

Network Connection Standard

Version 1: 31/03/2026



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6 EA Networks Standard – Document Change Request 25

Useful Reference Material

Reference	Location
EA Networks Get Connected web portal	Power Services - EA Networks' Reliable Electricity Solutions EA Networks
EA Networks – Rural Network Harmonics Standard	https://a.storyblok.com/f/285789107945704/x/110d3f6ae1/harmonics-standard-ver-4-v2.pdf
EA Networks – Asset Management Plan	Disclosures - EA Networks' Compliance, Financial, and Transparency Reports EA Networks
EA Networks – New Modified Connections Extensions Policy	EA Share point – EA Library - Policies
EA Networks – Underground Structures Manual	EA Share point – Network information
EA Networks – Underground Construction Manual	R:\Network\Contracts\Major, Minor Works 2025\UG Construction Manual version 3 Mar 2026.docx
EA Networks – Overhead Structures Manual	EA Share point – Network information

Enquiries regarding this document

Contact person: General Manager - Networks

1 General

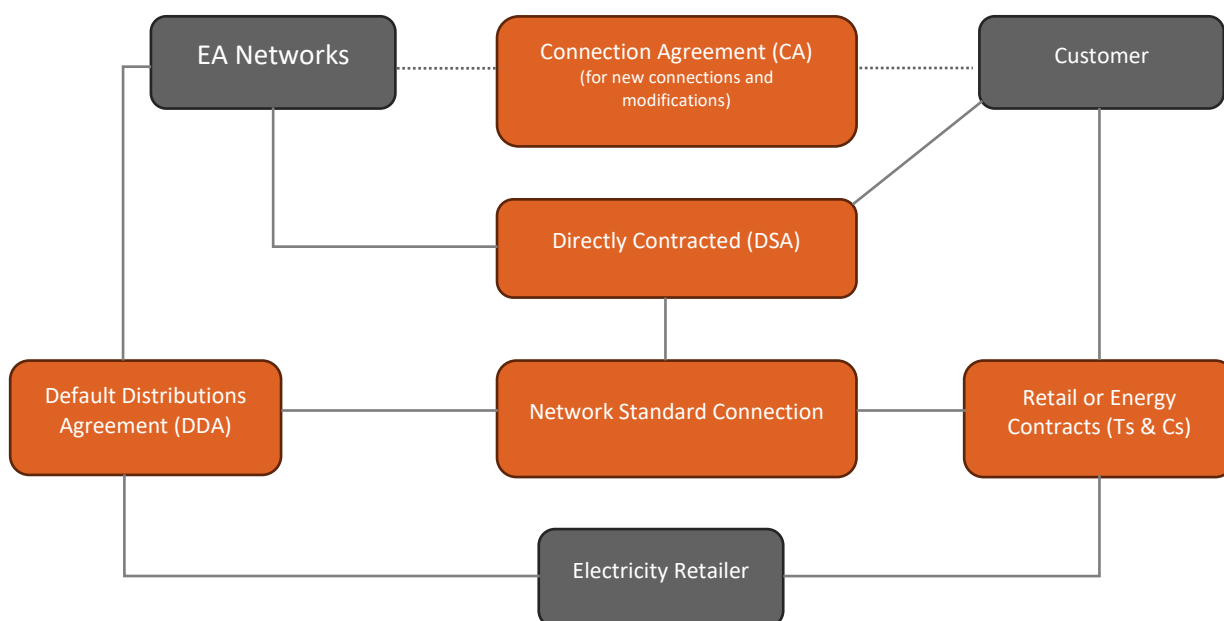
1.1 Purpose

This network connection standard outlines technical requirements for EA Networks standard network construction and connections to EA Networks' electricity distribution network.

1.2 Scope

This standard applies to all stakeholders in EA Networks' business including electricity retailers, contractors, developers, connected customers, consultants and advisers.

Overall, this standard outlines how we accommodate and manage electrical loads on our network. It covers the design and construction of our network and the customer's electrical interface to the network.



1.3 Summary

The Network Connection Standard is a comprehensive technical standard issued by EA Networks that outlines the requirements, design principles, and operational guidelines for constructing and connecting to their electricity distribution network. It addresses both urban and rural network configurations, specifying equipment types, installation practices, and customer responsibilities to ensure safe, reliable, and efficient network operation. The document also includes references to related manuals and policies and provides contact details for enquiries.

The purpose of the standard is to define technical requirements for EA Networks' standard network construction and connections to their electricity distribution system. It applies to all stakeholders including electricity retailers, contractors, developers, customers, consultants, and advisers. The document outlines how electrical loads are accommodated and managed, covering network design, construction, and customer interface. It clarifies that no new commercial terms are introduced, and compliance may be mandated through other agreements or retailer contracts. The standard practices may be amended over time, with changes effective from the issue date for new connections or modifications.

