Network Standard

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NW000-S0050 **NS117 DESIGN AND CONSTRUCTION STANDARDS FOR KIOSK TYPE SUBSTATIONS**

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ISSUE

For issue to all Ausgrid and Accredited Service Providers' staff involved with the design and construction of kiosk type substations, 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Where this Standard is issued as a controlled document replacing an earlier edition, remove and destroy the superseded document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 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 any procedure, process or any other thing 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 Work Health and Safety Regulation 2017 (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 is limited to scope identified below and provides controls for associated risks as listed below:

- ☐ applies only to kiosks, with Ausgrid type descriptors L, K and R.
- ☐ applies to nominal 11kV primary voltage systems.
- ☐ does not apply to nominal 5kV primary voltage systems.
- ☐ applies to nominal 400/230 volt distribution systems.
- ☐ does not apply to SWER systems
- ☐ does not apply to nominal primary voltage systems higher than 11kV.
- ☐ applies to kiosks used for control points and for control of supply to high voltage customer installations (HVCs).
- ☐ does not apply to kiosk housings used for other purposes.

Where to for more information?

Section 1, 2

General Information and Kiosk Types

The general information and requirements includes the following:

- ☐ All materials and equipment used must be free of Asbestos.
- ☐ All work must be carried out safely in accordance with the WHS Act and Regulation and Ausgrid's Electrical Safety Rules.
- ☐ Project details requirements for both contestable and non-contestable work.
- ☐ Equipping Permit and Access permit requirements.
- ☐ Details are provided for requirements relating to
  - ○ Environmental constraints
  - ○ Danger signs
  - ○ Locking and Security
- ☐ Details of LV boards suitable for each kiosk type is included.

Where to for more information?

Section 5 - 8

Tools and Forms

Annexure A List of drawings

Siting, Construction, Protection and Areas of Special Care

Construction requirements include the following:

- ☐ Detailed kiosk siting and foundation information is found in NS141 Site selection and site preparation standards for kiosk substations.
- ☐ Sites shall be dry, clear of obstruction and not close to rivers, creeks and other sources of water.
- ☐ Kiosks have oil containment requirements.
- ☐ Earthing requirements.
- ☐ Protection, monitoring and control requirements.
- ☐ Special consideration shall be given to:
  - ○ Siting
  - ○ Preventing corrosion
  - ○ Cables and cable terminations
  - ○ Restrictions on consumers mains
  - ○ Phasing of connections

Where to for more information?

Section 9 - 12

Tools and Forms

Annexure B Stockcodes
Annexure C Danger signs

Procurement, Testing, Inspection and Electrification

The procurement of materials and post construction testing, inspection and electrification requirements include:

- ☐ Materials either sourced from Ausgrid or approved as complying with specifications prior to use.
- ☐ Transformers and HV switchgear have specific requirements.
- ☐ Ausgrid will inspect the work undertaken by the Service Provider.
- ☐ Testing in accordance with NS230 Testing of Distribution Substations applies.
- ☐ Inspections will include progress inspections and milestone inspections.
- ☐ When "ready for electrification" of the kiosk occurs.
- ☐ Electrification of kiosk substations is undertaken by Ausgrid.
- ☐ Reporting requirements are listed.

Where to for more information?

Section 13 - 18

Tools and Forms

None provided

Network Standard
NS117
Design and Construction Standards for Kiosk Type Substations

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1.0 PURPOSE

This Network Standard specifies the electrical design and construction requirements for kiosk substations for installation on Ausgrid's network. Requirements are included for standard ratings up to 1500kVA, to provide three-phase four-wire nominal 400/230 volt supply.

The kiosk substations specified in this Network Standard are the current L, K and R types. These types are for installation throughout Ausgrid's network, subject to the limitations indicated in this Network Standard and NS109, NS112, NS141 and NS290. Kiosk designs and materials must comply with Ausgrid standards and specifications.

Ausgrid is responsible for the management and operation of Ausgrid's electricity supply network. The network is a major infrastructure investment and is required to operate economically and reliably in all weather and environmental conditions.

The design and construction requirements specified in this Network Standard are intended to satisfy electrical performance and economy requirements, and to meet all statutory obligations. The kiosks specified utilise readily available components which have demonstrated reliability.

This Network Standard may be amended or updated at any time to reflect improvements in design, technology advances etc. The Service Provider shall ensure that the latest version of this Network Standard is used for the equipping of the kiosk substation to which it applies.

2.0 SCOPE

This Network Standard:

- applies only to kiosks, with Ausgrid type descriptors L, K and R
- applies to nominal 11kV primary voltage systems
- does not apply to nominal 5kV primary voltage systems
- applies to nominal 400/230 volt distribution systems
- does not apply to SWER systems
- does not apply to nominal primary voltage systems higher than 11kV
- applies to R type kiosks used for control points and for control of supply to high voltage customer installations (HVCs),
- does not apply to kiosk housings used for other purposes.
- does not cover the installation of high voltage and low voltage mains. These requirements are covered in other network standards.

