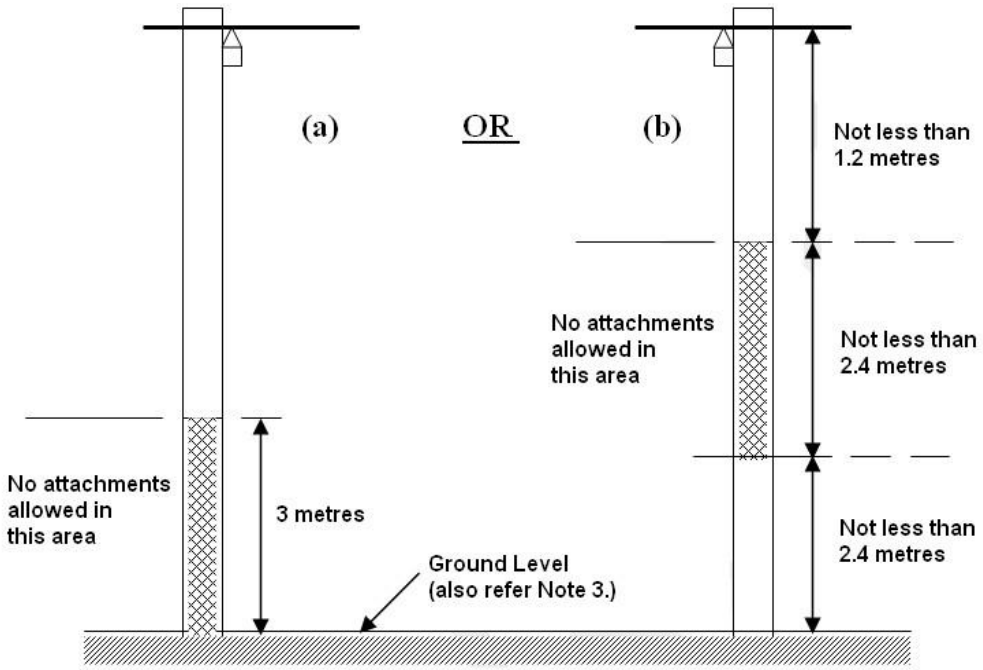
(b) a minimum 2.4 m length of the pole or other support is free from any such projection or device, and

this 2.4 m length must not be less than 2.4 metres above the ground, and

this 2.4 m length must be not less than 1.2 metres below the lowest aerial conductor.

Note: In this clause, all distances are measured vertically, and 'conductor' includes communications cables and / or catenary wires.

The diagram below illustrates the requirements of clauses (a) and (b).



Exceptions:

(i) A projection or device may be attached within the zones indicated in clauses (a) or (b) if the pole or support is fitted with an approved guard preventing climbing.

(ii) Operating handles and rods of approved air break switch installations and approved locked collapsible ladders that are not capable of providing a means of ascent, may be attached within the zones indicated in clauses (a) or (b).

In Exceptions (i) and (ii), 'approved' means approved by the responsible Ausgrid officer.

Notes:

1. Combinations of attachments, including combinations of pole steps and other attachments, must comply with the above requirements.

2. Relocation or removal of attachments may be necessary to ensure continuing compliance with clause (a) or (b). e.g. the attachment of a communications cable may necessitate relocation of other attachments.

3. Where poles are located close to structures, street signs, awnings, telephone boxes, rockwalls or similar elevated objects which could reasonably provide a means of access to part of the pole above normal ground level, the requirements of clause (b) apply, with the nominal ground level then being the highest elevated reasonable point of access.

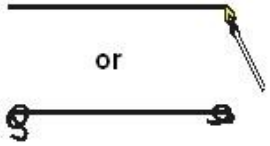
Annexure E – Lashing Condemned Wood Poles using Polypropylene Rope

The lashing of condemned poles using polypropylene rope (10.4kN breaking strength) is one of the approved methods for supporting a condemned pole to make it safe.

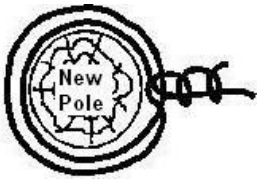
CAUTION
Condemned poles lashed with polypropylene rope should be replaced within 12 months from the date of the pole being lashed.

