# PowerWater POWER SERVICES

# Work Instruction 007 (WI007) Line/Service Pole Installation Civil Works



REV	DATE	GENERAL DESCRIPTION	PREPARED	REVIEWED	ENDORSED
1.2	14/08/2023	The requirements for installation of Line and service pole concrete foundations	Graham Clarke	Prakash Bhattarai	Bryan Vanderstelt
				NEXT REVIEW	14/08/2028
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HIS WORK INSTRUCTION IS UNCONTROLLED WHEN PRINTED

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## 1 Purpose

This Work Instruction describes the requirements for installation of distribution Line and Service pole concrete foundations.

# 2 Scope

This Work Instruction applies to Power and Water employees and contractors working on the installation of both distribution line and service pole foundations.

Where this Work Instruction provides alternative designs, the designer shall prepare a list of instructions to incorporate in the work pack.

The Design Data is found in S01-04-01-21

For pole butt replacement while retaining the upper section of the pole refer to; "Line Pole Base Remediation under Energised Conditions (Pole Butt Replacement)" D2021/37271

# **3** Instructions from Designer

The Designer shall prepare for issue to the contractor work pack instructions specifying the following requirements:

- The location of the line/service pole to be installed.
- The type of line/service pole to be installed.
- Permissible distance with respect to replacement poles to be placed within close proximity to existing line poles taking into account above & below ground services and infrastructure.
- Should the position of a replacement pole require a deviation in the existing line of greater than 1:12 (5°) (A Top Construction) between poles, this shall be stated in the work pack.
- Soil classification in accordance with AS 2159, including foundation dimensions and depth in accordance with S01-04-01-21
- Any specific recommendations for excavation method.
- Any potential issues or requirements for stabilisation of the excavation (eg. Collapsing sands, ground water).
- Determination of whether the soil conditions may be considered as 'chemically aggressive' or 'non-aggressive'.
- Any protective coating requirements for the line pole in accordance with standard drawings.
- Foundation concrete requirements in accordance with Appendix A & B.
- Safe temporary support for the pole structure during erection.
- Whether or not a rake angle will be required on the end of line termination pole. If a rake angle is required, how this angle is to be established and maintained until removal of the temporary support.
- Earthing requirements in accordance with PWC S01-02-03-19.
- Working and standard drawings should be included in work pack

# 4 Work Instruction

#### 4.1 Setting Out

- The location of the line pole shall be determined by a competent person using the design drawings. (ie a surveyor)
- Where replacement poles are to be installed within the vicinity of live apparatus, the alignment of the line pole shall be verified to ensure that the new pole position does not cause a deviation to the existing lines of greater than a 1:12 (5°) (A Top Construction) change of direction between poles.
- If there is a deviation of greater than 1:12 (5°) (A Top Construction), the project supervisor should be notified and the project supervisor shall seek clarification from the Designer.

#### 4.2 Existing Services

The location of all other overhead and buried services in the vicinity of the line pole to be installed shall be investigated and physically marked at the site using the DBYD process prior to the date of installation of the pole.

If underground electrical services are within the vicinity, consult and follow the 'Work in the Vicinity of Electrical Apparatus Procedure' BDOC2016/56 prior to commencing excavations

#### 4.3 Site Establishment

- Establish a working area, parking area, storage/laydown area and site amenities as required.
- A traffic management plan shall be developed in advance. Lodge applications for applicable permits/authorisations (Council, DIPL, Power and Water, etc) with the relevant department and approvals shall be obtained prior to the commencement of works.
- Undertake a Job Safety Environmental Analysis (JSEA) prior to the works.
- A Work Health and Safety (WHS) Management Plan shall be established in accordance with Power and Water Procedures. The WHS Management Plan must include all details of the site boundaries, site access, temporary fencing and take into account pedestrian and vehicular traffic.
- Where specified in the work pack instructions, any existing line poles that are required to have temporary support or propping during the works shall have the temporary support or propping installed prior to any excavation works.
- For the installation of one piece poles within the Safe Approach Distances to live electrical apparatus, the apparatus shall be isolated and under Access Authority conditions prior to the works commencing.
- For the installation of two piece poles, the lower section of the pole may be installed without isolation of the apparatus provided that appropriate risk management has been undertaken prior to the works, and a Safety Observer shall be used to ensure that Safe Approach Distances to Live Electrical Apparatus are maintained at all times.
- For the installation of upper section of two piece poles within the Safe Approach Distances to live electrical apparatus, the apparatus shall be isolated and under Access Authority conditions prior to the works commencing.