1.4 Status of this standard

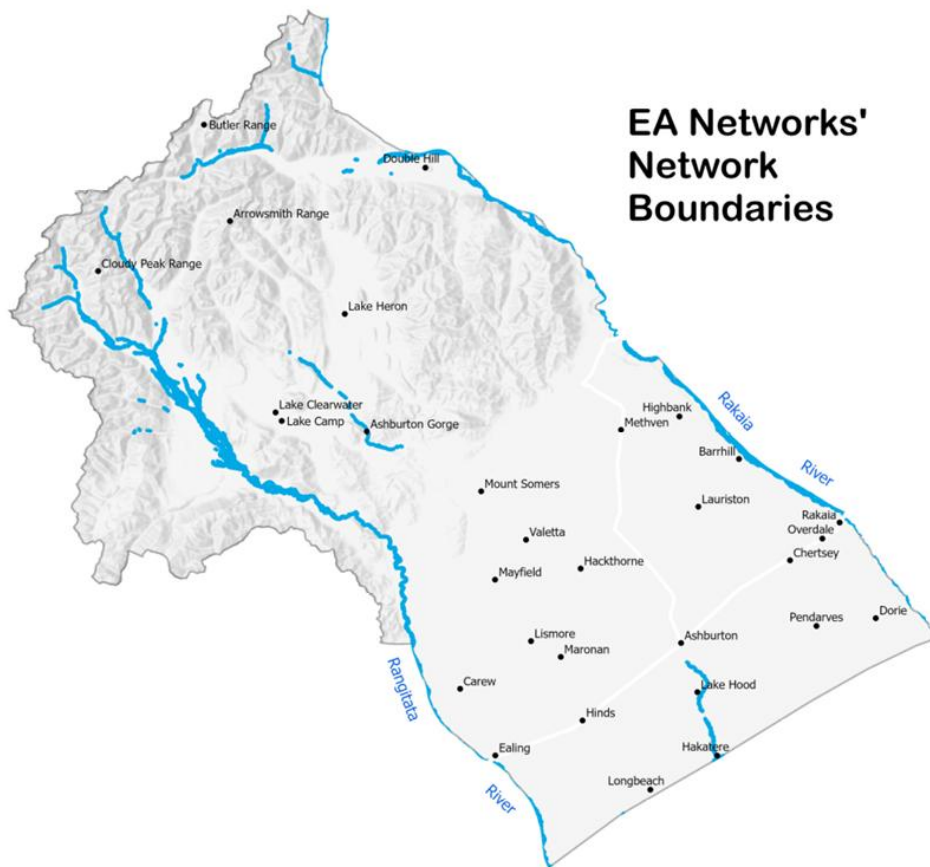
This document does not introduce any new commercial terms. Commercial arrangements are set out in the relevant agreements between EA Networks and the applicable party.

This document describes EA Networks' current standard practices, which may be amended from time to time in accordance with legislative and regulatory requirements. Unless stated otherwise, any changes take effect from the date of issue and apply to new connections or modifications from that date.

This document does not, of itself, create any legal obligations except where compliance is required under another agreement. In the event of any inconsistency, the terms of the relevant agreement shall prevail.

Customers may be required, through their retailer contracts, to comply with certain provisions of this document where necessary for safety and efficient network operation.

For enquiries relating to this document, contact EA Networks (Electricity Ashburton Limited).



2 Network Design and Construction

2.1 Standard Urban or Commercial Network Construction Types

EA Networks' urban network supplies customers within Ashburton and surrounding townships (e.g., Rakaia, Hinds, Mayfield, Mt Somers, Hakatere Huts, and South Rakaia Huts) via a combination of local medium-voltage (MV) and low-voltage (LV) systems.

The network is predominantly interconnected, with some radial feeders where required, providing an appropriate level of reliability, operational flexibility, and security across the urban area.

2.1.1 MV Network Construction in Urban Areas

Ashburton operates at 11 kV, while surrounding townships operate at either 11 kV or 22 kV, depending on historical development and load requirements.

Urban distribution is supplied from zone substations, providing both capacity and contingency for each township.

a) Existing MV Network

The MV network is supplied from zone substations and provides supply to ground-mounted kiosk substations and larger commercial transformer installations.

The network is predominantly underground, consisting mainly of XLPE cables, with some legacy paper-lead cable still in service. A small proportion of overhead MV remains.

Cable types currently in service include:

- 11 kV: 3-core XLPE aluminium (95, 150, or 300 mm²).
- 22 kV: 3-core XLPE aluminium (120 mm²).

Kiosk substations generally comprise a ground-mounted transformer, LV panel, and MV switchgear in the form of RMUs (e.g. Magnefix or Xiria).

Kiosks are typically constructed from fibreglass (11 kV) or steel (22 kV).

b) New or Upgraded MV Network

All new and upgraded MV network installations shall be designed and constructed in accordance with this standard and underground structure manual [1] and underground construction manual [4].

We construct the MV network using underground XLPE insulated cables. Overhead MV construction is not permitted for new works and shall be progressively replaced during upgrades.

Standard MV cable selections shall be:

- 11 kV: 3-core XLPE aluminium (95, 150, or 300 mm²), selected based on load and network requirements.
- 22 kV: 3-core XLPE aluminium (120 mm²), or as required by network design standards.

All new and upgraded kiosk substations shall include:

- Ground-mounted transformers sized for demand and future growth.
- LV panels compliant with current standards.
- RMU-based MV switchgear (e.g. Magnefix, Xiria, or approved equivalent).

Kiosk construction shall comply with EA Networks' standard designs:

- Fibreglass for 11 kV.
- Steel for 22 kV.

Network configuration, cable sizing, and routing shall be determined in accordance with load requirements, security standards, and overall network design criteria.

Where existing assets are retained, integration with legacy infrastructure shall be subject to engineering assessment.

2.1.1.1 Urban MV Network Connection

Where a connection to the urban MV network is required, EA Networks will design, procure, and construct the connection in accordance with the standard urban MV network construction defined in above section 2.1.1b).

Due to the bespoke nature of the connection type, EA Networks will assess and implement the most technically appropriate and cost-effective solution to ensure the network continues to operate safely, within design limits, and can accommodate the new connection.