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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

- Electrical Safety Rules
- ES4 Service Provider Authorisation
- NS100 Field Recording of Network Assets
- NS104 Specification for Electrical Network Project Design Plans
- NS109 Design of Overhead Developments
- NS110 Design of Underground Residential Subdivisions
- NS112 Design of Underground Industrial and Commercial Areas
- NS116 Design Standards for Distribution Equipment Earthing
- NS127 Low Voltage Cable Joints and Terminations
- NS129 11kV Joints and Terminations – Paper Insulated Lead Covered Cables
- NS130 Laying Underground Cables up to and including 11kV
- NS141 Site Selection and Site Preparation Standards for Kiosk Type Substations
- NS143 Easements, Leases and Rights of Way
- NS156 Working Near or Around Underground Cables
- NS158 Labelling of Mains and Apparatus
- NS161 Specification for Testing of Underground Cables
- NS171 Firestopping in Substations
- NS174 Environmental Procedures
- NS177 11kV Joints (including Transition Joints) and Terminations – Polymeric Insulated Cables
- NS181 Approval of Materials and Equipment, and Network Standard Variations
- NS195 High Voltage Customer Connections (HVC)
- NS212 Integrated Support Requirements for Ausgrid Network Assets
- NS230 Testing of Distribution Substations
- NS290 Selection of Distribution Substations
- Policy for ASP/1 Premises Connections
- Standard Connection Services for Contestable ASP1 Premises Connections no greater than 11kV

3.3 Other standards and documents

- ENA Doc 001-2019 National Electricity Network Safety Code
- Service and Installation Rules of New South Wales

3.4 Acts and regulations

- Electricity Supply (General) Regulation 2014
- Electricity Supply (Safety and Network Management) Regulation 2014
- Work Health and Safety Act 2011 (NSW)
- Work Health and Safety Regulation 2017 (NSW)

4.0 DEFINITIONS

Refer to NS001 Glossary of Terms.

5.0 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 Work 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 materials.

6.0 GENERAL INFORMATION AND REQUIREMENTS

6.1 Safety

This Network Standard requires compliance with the National Electricity Network Safety Code (ENA Doc 001-2008) and Ausgrid's network management planning documents. In addition, all work must be carried out in accordance with Ausgrid's Electrical Safety Rules. If there is any conflict between the requirements of these documents, the Electrical Safety Rules shall prevail.

Kiosk design and construction shall (at least) comply with the minimum safe working clearances and other requirements detailed in the Electrical Safety Rules.

The installation of kiosk type substations by crane or other lifting device, near or in the vicinity of exposed high or low voltage mains must (at least) comply with the requirements of the Work Health and Safety Act 2011 (NSW) together with the Work Health and Safety Regulation 2017 (NSW), and the minimum safe working clearances detailed in the Electrical Safety Rules, and documents referred to in those Rules.

The Service Provider shall be responsible for ensuring that all construction staff are fully conversant with the necessary clearances from exposed live conductors.

6.2 Project Details

6.2.1 Design information for contestable work

For contestable work, Ausgrid provides the Accredited Service Provider with Design Information that contains specific information, as well as general information, that assists the Service Provider in developing their Contestable Design.

6.2.2 Project details for work that is not contestable

For work that is not contestable, project details in accordance with NS104 will be provided to the group that is responsible for construction of the project.

6.3 Equipping permit

Service Providers may only commence work at the substation site after they have received an Equipping Permit for the particular project. The purpose of the Equipping Permit is detailed in Ausgrid's Electrical Safety Rules. It is intended to prevent the energising of equipment until all staff have acknowledged by their signature that the work is completed and the equipment can be connected to the supply system and shall be considered as "live".

Any further work after withdrawal of the Equipping Permit can only be performed under the authority of an Access Permit.

The Equipping Permit must be displayed at the substation construction site at all times while work is being carried out under the Equipping Permit. Refer to Ausgrid's Electrical Safety Rules for further information, and for details of the Equipping Permit procedure.

6.4 Access permit

When the construction of the kiosk substation nears completion, the connection of high and/or low voltage cabling to the supply system will allow the substation to be energised. At this stage, the Equipping Permit that has been displayed on site, must be “signed off” and recovered by an Ausgrid officer. The officer will then issue an Access Permit for Work that will detail exactly the mains and equipment allowed to be worked on. By signing the Access Permit, the recipient acknowledges a full understanding of the extent of the equipment to be worked on and claims to have completed a personal check and to have been satisfied that the isolation and earthing of the adjacent network components is effective.

The issue, acceptance and the conditions under which an Access Permit shall be issued are contained in Ausgrid’s Electrical Safety Rules. The Service Provider must work in accordance with the provisions of these Electrical Safety Rules.

The Access Permit must be displayed at the substation at all times while work is being carried out under the Access Permit. Refer to the Electrical Safety Rules for further information, and for details of the Access Permit procedure.

6.5 Service provider

In this Network Standard, reference to the term Service Provider includes Accredited Service Providers and Accredited Designers carrying out contestable works, and Ausgrid staff and its contractors carrying out non-contestable works.

Requirements for Accredited Service Providers and Designers are included in ES4 Service Provider Authorisation and the Policy for ASP/1 Premises Connections.

6.6 Design life and maintenance periods

The kiosk substation target design life of 50 years sets requirements for the careful selection of materials and equipment and for high standards of workmanship.

Maintenance periods for the substation and substation equipment are specified in the relevant Technical Maintenance Plan.

The Service Provider’s quality of work and materials supplied must be adequate for the kiosk to meet or exceed its design life and maintenance performance requirements.

6.7 Provision of approved materials

All materials necessary for contestable work shall be new Approved Materials supplied by the Service Provider and shall be in accordance with the Ausgrid Approved Material List available on the Ausgrid website under Network Standard NS181.

Ausgrid’s ASP Materials Sales can provide Approved Materials from its stores system at commercial rates. Whilst this method of obtaining materials has a number of advantages for Service Providers, it is not compulsory. Materials may instead be purchased directly from the manufacturers, in accordance with the Approved Material List.