#### 4.4 Site Clearance

Remove obstructions or hazards from the vicinity of the worksite location.

#### 4.5 Excavation

- Where works for replacement poles are to be undertaken within close proximity of existing line poles, a Safety Observer shall be used to ensure that Safe Approach Distances to live electrical apparatus are maintained at all times.
- The diameter and depth of the hole shall be as stated in the work pack instruction and in accordance with S01-04-01-21 for the type of line pole structure being installed.
- The rake of the pole, where specified for tension poles, shall be stated in the work pack instructions.
- Where required, liners are to be installed in the holes to prevent collapse of the sides of the excavation. This shall be stated in the work pack instructions.
- If during excavation an unidentified service is encounted contact the project supervisor to seek clarification.

#### 4.6 Earthing Installation

- The earthing shall be installed in accordance with the work pack instructions and S01-02-03-19.
  - If Type (A) earthing stakes are used, the depth of the hole shall not be less than 135 mm deeper than stated on the standard drawing to allow for the installation of the concrete block and encapsulation of the butt end of the pole structure.
  - If Type (B) earthing coil is used, the depth of the hole shall not be less than 235 mm deeper than stated on the standard drawing to allow for the installation of the earthing coil below the concrete block and encapsulation of the butt end of the pole structure.
- The earth conductor shall be secured above ground level to prevent the tag falling into the hole during subsequent works.
- Where B Type earthing coil has been installed, the coil shall be buried and the base of the hole backfilled with 100 mm of soil prior to the installation of the pole.

#### 4.7 Concrete block Installation (Besser Block)

- A Concrete block will be securely fastened to the bottom of the pole web plate by using heavy duty cable ties. The cable ties will be inserted through the holes in the concrete block and looped around the bottom web plate of the pole base. The cable tie ends should be trimmed.
- The pole will be positioned into the foundation hole as per S01-04-01-21

#### 4.8 Pole Installation - General

- The pole shall be installed without the pole being in contact with the surrounding ground at the sides of the hole. A minimum of 100 mm clearance shall be maintained between the sides of the hole and the steel pole at any point.
- Record and document relevant information (refer 6.5)

#### 4.9 Pole Installation - Two Piece Lower Section

- Take care when lowering the pole base into the hole to make mimimal contact with the sides of the hole
- When the pole base with the concrete block attached have been lowered into the hole it shall remain supported by the crane.
- The earthing wire shall be held outside the hole and fed up through the ground plate after the pole has been lowered into the hole and secured to prevent the earth from falling back into the hole.
- Temporary bracing (props or pikes) shall be installed on all four sides of the pole to align the pole base vertically or raked as per the design.
- The 300mm ground plate on the pole base shall be positioned so the centre of the plate is approxmitaly level with the ground .

#### 4.10 Pole Base Replacement

Pole base replacement is outside the scope of this work instruction refer to "Line Pole Remediation under Energised Conditions" (D2021/37271)

#### 4.11 Pole Installation - One Piece Pole

- Take care when lowering the pole into the hole to make minimal contact with the sides of the hole
- When the pole with the concrete block attached have been lowered into the hole it shall remain supported by the crane.
- The earthing wire shall be held outside the hole and fed up through the ground plate after the pole has been lowered into the hole and secured to prevent the earth from falling back into the hole.
- Temporary bracing (props or pikes) shall be installed on all four sides of the pole to align the pole vertically or raked as per design.
- The 300mm ground plate on the distribution pole shall be positioned so the centre of the plate is approxmately level with the ground

#### 4.12 Pole Installation - Raked Pole

Where a rake angle is specified, e.g. for dead end pole structures, the temporary support shall include suitable means to accurately establish and maintain the rake angle until removal of the support.