Customer connections shall be installed underground with minimum service main requirements defined in section 3.5. The MV service mains and transformer shall be protected by RMU fusing or a Circuit Breaker (CB).

The point of ownership demarcation shall be at the property boundary.

In all cases, EA Networks determines the most technically appropriate and cost-effective solution to ensure safe and compliant network operation.

2.1.2 LV Network Construction in Urban Areas

LV distribution is managed through the LV panel within the town kiosk substation described in section 2.1.1 b), which can accommodate up to six LV feeder circuits plus three streetlighting or auxiliary circuits. Kiosks also house ancillary equipment such as ripple relays, maximum demand indicators, and, at new sites, a Power Pilot power quality and demand meter.

Customer connections are typically made via pillar boxes located at property boundaries at the lowest-cost connection point for EA Networks.

a) Existing LV Network

The urban LV network is predominantly underground, with small sections of legacy overhead lines remaining. These overhead sections generally have limited capacity and minimal interconnection due to smaller conductor sizes and widely spaced pole-mounted substations.

The underground LV network provides increased capacity and operational flexibility, with interconnection between feeders enabling load transfer during planned outages or fault conditions. These transfers are facilitated via distribution link boxes with modular LV switchgear.

Existing underground cables comprise a mix of legacy and current standard cable types and sizes, which are not consistent across the network.

Typical cable types in service include:

- 4-core 185 mm² or 240 mm² XLPE aluminium for LV feeders.
- 3-core 35 mm² copper neutral screen cable for connections between LV feeders and pillar boxes.

Legacy cable types and non-standard sizes remain in service and can influence network capacity, voltage performance, and upgrade requirements.

b) New or Upgraded LV Network

All new and upgraded LV network installations shall adopt a standardised underground design in accordance with this standard and underground structure manual [1] and underground construction manual [4].

The LV network shall be installed underground. Overhead LV construction is not permitted for new works and shall be progressively replaced during upgrades.

LV feeders and associated network connections shall utilise the following standard cable types:

- 4-core 185 mm² or 240 mm² XLPE aluminium for LV feeders.
- 3-core 35 mm² copper neutral screen cable for connections between LV feeders and pillar boxes.

All installations shall be completed using approved jointing methods and construction practices.

The LV network will be designed to provide adequate capacity, voltage performance, and operational flexibility, including the use of interconnected feeders and distribution link boxes to enable load transfer during outages and fault conditions.

Upgrade works will be undertaken to improve capacity, reliability, and performance, and will incorporate standard configurations and equipment where reasonably practicable, with integration of existing assets subject to engineering assessment.

2.1.2.1 Urban LV Residential or Commercial Connection

New customer connections to the urban LV network are provided where sufficient network capacity exists and LV network voltage drop limits ($\leq 2.5\%$) are met.

Connections are typically made via a new or existing MK1 pillar box installed at the property boundary and connected to the LV network using standard cable sizes as outlined in Section 2.1.2b).

Where the existing LV network cannot support the connection due to capacity or distance limitations, EA Networks may upgrade the network or establish a new supply. This may involve increasing transformer capacity, extending or reinforcing LV circuits, upgrading conductors, or installing a new town kiosk substation supplied from the MV network.

Customer connections shall be installed as underground service mains defined in section 3.6 to the roadside pillar box, protected by HRC fuses with limits defined in section 3.6.

The ownership demarcation point is at the property boundary or the load side of the LV fuses, as appropriate.

In all cases, EA Networks determines the most technically appropriate and cost-effective solution to ensure safe and compliant network operation.

2.1.3 Distribution Transformers in Urban Areas

a) Existing Distribution Transformers

The network comprises a mix of standardised ground-mounted distribution transformers, broadly categorised as ≤ 500 kVA and > 500 kVA. Some legacy pole-mounted transformers remain in service but are being progressively replaced with ground-mounted installations.

Distribution transformers are installed on concrete pad foundations and provide the interface between the MV and LV networks. MV protection is typically provided via RMU-based fusing (e.g. Magnefix).

i) Transformers $\leq$ 500 kVA

Transformers rated $\leq$ 500 kVA are typically installed within standard urban kiosk substations defined in sections 2.1.1b) and 2.1.2 b).

These installations comprise a ground-mounted transformer integrated with MV and LV switchgear and associated ancillary equipment. This configuration is standard for urban residential areas.

ii) Transformers $>$ 500 kVA

Transformers rated $>$ 500 kVA (typically 750 kVA or 1000 kVA) are also installed as ground-mounted units on concrete pad foundations.

These installations generally comprise a pad-mounted transformer with one or more separate steel kiosks, allowing MV and LV switchgear to be housed separately. They are typically used in commercial and industrial areas where higher capacity is required and may be integrated into interconnected LV networks.

b) New Distribution Transformers

All new and upgraded distribution transformer installations shall comply with this standard, and EA Networks' underground structure manual [1] and underground construction manual [4].

Distribution transformers shall be installed as ground-mounted units on concrete pad foundations, or within a bund where the oil quantity is >1000 L unless an exemption is provided by Ashburton District Council.

Locations shall be selected to ensure safe separation distances from combustible buildings and sources of flammable gases or liquids, in accordance with AS 2067.

Pole-mounted transformers are not permitted for new installations and shall be progressively replaced during upgrade works.