To order any of the kiosk substation items from Ausgrid quote the appropriate stockcode number from Annexure B. Kiosk substations are available in kit form from Ausgrid to simplify ordering and handling. Email aspsales@ausgrid.com.au to request a quotation for these materials.

6.8 Environmental constraints

Refer to the environmental assessment requirements in the Policy for ASP/1 Premises Connections and NS174C.

In addition, all ground levels shall be finished to the design levels set by the local council authority.

The Service Provider shall be held responsible for any claims for damages and for clean-up charges, and for the cost of inspecting and rectifying any complaints that are deemed to be reasonable by Ausgrid, or the local council authority, or an inspector of the EPA.

6.9 Danger signs

Kiosk substation housings must have two danger signs attached. If the danger signs are not already attached to the housing, or if existing danger signs are damaged or ineffective, the Service Provider shall supply and attach danger signs in accordance with the specifications and requirements indicated in Annexure C.

6.10 Substation locking and security

As well as the requirements indicated in Clauses 6.3 and 6.4, substation access, locking and security must comply with Ausgrid's approved locking system. At the time the kiosk is delivered to site other than when it is already fitted with rim type cylinder locks, it is to be fitted with Contractor New Kiosk Entry ("construction X5") padlocks stockcode 179552. It is the ASP's responsibility to provide and install these locks, which will be replaced by A000 keyed locks sourced by the ASP on electrification. Additionally, the ASP shall supply the equipment padlocks as detailed in Annexure B.

7.0 KIOSK DESCRIPTIONS AND TYPES

7.1 Kiosk descriptions

Kiosk distribution substations referred to in this Network Standard are for connection to the primary distribution system, which is a three-phase three-wire AC system with a nominal system voltage of 11kV (11,000 volts).

In all cases, the kiosk substation output is a nominal 415/240 volts three-phase four-wire AC supply.

Kiosk substations are connected into the 11kV network by use of either a ring main isolator fuse switch (RMIFS) or a ring main isolator circuit breaker (RMICB). The type of high voltage switch applicable is specified in Table 1. Fuse switches are not to be used unless specified for particular locations by Ausgrid.

Annexure A includes a listing of drawings for each type of kiosk substation, and Annexure B includes stockcodes.

Limitations on siting and usage of the various kiosk types are included in this Network Standard and the following Network Standards:

- NS109 Design of Overhead Developments
- NS112 Design of Underground Industrial and Commercial Areas
- NS141 Site Selection and Site Preparation Standards for Kiosk Type Substations.
- NS290 Selection of Distribution Substations

7.2 Kiosk types

7.2.1 Kiosk type – L – with ring main isolator fuse switch (RMIFS)

These kiosks are pre-assembled and delivered to site as finished units by the manufacturer. They are suitable for installation throughout Ausgrid's network, subject to the limitations indicated in this Network Standard and NS109, NS112, NS141 and NS290. They are suitable for connection to 11kV radial or closed network feeders.

The RMIFS is connected with the isolators in series with the 11kV feeder and the fuse switch as a branch connection to the transformer.

Transformer ratings for type L are 400kVA, 600kVA, 800kVA and 1000kVA.

The low voltage switchboards are equipped with fused supplies of various configurations and ratings, as specified in Section 8 and Annexure B of this Network Standard.

7.2.2 Kiosk type – K – with ring main isolator circuit breaker (RMICB)

K type kiosks are pre-assembled and delivered to site as finished units by the manufacturer. These kiosks are suitable for installation throughout Ausgrid's network, subject to the limitations indicated in this Network Standard and NS109, NS112, NS141 and NS290. They are suitable for connection to 11kV radial feeders only.

The RMICB is connected with the isolators in series with the 11kV feeder and the circuit breaker as a branch connection to the transformer. The circuit breaker is capable of making and breaking fault and load current.

Overload and transformer protection is provided which trips the RMICB. Protection details for K kiosks are outlined in Section 11.

The single transformer rating is 1500kVA.

The low voltage switchboard configurations are indicated in Section 8 and Annexure B of this Network Standard.

7.2.3 Kiosk type – R for control points and for control of supply to high voltage customer installations (HVCs)

The requirements for supply to high voltage customer installations, as included in NS195 must first be satisfied before supply will be provided at high voltage.

Where Ausgrid agrees to the provision of supply at high voltage from a kiosk; the use of type R will be specified by Ausgrid. The requirements of this Network Standard and NS141 then apply to the extent that they are relevant. Project details will be provided by Ausgrid as indicated in Clause 6.2, and NS195.

Note: The standard type R HVC control point kiosk is fitted with an RMICB having a tee-off circuit breaker rated current of 200Amps, higher rated current tee-off circuit breakers are by project specific specification only.

The type R kiosk contains an integrated protection scheme, battery system and Automation Control Scheme, this requires a source of auxiliary 230VAC supply from the customer's metered installation. In each case, the installation of cables and other equipment to provide supply to the kiosk is the responsibility of the customer. Suitable labelling must be attached to each end of each circuit.

7.3 Maximum demand indicators (MDIs)

7.3.1 Transformer MDI

L and K kiosks are equipped with an MDI which indicates on an ammeter, (i) the maximum of the loadings reached for every 15 minute period since the MDI was last reset, and (ii) the loading on the transformer over the immediately preceding 15 minute period.