#### 4.13 Concrete - General

- Unless directed otherwise in the work pack instructions, all concrete used for the pole foundations shall be supplied by Quality Assured premix concrete company and are AS/NZS/1SO9001 accredited.
- Use N32 grade concrete for all concrete works (except in agresive soil conditions) including concrete for pole foundations, guy wire footings, stays etc. The N32 grade concrete shall have a maximum aggregate size of 20mm and target slump of 80mm plus or minus 15mm.
- For 'aggressive' exposures, concrete shall comply with the requirements of Appendix A & B.
- Rapid setting concrete may be used as directed in the work pack.

#### 4.14 Concrete Premix

- Concrete shall be delivered to site freshly batched and no retempering or addition of water will be permitted.
- Concrete should be placed directly from the chute into the hole at a rate so as not to cause the pole to move.

#### 4.15 Concrete Site Batched

- Where permitted (due to remote location) concrete may be site batched.
- The materials (aggregate and sand) shall be delivered to site dry.
- Concrete must be prepared using a mechanical mixer.
- The concrete mix shall be as specified in the work pack instructions.

#### **4.16 Concrete Placement**

- Once commenced, the concrete operation shall continue without significant pause to ensure that the concrete does not set in the hole prior to the next batch being placed. **NOTE:** For poles with conduits the concrete can be placed in two(2) batches.
- Concrete shall be placed evenly around the pole and inside of the pole structure.
- Concrete shall be vibrated throughout the pour to remove all air bubbles and ensure compaction around the steelwork.
- The steelwork shall be checked periodically during the concrete pour to ensure that it remains level and plumb.

- Once poured to ground level, the top of the foundation shall be hand tooled using a concrete float to
  provide a domed top surface at least 100 mm above ground level.
- The inside of the pole between the ground plates shall be filled with concrete to the top of the ground level plates and the top surface sloped to shed water away from the pole steelwork.
- Ensure concrete splatter is cleaned off steel work after placement of concrete
- Install barriers and signs BDOC2013/419

#### 4.17 Removal of Temporary Propping

- Unless directed otherwise, the temporary support (props/pikes) shall remain in place for a predetermined time following the initial set of the concrete.
- Unless directed otherwise, raking poles shall remain propped for a minimum of three days.

#### 4.18 Site Clean up

- At the completion of the works all debris and rubbish shall be removed from site.
- The ground around the pole shall be reinstated including top soil to the natural ground level
- All temporary fencing and barricades shall be removed and the site returned to its previous condition.

# **5** Definitions

Where terms or words are not included in the definitions section, refer to our glossary for clarification. The glossary is available in our process improvement and Event Information Management System.

Term	Definition
AASS/PASS	Actual or Potential Acid Sulphate Soils
Access Authority	Documented approval which permits access to work on or test apparatus.
Apparatus	Electrical apparatus and mechanical apparatus.
Approved	Having appropriate organisation endorsement in writing.
Authorised person	A competent person with technical knowledge or sufficient experience who has been approved to act on behalf of Power and Water to perform the duty concerned.
Chemically Aggressive Environments	The presence of aggressive chemicals in the soil that react with the concrete. (Sulphates, Sulphides, Acids, etc.)
Competent	Having the skills, knowledge and attributes a person needs to complete a task.
Competent person	A person who has acquired through training, qualification or experience the knowledge and skills to carry out the task.
	Competency is not simply a measure, or result, of training courses attended. Training provides a foundation for the development of competency, but achieving competency usually requires practical experience.
Conductor	A wire, cable or form of metal designed for carrying electric current.
Contractor	Any person and/or organisation entering into an agreement (whether oral or written) to provide goods or services to Power and Water.
Controller	The approved person responsible for control and/or operation of apparatus in high risk areas within premises owned, controlled or operated by Power and Water.