Transformer installations shall be configured as follows:

- $\leq$ 500 kVA: installed within standard kiosk substations with integrated MV and LV switchgear
- $>$ 500 kVA: installed on concrete pad foundations with MV and LV switchgear housed in separate kiosks or approved enclosures

MV protection shall be provided via RMU-based switching and fusing or approved equivalent. LV protection at the transformer must be either:

- via suitably rated HRC fuse, or
- a Moulded Case Circuit Breaker (MCCB).

Earthing systems shall be designed and installed using a MEN (Multiple Earthed Neutral) system in accordance with EA Networks' standards.

Transformer capacity, configuration, and placement shall be selected based on load requirements, network security, and future growth.

Where existing assets are upgraded, standard configurations shall be adopted where reasonably practicable. Integration with legacy equipment and network configurations shall be subject to engineering assessment

2.2 Standard Rural Network Construction Types

EA Networks' rural network supplies predominantly farming customers through a combination of overhead and underground LV and MV distribution lines. The network operates mainly in radial and interconnected radial configurations, providing reliability and operational flexibility where practical.

2.2.1 LV Network Construction in Rural Areas

Rural 230V or 400V LV areas are generally located in rural areas other than settlements (e.g., Rakaia, Hinds, Mayfield, Mt Somers, Hakatere Huts, and South Rakaia Huts), which are supplied by LV networks like urban areas.

2.2.1.1 Rural LV Overhead Network Areas

a) Existing LV Overhead

Some rural LV networks remain as overhead construction, typically underbuilt on the same poles as the MV network.

As this is a legacy design, conductor types and sizes vary and may include smaller legacy conductors (e.g. 7/16 up to 19/14 copper) resulting in limited capacity and performance in some areas.

b) New LV Overhead

Overhead LV construction is not permitted for new installations. All new LV feeders shall be installed underground in accordance this standard, and EA Networks' underground structure manual [1] and underground construction manual [4] and overhead structure manual [2].

Where required, a new pole-mounted transformer may be installed to supply a new underground LV network.

LV cable selection will be based on load requirements and customer numbers and shall utilise standard conductor sizes defined in Section 2.1.2b).

Existing overhead LV networks will be progressively upgraded, with preference given to conversion to underground systems. Where undergrounding is not reasonably practicable, upgrades will incorporate appropriate conductor sizing, transformer capacity, and protection improvements in accordance with current standards.

Where required, a new supply may be provided from a transformer connected to the MV network.

It is now standard to construct all new LV feeders underground. Conductor/cable sizes are typically dependant on the number of customers and load required, therefore conductors defined in section a) will generally be used.

2.2.1.1.1 LV Overhead Connection

New connections shall be provided to existing LV network where sufficient capacity exists and network LV voltage drop limits ($\leq 2.5\%$) are met.

Connections shall typically be made from an overhead line or pole-mounted transformer.

Customer connections shall be installed as underground service mains defined in section 3.6 to the roadside pillar box, protected by HRC fuses with limits defined in section 3.6.

The point of ownership demarcation at the property boundary or the load side of the LV fuse as appropriate.

In all cases, EA Networks determines the most technically appropriate and cost-effective solution to ensure safe and compliant network operation.

2.2.1.2 Rural LV Underground Network Areas

a) Existing LV Underground

Rural LV networks are typically underground alongside MV networks or supplied as spurs from MV feeders.

b) New or Upgraded LV Underground

All new rural LV networks shall be constructed underground in accordance with this standard, and EA Networks' underground [1] and overhead structure manuals [2] and underground construction manual [4].

LV networks shall be supplied from distribution transformers connected to the MV network.

Cable selection and sizing shall be based on load requirements and shall utilise standard conductor sizes defined in Section 2.1.2 b).

Existing underground LV networks will be upgraded where required to improve capacity, reliability, and performance. Upgrade works will incorporate standard configurations and equipment where reasonably practicable, with integration of existing assets subject to engineering assessment.

2.2.1.2.1 LV Underground Connection

This connection is the same as an urban connection and is defined in section 2.1.2.1.

2.2.2 MV Network Construction in Rural Areas

Rural feeders operate at either 11 kV or 22 kV depending on historical development and local load requirements and are supplied from nearby zone substations that provide capacity and contingency for surrounding areas. A typical feeder exits the zone substation via an indoor circuit breaker. Overhead feeders transition through a short length of underground cable before rising to an overhead line on a nearby pole, while underground feeders continue directly as underground cable. Feeders typically extend 10–15 km to an interconnecting adjacent feeder—usually supplied from another zone substation—with an open point between them.

2.2.2.1 Rural MV Overhead Network Areas

MV overhead feeders make up a majority of the rural MV distribution network as this the most cost-effective method of install.

a) Existing MV Overhead

The existing MV overhead network comprises a mixture of legacy and standardised equipment, most of which is described in the below.

b) New or Upgraded MV Overhead

All new and upgraded MV overhead network construction shall utilise standardised equipment and configurations in accordance with this standard, and EA Networks' overhead structure manual [2].

Standard overhead construction shall include:

- Treated hardwood poles and crossarms
- Porcelain pin insulators
- Polymer strain insulators
- 22 kV conductors (e.g. Flounder, Mink, or Dog), selected based on load, wind, and snow loading
- Air break and load break disconnectors

Overhead construction shall be designed to operate at 22 kV. Conversion of existing 11 kV networks to 22 kV shall be undertaken where reasonably practicable to improve capacity, voltage performance, and efficiency.

Feeder protection and sectionalising shall be coordinated with zone substation protection systems and shall incorporate:

- Reclosers (e.g. Nulec CB)
- Drop-out fuses
- Sectionalising devices (e.g. Jin Kwang)
- RMUs (e.g. Xiria), where applicable

Conductor selection, structure design, and equipment ratings shall be determined based on load requirements, environmental conditions, and network design standards.