Type L kiosks are supplied with dual ratio CTs. When the L kiosk is equipped with a 400 or 600kVA transformer, the kiosk is supplied with CTs connected to the 800/5 ratio. When the L kiosk is equipped with an 800 or 1000kVA transformer, the kiosk is supplied with CTs connected to the 1600/5 ratio.

For details refer to the relevant drawing listed in Annexure A.

7.4 Ratings and fault levels

The nominal three-phase fault levels for the various kiosk substation options specified in NS290 and connected to the 11kV network are listed in Table 1. The nominal transformer impedance is selected to limit the fault current at the LV board to the value specified in the table.

Table 1 Nominal three-phase fault levels

1	2	3	4
Substation Type and Transformer Size	High Voltage Switchgear	Nominal Transformer Impedance %	Nominal Prospective Short Circuit Current at Substation Low Voltage Board (see Notes (a) & (b))
L Kiosk 400 & 600kVA 800 & 1000kVA	RMIFS or Fuse Switch (see Note (c))	4 5	max. 25kA
K Kiosk 1500kVA	RMICB	6.25	28kA

Note (a): Refer also to the Service and Installation Rules of New South Wales which quotes the nominal prospective short circuit current at the point of supply, of 25kA for commercial and industrial areas, and 10kA for suburban residential areas. Unless advised otherwise by Ausgrid, these values shall be accepted by customer's installation designers, as the maximum point of supply values in calculations for equipment fault duty from single transformer substation installations.

Note (b): The nominal prospective short circuit currents at the low voltage board, as quoted in Table 1 Column 4, and in Note (a), refer to the maximum point of supply values, relevant for calculations for equipment fault duty.

Note (c): Fuse switches are not to be used unless specified for particular locations by Ausgrid.

8.0 LOW VOLTAGE BOARDS

Ausgrid's standard approved LV boards, shall be used for all kiosk type substations.

All L and K type kiosk LV boards for new kiosks installed in Ausgrid's area shall be either enclosed Schneider SAIF LV boards or Weber VF22 range.

Refer to the stockcode numbers list in Annexure B for available combinations of transformers and distributors.

K type kiosks LV boards consist of 1 x 2500A circuit breaker and 1 x 400A interconnector (normally open, connected to the load side terminals).

The 1600A panel is fully rated and must be equipped with 1600A, 1200A or 1000A "T" type bolt-in LV fuses. The 800A and 400A panels must be equipped with "J" type characteristic fuse cartridges (92 mm centres). Both the "T" type and "J" type fuse cartridges must have fast operating characteristics as specified by Ausgrid, and must be supplied from Ausgrid stocks.

The 400A distributor panel strip is intended for termination of one cable per phase (normally 240 mm^2, up to 300 mm^2). The termination is covered by an insulated boot designed for one cable. The 800A distributor panel strip is designed for two cables per phase (normally 2 x 240 mm^2, up to 2 x 300 mm^2). This termination is also covered by an insulated boot, designed for the two cables.

Connections to the neutral bar must be made with bolts, washers and nuts of the sizes specified in the drawings. Where the bolt size is not specified, the bolt and bar hole must be of an appropriate size consistent with the diameter of the hole in the lug being attached. Each cable lug must be separately connected under its own bolt. Cable lugs must be connected directly to the bar. It may be necessary for additional holes to be drilled in the bar. Connection extension pieces, such as bar stubs, flags, etc must not be used. Slotted lugs are not permitted. Full hole compression lugs must be used. Bolts, washers and nuts must be stainless steel grade 316. Lug holes must not be enlarged to accommodate larger bolts. Brass bolts must not be used.

8.1 Distributor current transformer

Where dual ratio 1600/1200/5 distributor CTs are installed, the CT ratio shall be selected to align with the fuse size installed.

9.0 KIOSK SITING AND CONSTRUCTION

9.1 Kiosk site

It is essential to locate kiosk substations in areas that are well drained and clear of underground and overhead obstructions. The kiosk shall not be located near rivers, creeks, natural or man-made watercourses.

For more information on siting of kiosk type substations refer to NS141.

9.2 Kiosk foundations

Refer to NS141 for requirements for kiosk foundations and finished ground levels.

9.3 Oil containment

Kiosk types L and K are designed to contain oil spills. For kiosk type L, oil is contained within the concrete base. For K type kiosks, an in-built metal tub is provided within the kiosk. Refer to the additional oil containment requirements specified in NS141 and reference drawings.

10.0 SUBSTATION EARTHING

10.1 General

The substation earthing shall be arranged so that:

- the step and touch voltage limits will not be exceeded,
- the flow of fault current will not be restricted due to excessive resistance of the earthing circuit, and
- the short-time current carrying capacity of the earthing conductors and electrodes will not be exceeded.

The integrity of the substation earthing system is critical in providing a safe electricity supply. The earthing system must comply with the requirements of NS116.

Unless directed otherwise by Ausgrid, the MEN system of earthing shall be installed throughout the supply network.

The Service Provider shall be responsible for advising Ausgrid of any potentially hazardous situation arising from metallic structures in contact with or near the kiosk substation. Such structures include but are not limited to metallic fences, swimming pools, flammable gas or liquid storage tanks, electric railway lines, pipelines, high voltage substations, high voltage transmission lines, operating theatres or similar facilities, communication centres, pits, pillars and metallic sheathed communication cables. Any potentially hazardous situation shall be referred immediately to Ausgrid to allow if necessary for an individual earthing system design for the substation.