Lash condemned poles using polypropylene rope as follows:

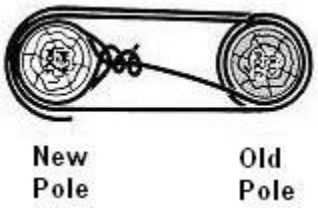
1. Cut the rope to the correct length and burn the ends or use the thumb knots to stop fraying.



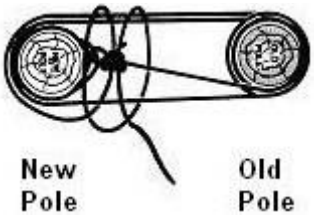
2. Tie the rope to the new pole 4 metres above ground using a clove hitch and two half hitches.



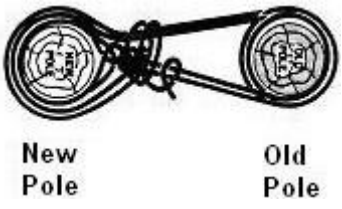
3. Wrap the standing part of the rope around the poles as shown (minimum of two full turns around the old pole, and always finish on the new pole).



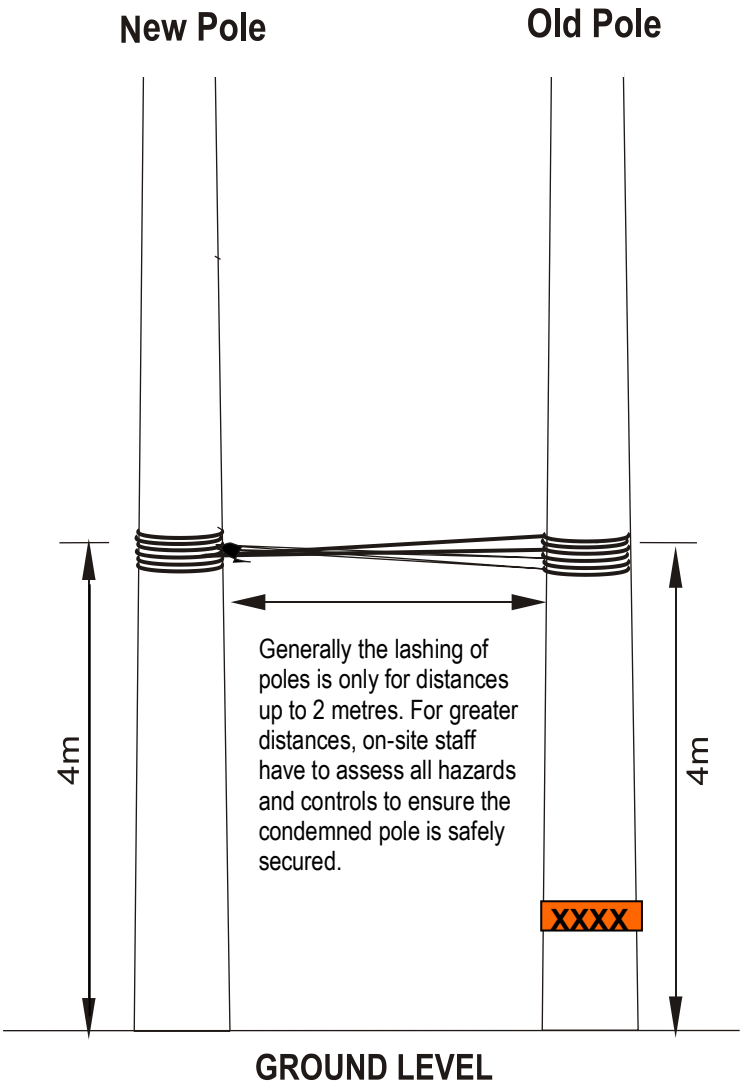
4. Tie the tail of the rope with a clove hitch as shown.