# POWER SERVICES - WORK INSTRUCTION

Term	Definition
Designated high voltage access area	An area, which includes high voltage conductors, which is defined by a barrier or similar structure as a requirement for the issue of an access authority.
DFT	Dry Film Thickness
Electrical Apparatus	Any electrical equipment, including electrical motors, transformers, switchgear, overhead lines and underground cables, the conductors of which are live or can be made live.
Employee	A person employed by Power and Water, a contractor or subcontractor, and a person employed by a contractor or subcontractor, who carries out work for Power and Water.
High voltage (HV)	A nominal voltage exceeding 1000 volts alternating current or exceeding 1500 volts direct current.
In the vicinity	<ul> <li>Either a situation where:</li> <li>A person is in close proximity to and there is a risk of either directly, or through any conducting medium, of unintentionally coming within relevant safe approach distances to live conductors; or</li> <li>There is a likelihood of unintentional contact with electrical apparatus or services that could cause personal injury or damage.</li> </ul>
Live	Energised or subject to hazardous induced or capacitive voltages.
Mobile plant	A crane, elevating platform, tip-truck or similar plant, any equipment fitted with a jib or boom including excavation equipment and any device capable of raising or lowering a load.
Person in charge	The person who has the responsibility of ensuring the safe conduct of work under their control.
Plant	Any plant or equipment that is not connected to the distribution system Any machinery, equipment, appliance, container, implement or tool, any component of any of those things and anything fitted or connected to any of those things. Examples of plant include lifts, cranes, computers, machinery conveyors, forklifts, vehicles, power tools and amusement devices.
Preparation/restoration instruction (PRI)	A documented instruction setting out the steps required to prepare the apparatus for access and to restore the apparatus after access has been relinquished.
Procedure	The documentation of a systematic series of actions (or activities) directed to achieve a desired result.
Rake	The angle of the centreline of the pole relative to vertical
Safe approach distance to live conductors	The minimum separation in air from a live exposed conductor that shall be maintained by a person, or any object (other than insulated objects designed for contact with live conductors) held by or in contact with that person.
Safety Observer	A competent person assigned the solitary duty of observing and/or monitoring the safety of person/s in potentially hazardous situations and providing warnings, where necessary.
Shall	Mandatory.
Should	Advisory or discretionary.
Standard safety clearances	The clearances used in the design of High Voltage installations to provide safe conditions from High Voltage exposed conductors for a person walking at ground level, or a person on any fixed ladder or platform.
Stripe coat	A coat of paint applied specifically to edges, welds, bolts, rivets, corrosion pits and other surface irregularities to ensure that satisfactory DFT is obtained over these areas. Stripe coats are applied by brush and worked into

Torm		Definition
	Тепп	Definition
		the surface profile. Subsequent coats should be applied while the stripe coat
		is still tacky.

# 6 Change Management and Continuous Improvement

#### 6.1 Consultation, Approval and Communication

This work instruction must be endorsed by the Line Manager/or Subject Matter Expert and approved by the Accountable Manager.

Role / title	Requirement		
Senior Manager Service Delivery	Accountable - approve this document		
Standards Engineer	Responsible - endorse this document		
Works Management	Review/Consult - endorse this document		
Works Practices	Review/Communicate – inform of any changes		

#### 6.2 Review

The requirements of this work instruction are mandatory and shall be reviewed and updated periodically for its ongoing effectiveness. This work instruction will be reviewed, at a minimum, every three years or in the event of any significant change in our vision, values, long term goals, risk appetite, policy statement business model or organisational structure, or related systems or processes.