10.2 Earthing arrangement

A combined system of earthing shall be used consisting of two groups of electrodes, labelled as “Earth Electrodes group A” or “B”. These groups shall be located so as to minimise the interaction effects between them. The electrode system shall be installed as detailed in NS116.

The A and B earth electrode groups shall be independently connected to the earth busbar.

The combined earthing system shall have an in-service impedance not exceeding 1 ohm and an individual electrode group impedance not exceeding 15 ohms when measured in accordance with NS116.

Where the above minimum values of earth impedance cannot be achieved, the Service Provider shall advise Ausgrid. In such cases, a special earthing system design will be required for the substation. The Service Provider will be required to obtain Ausgrid’s approval for the design, or to obtain a design from Ausgrid.

Where more than one kiosk is to be installed at a premises (refer to NS141 for Multiple Kiosks), a site specific earthing system design must be obtained for the installations. The Service Provider will be required to obtain Ausgrid’s approval for the design, or to obtain a design from Ausgrid.

Cable connections to the kiosk substation earth bar must be made with bolts, washers and nuts of the sizes specified in the drawings. Where the bolt size is not specified, the bolt and bar hole must be of an appropriate size consistent with the diameter of the hole in the lug being attached. Each cable lug must be separately connected under its own bolt. Cable lugs must be connected directly to the bar. It may be necessary for additional holes to be drilled in the bar. Connection extension pieces, such as bar stubs, flags, etc must not be used for cable connections. Slotted lugs are not permitted. Full hole compression lugs must be used. Bolts, washers and nuts must be stainless steel grade 316. Lug holes must not be enlarged to accommodate larger bolts. Brass bolts must not be used.

11.0 PROTECTION, MONITORING & CONTROL EQUIPMENT

11.1 Protection

Type L kiosk substations shall have HV and LV fuse protection.

Type K kiosk substations shall have HV and LV protection relays installed to trip the RMICB and LV MCCB.

Type R kiosk substations shall have an HV protection relay installed to trip the RMICB.

Kiosks built to Ausgrid stockcodes listed in Annexure B are factory-fitted with appropriate protection relays installed by the kiosk manufacturer.

Appropriate grading shall be maintained between customer protection, LV distributor protection and HV protection for probable faults under normal switching conditions.

HV protection shall comply with the requirements of NS263.

On LV network distributors the maximum size of fuse shall be 400 amperes.

For contestable work, refer also to Clause 6.2.1.

11.2 Distribution Monitoring & Control

11.2.1 General

Kiosk substations shall be equipped to provide Distribution Monitoring & Control (DM&C) functionality including remote indication of primary equipment status, protection operation status, Earth Fault/Fault Presence Indicator status and equipment alarm status, remote measurement of power system quantities, remote resetting of Earth Fault/Fault Presence Indicators and remote control of HV RMI motorised feeder isolators.

Kiosks built to Ausgrid stockcodes listed in Annexure B are factory-fitted with appropriate DM&C equipment installed by the kiosk manufacturer.

11.2.2 DM&C Power Supply Requirements

Type R kiosk substations shall be provided by the customer with a 16 A, 230 V AC power supply to provide the main supply to the DM&C equipment.

Prior to electrification while no DM&C main supply is available, the DC backup supply must be isolated to prevent discharging. Isolation methods vary depending on the power supply equipment but may include removal of battery fuses, or disconnection of battery cable from UPS. Care must be taken to ensure any disconnected DC backup supply cables are suitably covered and secured so they cannot inadvertently short circuit upon equipment electrification.

12.0 AREAS OF SPECIAL CARE

12.1 General

The experience of Ausgrid and of other supply authorities has shown that certain aspects of substation projects require special care so as to avoid reliability and/or maintenance problems. Service Providers' attention is drawn to these areas so that they can ensure that special care is given during construction.

12.2 Siting of kiosk substations

Refer to NS141.

12.3 Corrosion

Kiosk type substations have been designed and constructed with coatings to minimise the effects of corrosion of the outer shell. The Service Provider must ensure that the integrity of these coatings is not compromised by scratches, chips or dents to the surface of the kiosk. Where any defect is detected in the outer surfaces of the kiosk, the Service Provider shall repair the damage to the satisfaction of Ausgrid.

12.4 Cable terminations

All cable terminations shall be in accordance with NS127, NS129 and NS177.

All cables must be adequately supported to prevent undue stress on terminations. High voltage terminations shall be of a type approved by Ausgrid. Refer to NS181.

12.4.1 LV Distributor Cable termination to existing E Kiosks.

When installing 240/300AL4 cable into an existing E kiosk, a 4 to 1 straight through joint using 185Cu1 cable may be constructed to facilitate easier installation and termination to the LV Board. This method is not mandatory but may be required to overcome physical and spatial constraints within the E kiosk base.

12.5 Cable installation

The high voltage cables shall be installed into the cable end-box of the high voltage switch in such a manner that the earth fault indicator CT's can be installed over the single core cables and that the current in each of the single core cables can be easily measured using a "tong ammeter". The earth fault indicator shall be mounted on the right hand side "B" feeder switch when viewed from the front.

For RMU configurations with DM&C/EFI CT's supplied loose in the RMU feeder endbox, these must be positioned over each corresponding L1, L2, L3 phase cable below the termination and with the polarity (P1) side uppermost, facing towards the bushing. HV cable screens must be routed back through each respective CT before being joined to the endbox earth bar.

The drainage bond of the separable connector shall be connected directly to the switchgear earth bar.