Existing MV overhead networks shall be progressively upgraded based on asset condition, capacity requirements, network security, and customer demand. This may include conductor replacement, pole and structure renewal, phase upgrades, and conversion to three-phase supply where required.

Underground cable may be utilised as an alternative to overhead construction where technically suitable and cost-effective.

2.2.2.2 Rural Medium Voltage Connection

a) New Tee connection to Overhead Network

A new customer may connect where:

- sufficient thermal capacity exists,
- voltage drop limits are met, and
- the network is within practical distance.

Where these criteria are not met, the network shall be upgraded or extended. Upgrades may include:

- provision of three-phase supply,
- feeder extension,
- installation of additional protection equipment, or
- upgrading conductors.

Connections shall typically be made via an overhead tee from an existing feeder to a privately owned underground MV service main.

Customer connections shall be installed underground with minimum service main requirements defined in section 3.5.

The point of ownership demarcation shall be at the property boundary.

All works shall comply with the standard requirements defined in Section a)2.2.2.1b).

In all cases, EA Networks determines the most technically appropriate and cost-effective solution to ensure safe and compliant network operation.

b) Existing Upgraded Tee Connection

Where an existing overhead tee connection is upgraded, works may include upgrading from single-phase or two-phase to three-phase supply, or replacing sections of line that are aged, damaged, or no longer meet capacity requirements.

EA Networks will provide appropriate protection, including drop-out fuses (single or gang-operated) and air break switches as required.

All works shall comply with the standard requirements defined in Section a)2.2.2.1b).

In all cases, EA Networks determines the most technically appropriate and cost-effective solution to ensure safe and compliant network operation.

2.2.2.3 Rural MV Underground Network Areas

MV underground feeders form a relatively small portion of the rural MV network and are applied selectively based on safety, cost, environment, and technical constraints.

a) Existing MV Underground

Rural MV underground feeders are typically installed in specific locations such as state highways, Transpower crossings, or other areas where overhead construction is not suitable.

b) New or Upgraded MV Underground

MV underground networks shall be installed selectively, considering cost, environmental constraints, safety, and terrain.

All new and upgraded underground construction shall comply with this standard, and EA Networks' underground structure manual [1], underground construction manual [4] and overhead structure manual [2].

Standard MV underground construction shall include:

- 22 kV 3-core 120 mm² XLPE aluminium cable for feeders.
- Tee connections utilising dead-break elbow terminations.

Feeder protection and sectionalising shall be coordinated with zone substation protection systems and shall utilise appropriate devices in accordance with EA Networks standards.

Undergrounding of rural MV networks shall be undertaken where required, including replacement of end-of-life overhead lines or where underground construction provides a technical or economic benefit.

Cable selection, routing, and installation methods shall be determined based on load requirements, environmental conditions, and overall network design standards.

2.2.2.4 New Tee Connection to Underground Network

A new customer may connect where:

- sufficient thermal capacity exists,
- Network MV voltage drop limits are met, and
- the network is within practical distance.

Where these criteria are not met, the network shall be upgraded or extended. Upgrades may include:

- provision of three-phase supply,
- feeder extension,
- installation of additional protection equipment, or
- upgrading conductors.

Connections to the underground network shall be made via a high voltage tee-box using dead-break termination elbows to connect the privately owned service main cable.

Customer connections shall be installed underground with minimum service main requirements defined in section 3.5.

The point of ownership demarcation shall be at the property boundary.

All works shall comply with the standard requirements defined in Section a)2.2.2.3 b).

2.2.3 Distribution Pole Mount Transformers in Rural Areas

a) Existing Pole Mount Distribution Transformers

There is a mix of legacy and modern single- and three-phase transformers installed on EA Networks' overhead feeders and on private property.

Pole-mounted transformers are used across a range of rural applications, including irrigation, farmhouses, dairy sheds, and farmyards. Most installations are ≤ 100 kVA; however, some legacy units > 100 kVA remain in service.

Transformers are installed in configurations based on size:

- ≤ 100 kVA: mounted using hanger brackets.
- >100 kVA: legacy installations on pole structures.

Pole-mounted transformers are protected by HV drop-out, Dominion, or Pacific fuses.

b) New or Upgraded Pole Mount Distribution Transformers

Where a new or upgraded LV connection to a rural overhead network requires a transformer, a pole-mounted transformer may be installed either within the road reserve or on customer-owned overhead lines, at a location that meets customer requirements and represents the most practical and cost-effective solution for EA Networks.

All new and upgraded pole mounted transformer installs shall comply with this standard, and EA Networks' overhead structure manual [2].

Transformer installations shall comply with the following:

- Transformers ≤ 100 kVA may be pole-mounted.
- Transformers > 100 kVA shall be ground-mounted.
- Transformers shall be of galvanised steel construction.

Installation requirements for transformers ≤ 100 kVA will utilise hanger bracket mounting.

All installations shall include:

- HV drop-out fuse protection.
- Provision for LV connection via DIN-mounted HRC fuses mounted on the cross arm.
- Off-load tap changers (+7.5% / -2.5%) for voltage regulation.

Earthing systems shall be provided using a MEN (Multiple Earthed Neutral) system in accordance with EA Networks' standards.

Pole-mounted transformers shall be upgraded where required due to increased load demand, phase upgrades (e.g. single to three-phase), or asset condition.