5. Tighten the clove hitch but do not stress the poles. Finally lock the tail of the rope with a half hitch as shown.

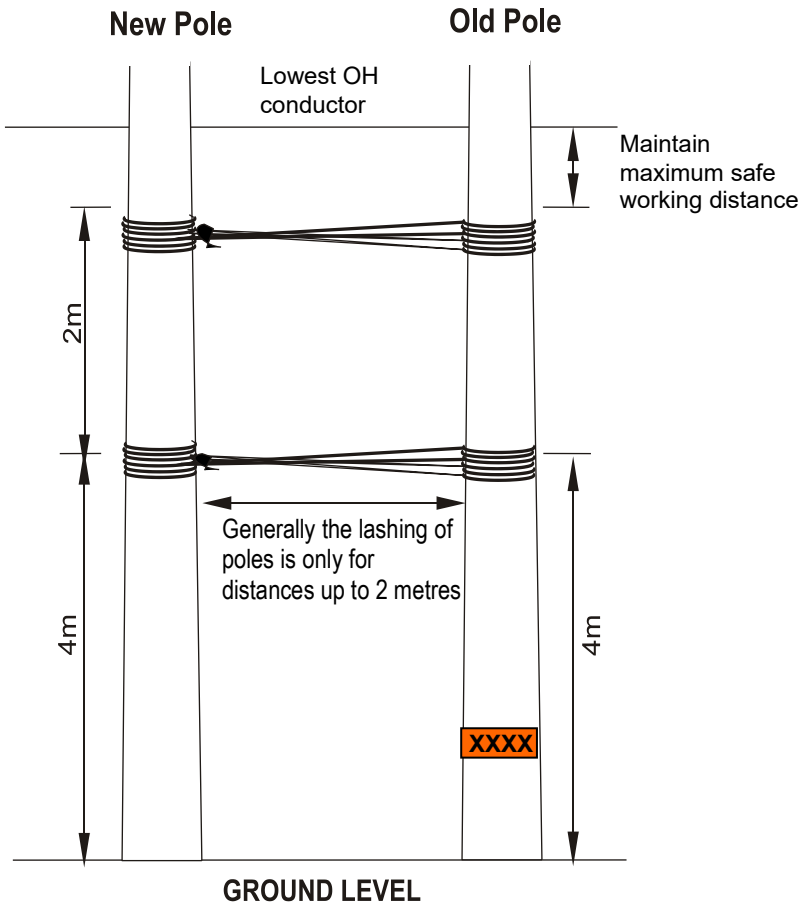


6. First lashing is completed.



7. Repeat steps 1-5 for the second lashing. The second lashing should be as high as practical maintaining minimum safe working distance from any live exposed conductors (details found in Ausgrid's Electrical Safety Rules). The aim is to achieve 2 metre separation between lashings where possible.

Note: More than two lashings can be utilised. The placement of the lashings will depend on the size of the pole, the construction configuration and the pole's position/situations. The diagram below is typical of how a lashed pole is left for the pole crew.



Note: To “make safe” condemned poles the use of stays and pikes may be needed in conjunction with pole lashings.

The old pole can be secured by either one or a combination of methods described in Section 14.

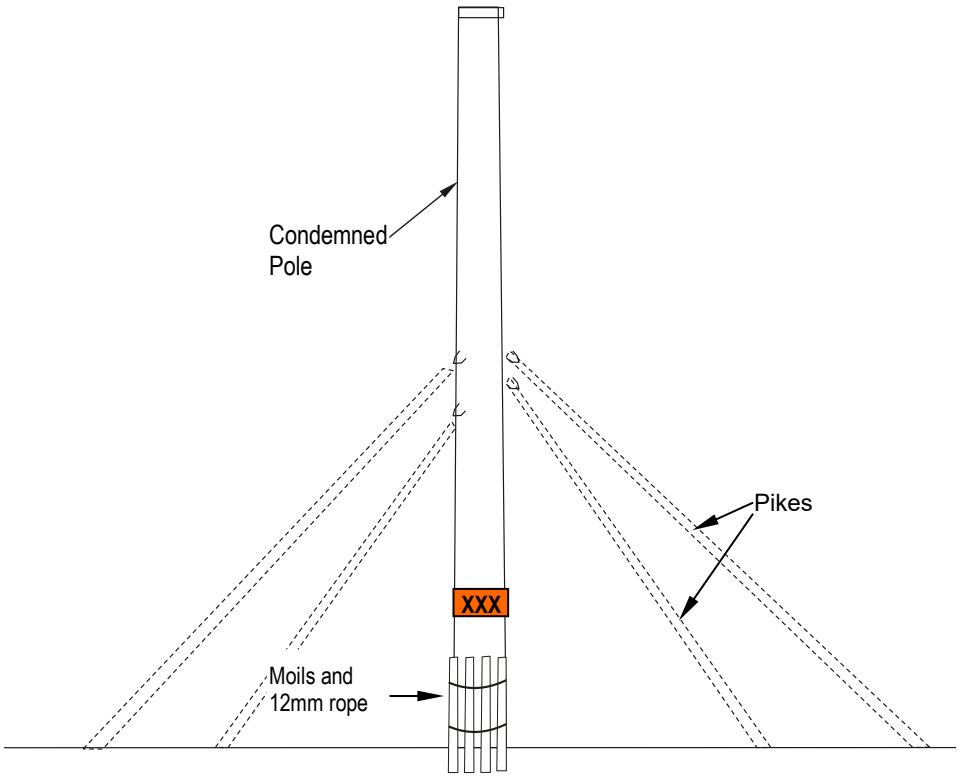
Annexure F – "Making Safe" Condemned Wood Poles using Pikes