Where a HV phase cross is required for the substation to phase to the existing HV network, the cross is to be done in the cables between the HV switchgear and the HV terminals of the transformer.

In all kiosk type substations, the low voltage cables shall be installed in such a manner that the current in each of the single core cables can be easily measured using a "tong ammeter". The use of spreaders will normally be required.

Cables are to be direct laid within the kiosk easement. However in some instances Ausgrid may require cables to be installed in conduits. In such situations, at the entry holes in the kiosk base for high voltage and low voltage cables, conduit bends shall be positioned carefully so as to facilitate installation of cables to their intended connection points at the high voltage switchgear and low voltage board. The high voltage conduit ends must line up as closely as possible with the cable entry points on the high voltage switchgear, so as to minimise the bending of cables. Similarly, the low voltage conduit ends must line up as closely as possible with the relevant cable connection points on the low voltage panel. Ausgrid will not accept excessive bending of cables, so failure to observe this requirement could necessitate costly relocation of conduit bends that may have been embedded in concrete.

12.5.1 Consumers mains

The following table outlines the restrictions on the maximum number and size of consumers mains cables that can be terminated at the low voltage board of kiosk customer substations:

Table 2 Maximum number and size of consumers mains cables

LV Panel Rating	Maximum Number of Cables per Phase	Maximum Size of Cables
400Amp	1	300mm^2 CU1XQZ

800Amp	2	300mm^2 CU1XQZ
1200/1600Amp	4 (see Note)	500mm^2 CU1XQZ
2500Amp	4 (see Note)	500mm^2 CU1XQZ
Circuit Breaker	3 (see Note)	630mm^2 CU1XQZ

Note: It is essential to ensure that all consumers' mains cable lugs, when terminated on the 1600/1200A panel or the circuit breaker, are adequately insulated phase to phase. If necessary, supplementary insulation shall be added around the lugs. In all cases where more than two cables per phase are used, supplementary insulation will be required around the lugs between phases.

Equivalent sized fire rated cables can also be used, with the exception of MIMS cables.

12.6 Phasing

The connections within the kiosk type substation together with its high and low voltage cabling must "phase" with the surrounding high and low voltage networks. Phasing of the substation means the phase orientation of the high and low voltage cables and connections will exactly match with the phase orientation of the surrounding network.

The Service Provider is responsible for designing the cable installation such that it will phase with the existing and/or the new primary and secondary distribution systems. Phasing details will be provided by Ausgrid as part of the Design Information for contestable works.

The phasing of the new substation will be tested by Ausgrid at the time of electrification. The Service Provider must be in attendance at the time of electrification and will be responsible for any required alterations resulting from incorrect phasing.

Each kiosk with a low voltage board is to have phase labels attached. Unless Ausgrid staff elect to attach the labels, the labels must be attached by the Service Provider under the direction of Ausgrid staff, when the phasing is being tested.

Phase labels must comply with the requirements of NS158, and must be attached as follows:

- Phase labelling must be attached to the right hand side (RHS) frame of the low voltage board in the correct phase sequence from top to bottom, e.g. ABC, or CBA, or BCA.
- A label must be placed on the inside of the RHS low voltage door to indicate the high voltage to low voltage phasing, e.g. ABC --- abc, or ABC --- cba if there is an a to c low voltage cross.

The main busbars of the switchgear frame are horizontal (top, middle & bottom) and the switchgear must be marked as follows to ensure the correct relationship between distributor connections:

- The left hand side (LHS) framework of the LV board will be marked T (top), M (middle) and B (bottom).
- The 400A and 800A cable connection busbars to be marked T, M, B.
- The voltage test point fuses to be marked T, M, B below each fuse.
- The switchgear should come with these markings already installed by the switchgear manufacture, if not, they must be installed on-site with suitable labels. The markings must not be removed or otherwise obliterated.

12.7 Stainless steel bolts and set-screws – lubrication of threads

Before installation of each stainless steel bolt or set-screw, the thread shall be lubricated with specially formulated anti-seize grease containing nickel (e.g. Loctite Nickel Anti-Seize, or equivalent). Ausgrid stockcode is 177212.

Where the lubricating grease will be in contact with an electrical insulating medium (e.g. heatshrink), the supplier of the insulating medium shall be consulted to ensure product compatibility.

13.0 KIOSK EQUIPMENT PROCUREMENT

13.1 Approved materials

Only materials approved by Ausgrid shall be used in the equipping of distribution substations. These materials shall comply with the requirements of Ausgrid's specifications. Refer to NS181.

Refer also to Clause 6.7 for information on provision of Approved Materials from Ausgrid.

Materials must be type and/or routine tested at the manufacturer's works in accordance with the Ausgrid Specification for Procurement and/or the relevant Australian Standard. Should an Australian Standard not exist, the relevant International Standard or the standard referred to in Ausgrid's Specification for Purchase shall apply. Where there is a discrepancy between the Australian (or International) Standard and Ausgrid's Specification for Purchase, Ausgrid's Specification for Purchase shall apply.

Acceptance testing and pre-electrification testing by Ausgrid, or a third party nominated by Ausgrid, may be required for individual types of equipment as listed below. Refer also to Section 14.

- high voltage switchgear
- transformers
- protection relays
- high and low voltage fuses
- high and low voltage cables
- high and low voltage termination kits

13.2 Transformers

Transformers shall comply with the latest Ausgrid specification for purchase of distribution transformers. This specification includes the required transformer impedance percent and the tapping range. Table 1 of Clause 7.4 indicates nominal impedances for the transformer sizes and kiosk types shown.