#### 6.3 Internal References and Related Documents

Document Title	Record Number
Work, Health and Safety (WHS) Risk Management Procedure	Control0068
Work in the Vicinity of Apparatus Procedure	BDOC2016/56
Contractor WHS Management Procedure	Control0011
Vehicle Safety, Safe Driving and Traffic Procedure	Control0057
Standard Drawings – Distribution and Service Poles	S01-01-01-08 to 39
PWC Standard Drawing Line Pole Foundations	S01-04-01-21
PWC Standard Drawing Two Piece Spliced Pole Installation	S01-02-01-69
Concrete Block Item No 504476	
Cable ties Item No 504476	

#### 6.4 External References, Legislative and Regulatory Obligations

- NT Work Health and Safety (NUL) Act 2011
- NT Work Health and Safety (NUL) Regulations 2013
- NT Worksafe Code of Practice: Construction Work
- AS 1379 Specification and supply of concrete
- AS 1478 Chemical admixtures for concrete, mortor and grout.
- AS 2159 Piling Design and installation
- AS/NZS 2312 Part 1 Guide to the protection of structural steel against atmospheric corrosion by the use of protective coatings Paint coatings
- AS/NZS 2312 Part 2 Guide to the protection of structural steel against atmospheric corrosion by the use of protective coatings Hot dip galvanising
- AS 3600 Concrete structures
- AS 3799 Liquid membrane-forming curing compounds for concrete

- AS/NZS 3894.3 Site testing of protective coatings Method 3: Determination of dry film thickness
- AS 4312 Atmospheric corrosivity zones in Australia
- AS/NZS 4680 Hot-dip galvanised (zinc) coatings on fabricated ferrous articles

#### 6.5 Records Management

This work instruction and all related documents, are captured, stored and managed in our Electronic Document and Records Management System and controlled in the Controlled Document Register.

The following records shall be created and all relevant information sent to Asset Management:

#### Description

- ASCON drawings of new pole showing exact location
- Date commissioned (put in service)
- Pole size (eg. 12B) and type (1 piece, 2 piece flange, 2 piece splice or service pole)
- HV and LV pole configuration (eg. Aa)

#### 6.6 Improvement Suggestions

Improvement suggestions are captured and managed in our process improvement and event information management system. To log an improvement suggestion for this document please see the 'how to report an event' user guide located on our intranet or contact <u>events@powerwater.com.au</u>.

#### 6.7 Document History

Date of Issue	Version	Prepared By	Description of Changes	
22/3/2021	1.0	Nick Coe	Converted to new corporate format and reviewed with track changes. Previous document S01-04-04-01	
26/4/2023	1.1	Bryan Vanderstelt	Updated 4.13 Dot points 2 and 3	
14/8/2023	1.2	Bryan Vanderstelt	Updated 4.13 Dot point 2	

## 7 Appendices

#### **Appendix A: Typical Foundation Concrete Requirements**

This section details additional concrete durability guidelines for 'aggressive' exposures (as defined in AS3600) and additional concrete guidelines for underwater construction where foundations extend below the local groundwater table.

- A.1 The foundation concrete for aggressive exposure shall be Grade S40 supplied in accordance with AS 1379. The concrete shall have the following characteristics:
  Minimum Cement Content: 400 kg/m3 Type GP cement.
  Maximum Water/Cementitious ratio: 0.42
  Maximum Aggregate Size: 20 mm
  Target Slump: 125mm ± 30mm
- A.2 For marine exposures and where soil conditions are AASS/PASS, saline, hypersaline or otherwise aggressive environments as defined in clause 4.8 of AS 3600, or for placement under water, the concrete shall contain 30-35 kg/m3 condensed silica fume in addition to the requirements of AS3583 Part 3.

**Note:** When placing concrete under water use a trammie pipe (drop chute) or ensure the nozzle of the pump line is always immersed in fresh concrete

#### **Appendix B: Additional Special Concrete Guidelines**

This section details additional concrete guidelines which must be approved by PN Standards group, for underwater construction where foundations extend below the local groundwater table or for the use of rapid setting or high early strength concrete.

- B.1 For placement under water, the concrete shall contain 30-35 kg/m3 condensed silica fume in addition to the requirements of A.1 and A.2.
- B.2 Where rapid setting / high early strength development is required for operational reasons, the concrete mix design shall use Type HE cement and/or set accelerating admixtures to achieve the performance requirements that comply with AS 1478. The concrete shall otherwise meet or exceed the requirements of A.1 and A.2 above. Alternative rapid-setting binders may be submitted for consideration by the Project Coordinator, but shall not be used without written approval from PN Standards.