The "making safe" of a condemned pole using pikes may only to be used when methods of securing condemned poles in Section 14.0 cannot be used. A documented risk assessment is to be completed when using pikes which considers:

- public safety;
- the risk of interference to the pikes;
- stability at the head of the pole and at the ground line;
- the load on the pole;
- the position of the defective section of the pole;
- the height of the pole;
- positioning of the pikes; and
- stability of the ground.

Pikes must be fixed to the pole and secured to ensure the pole does not move or twist under load. Appropriate steps must be taken to ensure the pikes can perform their intended use. Steps could include but are not limited to, tying the pike's spikes to the pole and tying/choking the pikes at groundline.

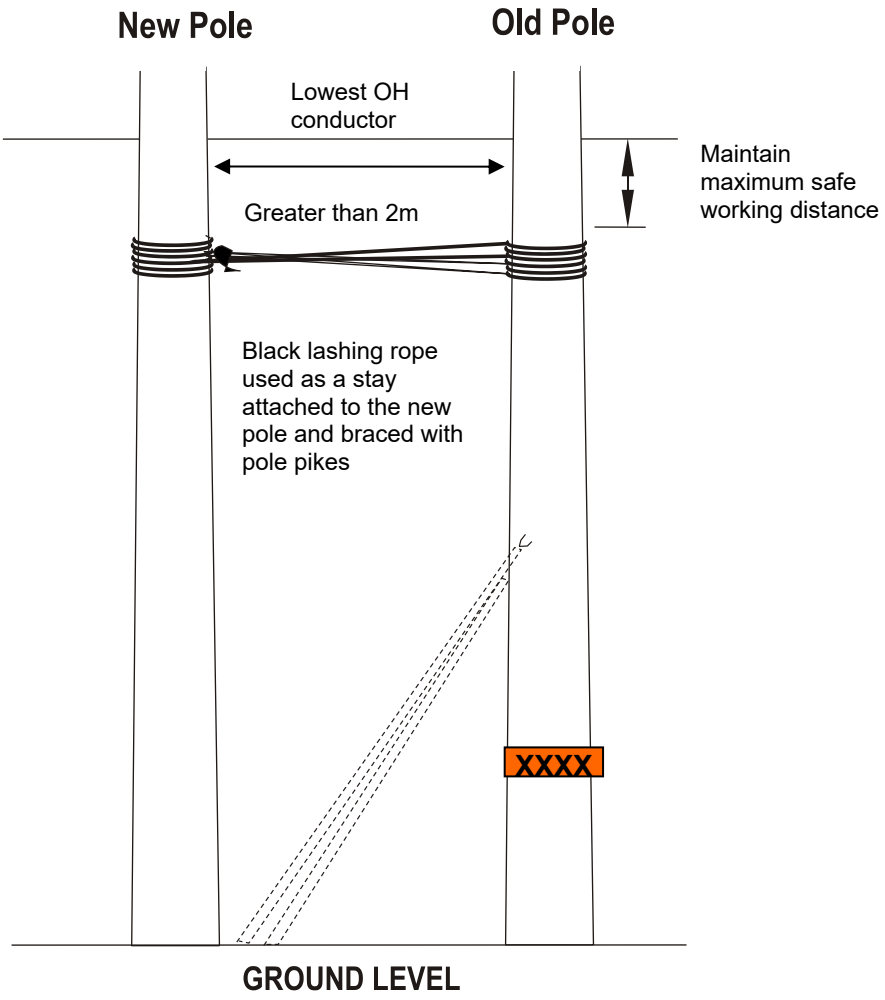
Note: These condemned poles should be replaced as soon as practicable.