13.3 High Voltage switchgear

13.3.1 Ring main isolator fuse switch (RMIFS)

RMIFS shall comply with the latest Ausgrid specification for the purchase of 11kV RMIFS.

All RMIFS shall be fitted with fuse cartridges having striker pins.

13.3.2 Fuses

The correct use of HV and LV fuses is critical to the reliable and safe supply of electricity and shall be in accordance with Ausgrid's Approved Material List.

13.3.3 Ring main isolator circuit breaker (RMICB)

RMICBs shall comply with the latest Ausgrid specification for the purchase of 11kV RMICBs. The RMICB tee-off circuit breaker shall have a nominal minimum rated current of 200Amps. Higher rated 630A tee-off circuit breakers can be ordered for R type kiosks only where load current has been approved by Ausgrid to exceed 200A.

14.0 TESTING

Refer to NS230 for all testing requirements.

15.0 INSPECTION

Ausgrid will inspect the work being carried by the Service Provider, the Service Provider's employees and sub-contractors.

Inspections may take two broad forms; review of progress inspections and milestone inspections.

Review of progress inspections: are intended to keep Ausgrid up to date with the project's progress, to maintain good working relationships, and to assist in the smooth running of the project.

Milestone inspections: are specifically arranged to inspect a particular aspect of the project. Ausgrid will nominate the milestones for each particular project in accordance with relevant Ausgrid requirements.

Once the substation installation and testing is complete, a final inspection shall be carried out by Ausgrid to ensure:

- the substation is complete to the relevant drawings and is ready for service
- all operational and asset numbers and labels are correctly in place
- all danger signs and warning signs are correctly in place
- all work has been performed in a tradesperson-like manner and is fit for purpose.

Following the successful completion of the above inspection, all personnel involved in the construction shall be advised if the kiosk installation is "ready for electrification".

The Equipping Permit will be signed-off at the time of electrification.

15.1 Rectification inspection

Within the three month period prior to the completion of the rectification period, Ausgrid shall carry out a rectification inspection. This inspection shall consist of a general in-service inspection of the substation, including but not limited to:

- assessment of the integrity of the corrosion protection finishes,
- oil containment of all oil filled equipment,
- operability of the access points,
- labelling, and
- the integrity of the various fasteners and connections.

16.0 READY FOR ELECTRIFICATION

Ready for electrification shall occur when Ausgrid determines that all of the following requirements have been satisfied and in accordance with Section 17 of the Contract for Connection Services for Contestable ASP/1 Connections:

- the works have been completed in accordance with the Certified Design,
- the works are free from Major Defects,
- all fees and charges payable in respect to the works have been paid to Ausgrid,
- all required certificates and all required agreements for leases, easements and rights-of-way have been provided,
- satisfactory test reports and inspection reports have been made available to Ausgrid,
- all danger signs and warning signs are correctly in place,
- all equipment reports have been made available to Ausgrid.

17.0 ELECTRIFICATION

The electrification of the kiosk type substation must be carried out by Ausgrid. The Service Provider shall attend the electrification to rectify any defects detected and to witness the phasing tests.

18.0 REPORTING

The Service Provider shall provide Ausgrid with completed Technical Equipment Information (TEI) sheets.

The results of the tests required by NS230 shall be provided to Ausgrid.

19.0 RECORDKEEPING

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

Table 3 – 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 (HPRM ref. 2014/21250/241)	Unlimited
Working documents (emails, memos, impact assessment reports, etc.)	Records management system Work Folder for Network Standards (HPRM ref. 2014/21250/241)	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.

20.0 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 Engineering Technical Documents within the document repository. 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.

21.0 DOCUMENT CONTROL

Content Coordinator : Mains Engineering Manager

Distribution Coordinator : Manager Asset Standards

Annexure A – List of Drawings

Table A1 List of drawings for L type kiosks

Drawing	Description
L type kiosk drawings (Schneider T2)	
269248	L type 1000kVA kiosk general arrangement (2 sheets)
269247	L type 800kVA kiosk general arrangement (2 sheets)
269246	L type 600kVA kiosk general arrangement (2 sheets)
269245	L type 400kVA kiosk general arrangement (2 sheets)
242586	L type kiosk reinforced concrete base – with oil containment
L type kiosk drawings (Wilson KLW)	
238566	400kVA Wilson L Type Kiosk - General Arrangement (4 sheets)
238567	600kVA Wilson L Type Kiosk - General Arrangement (4 sheets)
238568	800kVA Wilson L Type Kiosk - General Arrangement (4 sheets)
234382	1000kVA Wilson L Type Kiosk - General Arrangement (4 sheets)
L type kiosk drawings (Tyree KLT)	
258091	Tyree L Type Kiosk - General Arrangement (2 sheets)
L type kiosk related drawings	
151572	L type kiosk layout option plan

Table A2 List of drawings for K type kiosks

Drawing	Description
K type kiosk drawings (Schneider T3)	
269244	K type kiosk general arrangement
K type kiosk related drawings	
151190	K type kiosk layout option plan

Table A3 List of drawings for HVC kiosks

Drawing	Description
R type High Voltage Customer (HVC) control Kiosk (Schneider)	
258017	Standard Construction R Type Kiosk (HVC) Layout Option Plan
269249	R Type Kiosk (HVC) general arrangement

Annexure B – Stockcode Numbers

B1 Purchase arrangements

Kiosk substation items are available for purchase from Ausgrid. Requests shall be directed to aspsales@ausgrid.com.au and include the appropriate stockcode number.