Upgraded transformers may remain pole-mounted where rated ≤ 100 kVA and the supporting structure is suitable. Otherwise, installations shall transition to a ground-mounted configuration.

2.2.3.1 Pole Mount Transformer Connection

New LV connections shall be made via an underground service main connected to the LV fusing provided defined in section 2.2.3 b). Minimum service main requirements are defined in section 3.5, and fusing requirements are defined in section 3.6.

Table 1 below shows the available pole mountable transformer sizes required relative to the requested capacity.

Requested capacity (up to)	Transformer size (kVA)
1ph 32 amp, 8 kVA	15
1 ph 63 amp, 15 kVA	15
3 ph 32 amp, 22 kVA	30
3 ph 63 amp, 45 kVA	30
3 x 80 amps, 55 kVA	50
3 x 100 amps, 69 kVA	50
3 x 125 amps, 86 kVA	75
3 x 160 amps, 110 kVA	100

Table 1

Note: The capacities in table 1 above relates to a single load connection, for multiple connections or solar connections EA Networks will advise the transformer capacity required.

2.2.4 Distribution Ground Mount Transformers in Rural Areas

a) Existing Ground Mount Distribution Transformers

There is a mix of legacy and modern single- and three-phase ground-mounted transformers installed across rural overhead and underground networks, as well as on private property.

Ground-mounted transformers are widely used in rural applications such as irrigation, farmhouses, dairy sheds, and farmyards, and are typically > 100 kVA, although smaller units are also present.

Installations include mini/micro substations and pad-mounted transformers, generally located on private property or along underground feeders where supply is required. Protection arrangements comprise a mix of zone substation circuit breaker protection, HV pole-mounted fuses, and in-tank HV fuses.

b) New Ground Mount Distribution Transformers

Where a new or upgraded LV connection to a rural overhead or underground network requires a transformer, a ground-mounted transformer shall be installed either within the road reserve or at the end of a customer-owned service main, at a location that represents the most practical and cost-effective solution.

All new and upgraded ground mounted transformer installs shall comply with this standard, and EA Networks' underground structure manual [1] and underground construction manual [4].

Distribution transformers shall be installed as ground-mounted units on concrete pad foundations, or within a bund where the oil quantity is >1000 L unless an exemption is provided by Ashburton District Council.

Locations shall be selected to ensure safe separation distances from combustible buildings and sources of flammable gases or liquids, in accordance with AS 2067.

Ground-mounted transformer installations shall be selected and configured as follows:

- Mini/micro substations (typically ≤ 100 kVA) shall be installed where a compact, enclosed solution is required, such as on private property, along underground feeders (e.g. state highways), or where integrated MV and LV equipment is preferred
- Pad-mounted transformers (typically > 100 kVA) shall be installed for higher-capacity applications, typically at the end of overhead or underground MV service mains

All installations shall comply with the following:

- Installed on a precast concrete pad.
- Earthing provided using a MEN (Multiple Earthed Neutral) system.
- Fitted with off-load tap changers (+7.5% / -2.5%) for voltage regulation.
- HV protection via in-tank fuses.
- HV drop pole mounted drop out fuses where applicable.

LV connections shall be provided via ganged HRC fuse units housed within the micro-substation or in a pillar box (toby box), installed within 1 m of the transformer and connected using appropriate copper cable.

Ground-mounted transformers will be upgraded where required due to increased load demand, phase upgrades (e.g. single to three-phase), or asset condition.

Upgrades will incorporate current standard configurations, including capacity increases, protection modernisation, and LV network reconfiguration where required, with integration of existing assets subject to engineering assessment.

2.2.4.1 Ground Mount Transformer Connection

New LV connections shall be made via an underground service main connected to the LV fusing provided defined in section 02.2.4 b). Minimum service main requirements are defined in section 3.5, and fusing requirements are defined in section 3.6.

Table 2 below shows the available ground mountable transformer size's required relative to the requested capacity.

Requested capacity (up to)	Transformer size (kVA)
1 ph 32 amp, 8 kVA	30
1 ph 63 amp, 15 kVA	30
3 ph 32 amp, 22 kVA	30
3 ph 63 amp, 45 kVA	30
3 x 80 amps, 55 kVA	50
3 x 100 amps, 69 kVA	50
3 x 125 amps, 86 kVA	75
3 x 160 amps, 110 kVA	100
3 x 200 amps, 138 kVA	150

3 x 250 amps, 173 kVA	150
3 x 315 amps, 217 kVA	200
3 x 500 amps, 345 kVA	500
3 x 630 amps, 435 kVA	500

Table 2

Note: The capacities in Table 2 above relates to a single load connection, for multiple connections or solar connections EA Networks will advise the transformer capacity required.

2.3 Zone Substation Construction Type

This section defines the current standard configuration for 66/22 kV (or 66/11 kV) zone substations, applicable to both rural and urban installations.

Zone substations are supplied by a minimum (except for Dorie Substation) of two 66 kV sub-transmission lines to provide N-1 security to the transformer.

Each 66kV line termination is equipped with dead tank, SF6 circuit breakers, incorporating line differential protection and distance protection relays.

The 66 kV busbar system comprise tubular aluminium conductors mounted on steel support structures. Busbar configurations are selected based on application, with single bus arrangements applied in rural substations and dual bus zone configurations applied in urban substations. Busbar protection is provided using high impedance busbar protection relays.