Typically moils are driven a minimum 350mm below ground line

Sufficient pikes must be used in appropriately positions to ensure the stability of the pole. When required the base of the pole should be stabilised with such items as moils. Moils may take the form of star stakes or any other robust metal rods used in sufficient numbers (minimum 3) and lashed to the pole with rope. The depth of the moils will depend on the bearing strength of the soil and the moil is typically driven into the ground a minimum of 350 mm. The strength of the soil can be assessed while performing the below ground pole inspection as per NS146 Safe Inspection Procedure for Working on Poles. The depth of the moils should be deeper than 350mm in poor bearing strength soils.

The risk assessment process used in “making safe” condemned poles should identify the most appropriated hazard risk controls to achieve the safest result for each individual condition and location. The on-site staff are required to perform the risk assessment and then identify the best method or combination of methods to ensure the safest outcome is achieved.



The above pole is secured using a combination of a stay and two pole pikes. Different combinations using stays, lashings, pikes and moils can be utilised to achieve the safest result (e.g. all stays, two stays and a number of pikes etc).

Annexure G – Composite fibre reinforced cement poles

G.1 Purpose

This section provides information required for the safe handling and acceptable work practices for Titan poles. The Titan pole is an Engineered Cement Pole (ECP) which is a combination of Cement, Kaolin, acrylic latex polymer and alkaline resistant glass fibre (i.e. polymer modified cement product which is reinforced with glass fibre).

G.2 Scope

This section provides information on pole erection, pole removal, PPE, handling and transport requirements for Titan poles.

G.3 Description

The Titan pole is a thin walled structure and relatively lightweight. As such they are relatively susceptible to damage from applied excessive wall pressure during pole handling and transport or pole top construction activities. Impact drivers must not be used to tighten fittings to these poles and pole loaders are generally not suitable for moving Titan Poles due to the risk of crushing the pole's wall.

The Titan poles are manufactured by Dulhunty Poles. They are;

- Manufactured in Australia (under licence);
- Developed to suit our local energy supply requirements and conditions;
- Made of glass fibre and cement;
- Requiring minimal maintenance;
- Conductivity similar to timber poles;
- UV resistant;
- Not affected by termite and fungal decay;
- Expected to last more than 70 years;
- Lightweight (approximate weight comparison - half that of timber poles, a third of concrete poles & similar to steel poles);
- Easy to handle and to install; and
- Fire resistant and suitable for bushfire prone areas

G.3.1 Pole sizes

Table H1 Titan pole sizes – line poles

Load	16kN (Ultimate strength) 8kN (Working strength)			24kN (Ultimate strength) 12kN (Working strength)		
	Nominal Weight (kg)	Nominal Tip OD (mm)	Nominal Butt/Max OD (mm)*	Nominal Weight (kg)	Nominal Tip OD (mm)	Nominal Butt/Max OD (mm)*
9.5m	450	315	424	590	325	445
11.0m	535	315	442	670	325	460
12.5m	630	315	460	825	325	480
14.0m	900	315	435/475	1110	325	435/485
15.5m	1050	315	450/475	1225	325	450/485
17.0m	1125	315	475/475	1465	365	505/515
18.5m	1320	360	505/505	1525	365	530/515
20.0m	1625	360	540/505	1810	365	540/515
21.5m	2050	360	565/505	2185	365	565/515

* 14m and above poles are made in 2 pieces & supplied assembled. The base or butt diameter is the left number, while the max OD at the base of the top piece is the right number (e.g. (435/475).

Weight Tolerance is +10%/-5% of nominal.

Table H2 Titan pole sizes – Equipment poles

Load	24kN (Ultimate strength) 12kN (Working strength)		
	Nominal Weight (kg)	Nominal Tip OD (mm)	Nominal Butt/Max OD (mm)*
14m	1400	330	450/500
15.5m	1600	330	460/500

G.4 Handling and transportation

G.4.1 General

Titan poles are thin walled structures, and as such are relatively susceptible to being damaged from excessive wall pressure. Therefore, care must be exercised during handling as these poles are not solid and cannot be handled like timber poles.

Caution: Titan poles are easily damaged and NOT SUITABLE for loading or unloading using a pole loader, unless they can be handled safely without applying pressure to the pole beyond that exerted by the weight of the pole itself.

A risk assessment by a competent person is required with any handling or transporting of Titan poles.