B2 L, K and R (HVC) type kiosks

Table B1 Stockcodes for L, K and R type kiosks

Stockcode	Item
L type kiosk stockcodes (T2)	
186330	1000kVA Tx with RMI and 4 x 400A LV board
178155	1000kVA Tx with RMI and 5 x 400A LV board
179591	1000kVA Tx with RMI and 1 x 800A, 3 x 400A LV board
176621	1000kVA Tx with RMI and 2 x 800A, 1 x 400A LV board
178281	1000kVA Tx with RMI and 1 x 1600A, 1 x 400A LV board
178282	1000kVA Tx with RMI and 1 x 1600A, 2 x 400A LV board
176863	800kVA Tx with RMI and 4 x 400A LV board
176864	800kVA Tx with RMI and 400/800/400 LV board
179622	800kVA Tx with RMI and 1 x 800A, 3 x 400A LV board
176865	800kVA Tx with RMI and 2 x 800A, 1 x 400A LV board
176866	800kVA Tx with RMI and 1 x 1200A, 1 x 400A LV board
178538	800kVA Tx with RMI and 1 x 1200A, 2 x 400A LV board
176847	600kVA Tx with RMI and 3 x 400A LV board
176848	600kVA Tx with RMI and 4 x 400A LV board
186329	600kVA Tx with RMI and 1 x 800A, 1 x 400A LV board
176849	600kVA Tx with RMI and 1 x 800A, 2 x 400A LV board
176837	400kVA Tx with RMI and 3 x 400A LV board
176839	400kVA Tx with RMI and 4 x 400A LV board
176838	400kVA Tx with RMI and 1 x 800A, 1 x 400A LV board
K type kiosk stockcodes (Schneider T3)	
178853	1500kVA Tx with RMICB and 2500A Circuit breaker & 1 x 400A LV board
R Type High Voltage Customer (HVC) control Kiosk (Schneider)	
186402	RMICB Kiosk for Control of HVCs with 200Amp rated Tee-off circuit breaker (630Amp rated Tee-off circuit breaker by Ausgrid approval only)

B3 Miscellaneous Items

Table B2 Stockcodes for Miscellaneous Items used with kiosks

Stock code	Item	Schneider T2 400-1000kVA L kiosk	Schneider T3 K kiosk	Wilson T2 400-1000kVA L kiosk	Tyree T2 400-1000kVA L kiosk	Schneider R (HVC) kiosk
175092	Z1 Padlock (substation)	4	3	4	3	4
179552	X5 Padlock (construction)	As required	As required	As required	As required	As required
H46498	Z5 Padlock (operator)	3	2	3	3	3
182854	Z6 Padlock (operator small)	1	0	2	2	1
187131	Z15 Padlock	0	1	0	0	0

Note: Consistent marking as per below picture must be included on the Z15 padlock.

Table B3 Fuse and fuse cartridge stockcodes

Stockcode	Description	Tx kVA Rating
85704	315A LV J Type Fuse Cartridge (SAIF/WEBER Board)	
85738	400A LV J Type Fuse Cartridge (SAIF/WEBER Board)	
85753	630A LV J Type Fuse Cartridge (SAIF/WEBER Board)	
177871	800A LV J Type Fuse Cartridge (SAIF/WEBER Board)	
85639	1000A LV T Type Fuse Cartridge (SAIF/WEBER Board)	
85654	1200A LV T Type Fuse Cartridge (SAIF/WEBER Board)	
85647	1600A LV T Type Fuse Cartridge (SAIF/WEBER Board)	
181951	100A DIN HV Fuse (RM6/SAFELINK/EFACEC/AEGIS)	1000 & 800 kVA
89631	80A DIN HV Fuse (RM6/SAFELINK/EFACEC/AEGIS)	600kVA
88005	40A DIN HV Fuse (RM6/SAFELINK/EFACEC/AEGIS)	400 & 315kVA

Annexure C – Danger Signs for Attachment to Kiosk Housings

C1 L, K and R type kiosks

Danger signs for these kiosks are fitted originally by the manufacturer.

If the original signs have been removed, or are damaged or ineffective, replacement signs complying with the following specifications must be attached:

- One sign is to be located at the high voltage end and one sign at the low voltage end, both visible from normal access points.
- The signs shall be either on:
  - (i) stick-on Scotchlite (or equivalent) reflective sheeting, or
  - (ii) aluminium sheeting.
- The signs shall comply with AS 1319 Safety signs for the occupational environment for colours and lettering dimensions.
- The dimensions of the signs shall be 350 mm wide x 175 mm high.
- The wording of the signs shall be as indicated below.
- Complying signs are available on Ausgrid stockcode 177281 for the stick-on sign, and stockcode 177282 for the sign on aluminium sheeting.
- Aluminium sheeting signs shall be attached with suitable sized rivets. A small amount of non-acid cure silicon sealant must be applied to the rivet holes before the sign is riveted in place.

Caution 1. If it is necessary to replace or retrofit a metal danger sign after the kiosk substation is electrified; the work must be carried out in accordance with the requirements of Ausgrid's Electrical Safety Rules.

Caution 2. Danger signs must not be attached in any position where drilling for the attachments, or fixing of the attachments, could possibly endanger the person attaching the sign, or any other persons, or cause damage to the equipment in the kiosk substation.

Figure C1 Danger sign for L, K and R type kiosks