Power transformers consist of one or two ONAN/ODAF 10/20 MVA 66/22 kV units, each fitted with a +5/–15% on-load tap changer. Transformer neutral earthing is provided via a 320 A Neutral Earthing Resistor (NER), rated at 40 ohms for 22 kV systems or 20 ohms for 11 kV systems. Each transformer is be protected by a transformer differential protection relay.

Transformers supply indoor 22 kV metal-clad switchboards, typically configured as 5 or 6-way boards comprising one incomer and multiple outgoing feeders. Where required, particularly in urban substations, a bus coupler is provided between multiple switchboards. Feeder protection is provided using overcurrent protection relays.

Urban substations incorporate multiple switchboards (typically four) to provide operational flexibility and capacity, while rural substations generally utilise a single switchboard with provision for future expansion and parallel transformer operation.

Local service supply is provided via a vacuum insulated RMU.

2.3.1 Large Industrial Zone Substation Connection

Connections for large industrial customers at zone substations are typically bespoke and non-standard, are assessed on a case-by-case basis considering substation capacity and security requirements. Where upgrades are required, EA Networks standard approach is to engineer, procure, and install zone substation equipment in accordance with the Zone Substation Construction Type outlined above.

An interface agreement will be established between EA Networks and the connecting party. This will define ownership demarcation points, protection, control and SCADA requirements, operating protocols, and curtailment arrangements (where distributed generation within the connection or flexible load arrangements are involved).

The standard configuration for a single distribution feeder comprises a 24 kV, 630 A continuously rated high-voltage vacuum circuit breaker, equipped with embedded Class 5P15 current transformers (CTs) rated at 400/200:1 per phase. Voltage transformers (VTs) are not typically included as part of the feeder circuit breaker and are only provided where specifically required.

Each circuit breaker is designed to accommodate one set of three-core (3C) cables, suitable for termination onto C-cone (Interface C) type bushings, with a maximum conductor size of 630 mm² aluminium (or equivalent copper cross-section).

Provision for MV metering would need to be considered by both parties, but it is the customers responsibility to initiate this with their retailer.

2.4 Sub transmission Construction Type

EA Networks has historically operated both 33 kV and 66 kV sub transmission systems to supply EA's zone substations, but 66 kV is now the standard voltage going forward. The 33 kV network has been progressively retired, with the largest 33 kV system—supplying Ashburton, Fairton, and Seafield—decommissioned in 2019 following conversion of Ashburton Zone Substation to 66 kV and construction of the Fairton 66 kV substation.

The only remaining 33 kV assets are two radial feeders supplying Mt Hutt and Montalto. As radial lines, any fault results in loss of supply, highlighting either the appropriate security class for the size of load (Mt Hutt) or their limited long-term role (Montalto being converted to 22kV supply).

In contrast, the 66 kV network forms the backbone of EA Networks' rural supply. It consists of two internally interconnected closed rings linking Methven and Mt Somers, with the former 33 kV line between them upgraded to 66 kV in 2024 to improve security. The northern ring supplies multiple 66/22 kV substations and carries more than 100 MVA of summer load, while the southern ring provides full redundancy so that a single 66 kV line fault does not interrupt supply.

The current standard overhead construction uses hardwood poles typically with 22kV distribution lines underbuilt. All 66 kV insulators are manufactured using polymer materials with a clamp top

The current standard for new overhead rural construction conductor is Jaguar (low snow loading areas) or Lemon (heavy snow loading areas) which both have a nominal thermal rating of approximately 500 amps (summer) and 600 amps (winter).

2.4.1 Sub transmission Connection Type

The sub transmission connection type is bespoke and generally non-standard, pending a case-by-case review of the substation capacity and security, and a substation upgrade was required, EA Networks standard approach would be to engineer, procure and connect standard zone substation equipment described in the Zone Substation Construction Type section above.

An interface agreement will be negotiated between EA Networks and the connecting party to define ownership demarcation points, protection, control, SCADA & Control, operating protocols and curtailment arrangements (where distributed generation within the connection or flexible load arrangements are involved).

3 Installations

3.1 Introduction

This document outlines the key requirements and standards for connecting to the EA Networks' distribution system. It defines the roles and responsibilities at the Network Connection Point (NCP), establishes technical and operational requirements for service mains, protection, metering, and load management, and provides guidance on power quality, motor starting, and customer obligations. These requirements ensure safe, reliable, and efficient integration of customer installations with the network while maintaining overall system performance and compliance with industry standards.

3.2 Network Connection Point

The Network Connection Point (NCP) is the point on the network at which ownership of electrical assets transfers from EA Networks to the customer.

The NCP defines the interface between the electricity network and the customer's installation. It is generally located at or near the property boundary, unless an alternative arrangement has been approved by EA Networks.

EA Networks is responsible for all equipment located on the network side of the NCP.

The customer is responsible for all equipment and wiring on the installation side of the NCP.

3.3 Installation Control Point

Installation Control Point (ICP) is the isolation point and has an associated unique number that identifies it as an individual power connection on the national electricity system.

3.4 Access and Easements

Network extensions often require new land or easements. Unless we specifically state otherwise, for all new equipment or corridors we will require the customer or developer to provide or obtain any necessary land or easements. Where substation sites or easements are required to service one customer only and the easement or site is on that customer's property then EA Networks will not contribute towards the cost of any easement or site.

3.5 Service Mains

For 11 kV and 22 kV connections, the minimum cable size permitted to connect to EA Network's MV network, without prior approval is 35 mm² aluminium (or equivalent) for both the conductor and, where applicable, the screen should have minimum rating of 3.3kA for one second.