The competent person should be familiar with the Dulhunty's Manufacturer's Instructions guide (Titan Engineered Cement Poles by Dulhunty – Pole Handling and Installation Procedure). These instructions may be found on the manufacturers website or (for Ausgrid personnel) in Balin – Manufacturers' Equipment Manuals – Mains Equipment.

Silica dust hazard:

Silica dust may be generated when cutting/drilling composite fibre reinforced cement poles. There is a need to minimise dust generation and apply appropriate PPE.

G.4.2 Equipment and Maintenance requirements

General Work Procedures that need to be noted are -

- Similar work procedures and PPE as concrete poles – respiratory masks, gloves etc;
- Handling & transporting procedures of Titan poles are similar to steel and concrete poles:
  - appropriate lifting slings should be used when handling a Titan pole e.g. synthetic slings so as not to damage the pole's surface;
  - all fastening/contact points must have a rubber pad where required to prevent damaging the external surface of the poles;
  - pole loaders are generally NOT SUITABLE for loading or unloading Titan poles (see caution note above):
- Hardware is ordered from the manufacturer (Toggle fittings – poles steps (stockcode 184743);
- Coach-screws can be used on Titan Poles on light load applications. Stockcode 50567. Must have extended full length thread;



Coach-screw with extended full length thread



Toggle bolt

- Through bolts are installed for heavy loads such as mounting crossarms, streetlighting arms and transformer installation. The size depends on the size of the pole.
- Toggle bolts are installed for lighter load applications such as service wire installation.

- Impact drivers (Rattle Guns) are unsuitable and are not to be used on Titan poles due to the risk of crushing the pole's wall;
- Sutton hole saws for 41, 44 & 51mm at this stage;
- It is mandatory to record Titan Poles as Titan poles in Ausgrid's SAP database. ASPs must provide the information to Ausgrid Project Officer to update the SAP database;
- Attachment of pole numbers – same procedures as steel and concrete poles;
- Pre-climbing procedures for Titan Poles is similar to concrete poles – refer NS146. (visual inspection for physical damage only - no excavation); and
- Universal pole platforms can be used on Titan Poles – (similar precautions as with steel and concrete poles).

Table G3 Hole saw size recommendations for pole step drilling

Ausgrid Stock Code	Pole Length	No. of Sections	Ultimate Load	Lower Section Base Wall	Lower Section Tip Wall	Upper Section Base Wall	Upper Section Tip Wall	Joint Section Wall	Recommended Hole Size	Min. Recommended Hole Saw
183761	9.5m	1 Piece	16kN	N/A	N/A	21mm	23.5mm	N/A	28mm	Sutton TCT Holesaw 29mm Part No. H1110290
183764	9.5m	1 Piece	24kN	N/A	N/A	31.5mm	28.5mm	N/A	30mm	Sutton TCT Holesaw 30mm Part No. H1110300
183765	11m	1 Piece	16kN	N/A	N/A	21mm	23.5mm	N/A	28mm	Suttons TCT Holesaw 29mm Part No. H1110290
183766	11m	1 Piece	24kN	N/A	N/A	30mm	28.5mm	N/A	30mm	Suttons TCT Holesaw 30mm Part No. H1110300
183767	12.5m	1 Piece	16kN	N/A	N/A	20mm	23.5mm	N/A	28mm	Suttons TCT Holesaw 29mm Part No. H1110290
183768	12.5m	1 Piece	24kN	N/A	N/A	30mm	28.5mm	N/A	30mm	Suttons TCT Holesaw 30mm Part No. H1110300
183769	14m	2 Piece	16kN	27.5mm	26.5mm	27.5mm	23.5mm	54mm	28mm	Suttons TCT Holesaw 29mm Part No. H1110290
183770	14m	2 Piece	24kN	43.5mm	42.5mm	32.5mm	28.5mm	75mm	32mm	Suttons TCT Holesaw 32mm Part No. H1110320
183771	15.5m	2 Piece	16kN	42.5mm	42.5mm	27.5mm	23.5mm	70mm	29mm	Suttons TCT Holesaw 29mm Part No. H1110290
183772	15.5m	2 Piece	24kN	55mm	55mm	32.5mm	28.5mm	87.5mm	32mm	Suttons TCT Holesaw 32mm Part No. H1110320
183773	17m	2 Piece	16kN	46mm	42.5mm	27.5mm	23.5mm	70mm	29mm	Suttons TCT Holesaw 29mm Part No. H1110290
183774	17m	2 Piece	24kN	45mm	45mm	30mm	30mm	75mm	31mm	Suttons TCT Holesaw 32mm Part No. H1110320
185015	14m Equip	2 Piece	24kN	55mm	53mm	35mm	35mm	88mm	33mm	Suttons TCT Holesaw 35mm Part No. H1110350
185016	15.5m Equip	2 Piece	24kN	53mm	53mm	35mm	35mm	88mm	33mm	Suttons TCT Holesaw 35mm Part No. H1110350

Notes:-

The above Sutton branded holes saws requires a QC8 arbore and TCT pilot drill provided as a separate item.

The recommended hole sizes are minimums and may require slight angulation of the drill holes to account for irregularities in the pole wall thickness.

Annexure H Advantages and Disadvantages of Different Pole Types

Advantages of using timber poles

- Cheapest to purchase
- Renewable resource (all timber is sourced from plantation resources)
- Easy to transport and install with conventional pole handling equipment
- Can change crossarm attachment heights with ease
- Relatively non-conductive.

Disadvantages of using timber poles

- Require on-going maintenance to achieve expected service life
- Stays are typically required for high mechanical load situations
- Maximum pole lengths often too short for sub-transmission level or unique circumstances (e.g. water crossings)
- Susceptible to termites, timber rot and bushfire
- Burnt CCA timber by-products are toxic.

Advantages of using steel poles

- Large range of poles lengths and strengths to suit most situations
- Capable of supporting high mechanical loads without the use of stays
- Lower weight than a concrete pole with equivalent rating
- Sustained load strength reduction factor of 0.9 (compared with 0.3 for concrete poles and 0.34 for timber poles – refer NS220
- Not affected by bushfire

Disadvantages of using steel poles

- More expensive than a concrete or timber pole with equivalent rating
- Changing equipment/component attachment points is possible, but may require welding capabilities (not common training for lineworkers). Also, most changes will require an application of cold-galvanising paint which is not as effective as the pole's original hot-dipped galvanised coating and can affect the longevity of the pole
- It is a conductive material with possible touch potential issues and must be earthed
- Soil conditions (e.g. acid sulphate) can increase susceptibility to corrosion at ground line (direct buried & ragbolt) with increased inspection and maintenance costs and potential for reduced longevity of the pole
- Inspection methodology either subjective or employs immature technology
- Ragbolt foundation options susceptible to degradation caused by reaction of the cement and acid sulphate soils
- Extent of structural damage caused by rust on direct buried poles difficult to determine/quantify
- Rust on direct buried poles cannot be successfully treated
- Direct buried concrete encased steel poles cannot be inspected or treated – unpredictable time to failure

Advantages of using concrete poles

- Large range of poles lengths and strengths to suit most situations
- Capable of supporting high mechanical loads without the use of stays
- If there is no additional earthing, low maintenance costs compared with timber poles (not susceptible to termites or timber rot)
- Not affected by bushfire

Disadvantages of using concrete poles

- More expensive than an equivalent timber pole
- The heaviest pole material which generally increases transport, access track and installation costs
- Changing equipment/component attachment points is possible, but time consuming for lineworkers
- It is a conductive material with possible touch potential issues and must be earthed
- Reinforced and prestressed concrete poles must exhibit a no-crack criteria for serviceability/sustained loads in line with the manufacturer's load/deflection pole performance. Refer NS 220 Overhead Design Manual, for Strength Factors
- Only suitable for use where there is an overhead wire earth system
- Ragbolt installations susceptible to corrosion. Greater Civil costs.
- Inspection methodology either subjective or employs immature technology
- Susceptible to degradation caused by reaction of the cement with acid sulphate soils, acidic soils (pH typically < 4.5), and chloride attack by osmosis movement of salt through the concrete when installed in soils with high salinity. Note: Acid sulphate and acid soils can be managed with backfill containing gypsum or lime to neutralise the acid or concrete backfill.

Advantages of using composite fibre reinforced cement poles

- Lightweight and available as multi-piece, hence easier to transport and install via aircraft and watercraft or by hand
- Minimal maintenance costs (not susceptible to termites, fungal decay, or corrosion)
- Non-conductive – eliminating step and touch potential issues
- Hollow allowing internal positioning of down cabling – eliminating cable theft
- Have a very long service life (70 years) making them commercially more suited to the support of expensive assets such as enclosed switchgear and substations
- Suitable for marine installations
- Bushfire rated.