For 400 V connections, the minimum cable size permitted to connect to EA Network's LV network, without engineering approval is 6.0 mm² copper (or equivalent). A neutral screened cable should be used.

3.6 LV Service Mains Fusing

For connections to the EA Networks' distribution network, the following load and protection limits apply:

- Single-phase connections are limited to a maximum supply capacity of 80 amps.

- For multi-phase connections, the difference between fuse ratings on any phase must not exceed 80 amps, ensuring balanced loading across the network.
- A maximum of three fuses is permitted per connection point, with no more than one fuse installed on each phase.

3.7 Metering

Each separate connection to the EA Networks' distribution network must have its own Installation Control Point (ICP). Each ICP must be associated with a single metering point only.

Where required by EA Networks for network operation or load management, customer loads must be separately metered. Irrigation installations exceeding 20 kW must be supplied independently of other load and connected via dedicated ICP and meter.

Metering installations are provided and maintained by an approved Metering Equipment Provider and must comply with the Electricity Industry Participation Code. EA Networks does not own customer metering equipment.

Where controlled load is required, equipment capable of responding to EA Networks' Ripple control signalling is required. EA Networks may temporarily control load during periods of peak demand to maintain network security and reliability, to facilitate maintenance, help restore supply following faults, and to improve the efficient use of the network and Transpower's grid.

3.8 Load Management

Electricity networks can experience periods of congestion when demand is high. This typically occurs during cold winter mornings, when residential water heating coincides with the start of the business day, and again in the evenings, when people return home and use heating, lighting, and cooking appliances.

On the rural network, peak demand can also occur when irrigation pumps are switched on at the same time. During these periods, network capacity can become fully utilised.

These peak periods are usually short in duration. Rather than investing significantly to increase network capacity for these brief peaks (which would ultimately increase line charges), EA Networks uses load management to maintain supply within available capacity.

Load is managed using a ripple signalling system, which allows certain appliances—typically hot water cylinders—to be temporarily switched off to reduce overall demand. This is referred to as shedding. As demand decreases, these appliances are progressively restored.

3.9 Harmonics

All new or updated supplies in the rural area must comply with EA Networks Rural Harmonics Standard. The Standard can be found on EA Networks' website here:

<https://a.storyblok.com/f/285789107945704/x/110d3f6ae1/harmonics-standard-ver-4-v2.pdf>

3.10 Power Factor

All connections must maintain a power factor of between 0.95 lagging and 0.95 leading whenever required by EA Networks including where it may affect other customers. For the purposes of this standard, power factor is defined as true power factor kW/kVA not displacement power factor $\cos \phi$.

Customer installations must operate within these limitations and must not cause adverse effects on the distribution network. Where an installation operates at an unsatisfactory power factor, EA Networks may require the customer to install and maintain appropriate power factor correction equipment to achieve compliance with network requirements.

3.11 Ownership

Ownership of network assets is defined in EA Networks' current Asset Management Plan available on EA Networks' website.

3.12 Motor Starting

To minimise interference to other customers during motor starting, EA Networks may specify a maximum motor starting current. This limit must not be exceeded under any circumstances.

3.12.1 Induction Motors

a) Dedicated Transformer Supply

Where a motor is supplied from a transformer that supplies only the motor and its associated equipment, the following applies:

Up to 25 kW

- Starter type: Direct-on-line (DOL).
- Specified current limit: Not applicable.

Above 25 kW

- Starter type: Dependent on motor size and location.
- Specified current limit: Determined by EA Networks.

The requirement for a specified current limit depends on the installation's location within the EA Networks' network.

A 'Motor Installation Details' (MS2) form must be completed and submitted for all motors with a rated output greater than 25 kW.

In some cases, the approved current limit may still permit direct-on-line (DOL) starting.

b) Shared Transformer Supply

Where a motor is supplied from a transformer that also supplies other customers:

- Three-phase motors greater than 4 kW, or
- Single-phase motors greater than 1.5 kW

A specified current limit may be required.

A Motor Installation Details (MS2) form must be completed and submitted to EA Networks for all such motors.

3.12.2 Motors Other Than Induction Motors

Requirements will be assessed on a case-by-case basis. Please refer to EA Networks for individual determination.

4 Bibliography

[1] EA Networks, "Underground Structures Manual," 2024.

[2] EA Networks, "Overhead Standard Structure Manual," 2019.

[3] EA Networks, "Rural Network Harmonics Standard," 2009. [Online]. Available:
<https://a.storyblok.com/f/285789107945704/x/110d3f6ae1/harmonics-standard-ver-4-v2.pdf>.

[4] EA Networks, "Underground Construction Manual," 2026.

5 Document Review History

Version Number	Author	Reviewed By.	Issue Date	Reason
01	C. Harcourt	P Armstrong	31/03/26	First release

6 EA Networks Standard – Document Change Request

Memo to: GM Networks
EA Networks
Private Bag 802
Ashburton 7740

Change details: (attach separate sheets as necessary).

Change details: (attach separate sheets as necessary).						
Paragraphs affected:						
Priority:	Urgent (within 1 week)		Routine (Within 12 months)		Low (Next Review)	
Submitted by: (Print Name)						
Date:						

Document Change Request - Acknowledgement

Dear [NAME]

Thank you for your suggestion regarding changes to this Standard.

Your request has been noted and added to our works program.

Should we require any additional information regarding your notification then we will be in contact with you.

Thank you for your contribution to improving the quality of EA Networks documentation.

Kind regards

.....

Pete Armstrong

.....

GM - Networks