Disadvantages of using composite fibre reinforced -cement poles

- Expensive compared with timber poles
- Limited length options.

Advantages of using fibreglass-reinforced poles

- Lightweight and available as multi-piece, hence easier to transport and install via aircraft and watercraft or by hand
- Low maintenance costs compared with timber poles (not susceptible to termites or timber rot).
- Can be engineered to suit depending on capabilities of manufacturing plant
- They are hollow allowing internal positioning of down cabling if necessary to eliminate cable theft
- Non-conductive – eliminating step and touch potential issues
- Some capacity to withstand marine borer attack Some capacity with regard to Bushfire rating

Disadvantages of using fibreglass-reinforced poles

- Expensive up front cost compared with timber poles
- Stays typically required for standard poles with high mechanical load situations
- Limited standard length and strength options
- Susceptible to UV degradation requiring an external protective coating.

Note: The level of UV degradation is unknown due to the short number of years in service to date

Annexure I Bushfire Vegetation Categories

This section is an extract of NSW Rural Fire Services Guide for Bush Fire Prone Land Mapping Version 5b November 2015.

Vegetation Category 1

Vegetation Category 1 is considered to be the highest risk for bush fire. It is represented as red on the bush fire prone land map and will be given a 100m buffer. This vegetation category has the highest combustibility and likelihood of forming fully developed fires including heavy ember production. Vegetation Category consists of:

Areas of forest, woodlands, heaths (tall and short), forested wetlands and timber plantations.

Vegetation Category 2

Vegetation Category 2 is considered to be a lower bush fire risk than Category 1 and Category 3 but higher than the excluded areas. It is represented as light orange on a bush fire prone land map and will be given a 30m buffer. This vegetation category has lower combustibility and/or limited potential fire size due to the vegetation area shape and size, land geography and management practices. Vegetation Category 2 consists of:

- Rainforests.
- Lower risk vegetation parcels. These vegetation parcels represent a lower bush fire risk to surrounding development and consists of:
  - Remnant vegetation;
  - Land with ongoing land management practices that actively reduces bush fire risk. These areas must be subject to a plan of management or similar that demonstrates that the risk of bush fire is offset by strategies that reduce bush fire risk; AND include:
    - Discrete urban reserve/s;
    - Parcels that are isolated from larger uninterrupted tracts of vegetation and known fire paths;
    - Shapes and topographies which do not permit significant upslope fire runs towards development;
    - Suitable access and adequate infrastructure to support suppression by firefights;
    - Vegetation that represents a lower likelihood of ignitions because the vegetation is surrounded by development in such a way that an ignition in any part of the vegetation has a higher likelihood of detection.

Vegetation Category 3

Vegetation Category 3 is considered to be medium bush fire risk vegetation. It is higher in bush fire risk than category 2 (and the excluded areas) but lower than Category 1. It is represented as dark orange on a Bush Fire Prone Land map and will be given a 30m buffer. This category consists of:

Grasslands, freshwater wetlands, semi-arid woodlands, alpine complex and arid shrublands.

Annexure J Drawing List

Table J1

Drawing number	Title
21852	Overhead Construction Pole Cap - Details
61501	Overhead Stay & Stay Poles anchorages, Footings & Termination Arrangements
178123	Standard Construction Steel Pole Footing Arrangement
183192	Network Earthing Standard Concrete Pole Earthing Pad – Civil Works – Embedded Earthing Layout and Embedded Earthing Details
248464	Standard Construction Composite Pole (Titan) Footing Arrangement
251922	Fibre Cement Pole Stock Index
256214	Standard Construction Desapped Timber Pole Stock Index
508726	Standard Construction Timber Pole Footing Arrangement
512331	Standard Construction Concrete Pole Footing Arrangement
513988	Standard Construction Preservative Treated Timber Pole Stock Index
514087	Standard Construction Street Light Column Pile Footing Details
515278	Standard Construction dressing for 15.5m timber poles
515279	Standard Construction dressing for 17.0m to 21.5m timber poles
515280	Standard Construction dressing for 12.5m timber poles
515281	Standard Construction dressing for 14m timber poles
515282	Standard Construction dressing for 11m timber poles
515283	Standard Construction dressing for 9.5m timber poles