<table>
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<tr>
<th>Document No</th>
<th>NW000-S0041</th>
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<td>Amendment No</td>
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<td>Approved By</td>
<td>Manager - T&amp;DME</td>
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<td>04/07/2018</td>
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**Minor amendments approved – 08.04.2019**

NW000-S0041 NS12 DESIGN STANDARDS FOR INDUSTRIAL AND COMMERCIAL DEVELOPMENTS

[Image of a map or diagram related to network standards]
ISSUE
For issue to all Ausgrid and Accredited Service Providers’ staff involved with the design and installation of reticulation systems, and street lighting, in commercial and industrial developments 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Where this standard is issued as a controlled document replacing an earlier edition, remove and destroy the superseded document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 a variation to a Network Standard in a design.

External designers including those 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 precedence 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.”).
This standard is limited to scope identified below and provides controls for associated risks as listed below:

- Details the design standards for Industrial and Commercial subdivisions
- Specifies method of supply.
- Refers to NS130 for electrical cable installation, excavation and reinstatement requirements
- Refers to NS143 for easements

Use this section to identify/summarise major design requirements:

- Four approved methods of supply:
  - Service from the existing LV system - nominally 400/230V
  - Direct Distributor - nominally 400/230V
  - Customer Substation - nominally 11000V/400/230V
  - HV - nominally 11, 33, 66 and 132kV
  - Refer to Section 6 of Ausgrid’s ‘Policy for ASP/1 Premises Connections’ for details of Ausgrid’s overhead and underground mains policy.
- Underground cables and ratings
- Cable installation and jointing to conform to NS127, NS129, NS130 and NS177
- Earthing requirements to conform to NS116
- Streetlighting requirements to conform to NS119
- Distribution substations to conform to NS114, NS117 and NS141
- Maximum demand to be assessed by Ausgrid

Where to for more information?
Clause 7
Tools and Forms
Annexure E & H

Use this section to identify design parameters:

- Maximum LV distributor loading not to exceed 75% of the nominal rating
- Max voltage drop in the service not to exceed 3% at full load
- Distribution pillars to conform to NS224
- Quality of supply must be ensured

Where to for more information?
Clause 8
Tools and Forms
Annexure E & H

Use this section for the details of Lease, Easements and Right of ways.

- Leases, licences, easements and right of ways are generally required where distribution centres and cabling that will be vested to Ausgrid on completion of the works, are not sited on public land
- A suitable access way, at least 4.5 metres wide is required for personnel and equipment to gain access to substations on private land
- The complete restoration of landscaping within easement sites is the responsibility of the Developer

Where to for more information?
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1.0 PURPOSE

Distribution Centres and the electricity reticulation systems in new industrial and commercial developments must be installed in accordance with the requirements of this Network Standard and all design and construction standards referenced in this document.

Detailed design of industrial and commercial electricity reticulation systems depends on assessed maximum demands, building and street layouts, street lighting requirements and other local factors. The design information and parameters specified in this Network Standard provide for minimum acceptable standards. Any deviations from this specification must be submitted to Ausgrid for approval before they are implemented.

Where new industrial and commercial developments take place in overhead reticulated areas, Ausgrid will determine the extent of undergrounding of existing overhead mains that may be necessary. For new subdivisions, all new substations are to be on the development property (i.e. not a roadway site).

Street lighting design may form part of the low voltage system design in industrial and commercial developments and must conform to the requirements of both the street lighting customer and Ausgrid. Approval by the street lighting customer for the applicable street lighting charges must be obtained first before construction work commences.

2.0 SCOPE

This Network Standard details the design requirements for Industrial and Commercial Developments across the Ausgrid franchise area.

Responsibilities of the Client are specified.

Method of Supply can be any of the methods given below.

- Service from the existing low voltage reticulation system – nominally 400/230V
- Direct Distributor – nominally 400/230V
- Customer Substation – nominally 11,000/400/230V
- High Voltage supply – nominally 11kV, 33kV, 66kV and 132kV

The design and construction of all earthing systems forming part of the works to be vested to Ausgrid shall comply with NS116 Design Standards for Distribution Equipment Earthing.

The design and construction of street lighting in Industrial and Commercial developments shall comply with NS119 Street Lighting Design and Construction.

The Client shall refer to NS130 Specification for Laying Underground Cables up to and Including 11kV for electrical infrastructure design standards with regards to cables. The general excavation and reinstatement requirements as well as the associated documentation, safety and environmental aspects of underground asset installation detailed in NS130 shall be applied to Industrial and Commercial Development’s cable installation work.

This Network Standard describes design parameters such as assessment of maximum demand, maximum low voltage distributor loading and maximum voltage drop.

The Client shall comply with Service and Installation Rules of New South Wales and NS238 for Supply Quality.

The Client shall refer to NS143 Easements, Leases and Rights of Way and other documents listed in this Network Standard for easements.
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

- ASP Level 1 Authorisation Agreement
- Bushfire Risk Management Plan
- Company Form (Governance) - Network Technical Document Endorsement and Approval
- Company Procedure (Governance) - Network Technical Document Endorsement and Approval
- Company Procedure (Network) – Network Standards Compliance
- Company Procedure (Network) - Production / Review of Engineering Technical Documents within BMS
- Connection Policy – Connection Charges
- Customer Installation Safety Plan
- Design Contract – Connection Assets
- Electrical Safety Rules
- Electricity Network Safety Management System Manual
- ES1, Premises Connection Requirements
- ES4, Accredited Service Provider Authorisation
- Model Standing Offer (MSO) – Standard Connection Services for Contestable ASP/1 Premises Connection no greater than 11kV
- NS100 Field Recording of Network Assets
- NS100 External Annexure C
- NS104 Specification for Electrical Network Project Design Plans
- NS109 Design Standards for Overhead Supply Developments and Distribution Centres
- NS110 Design and Construction Standard for URDs
- NS113 Site Selection and Construction Design Requirements for Chamber Substations
- NS114 Electrical Design and Construction Standards for Chamber Type Substations
- NS116 Design Standards for Distribution Equipment Earthing
- NS117 Design and Construction Standards for Kiosk Type Substations
- NS119 Street Lighting Design and Construction
- NS127 Specification for Low Voltage Cable Joints and Terminations
- NS129 11kV Joints and Terminations – Paper Insulated Lead Covered Cables
- NS130 Specification for 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
- NS161 Specification for Testing of Underground Cables
- NS177 11kV Joints (including Transition Joints) and Terminations – Polymeric Insulated Cables
- NS181 Approval of Materials and Equipment and Network Standard Variations
- NS181 Approved Material List (AML)
- NS195 High Voltage Customer Connections (HVCs)
- NS211 Working With Asbestos Products
- NS212 Integrated Support Requirements for Ausgrid Network Assets
- NS224 Low Voltage Suburban Commercial and Industrial Underground Distribution Utilising Pillars
- NS238 Supply Quality
- NS261 Requirement for Design Compliance Framework for Network Standards
- Policy for ASP/1 Premises Connections
- Public Electrical Safety Awareness Plan
- Public Lighting Management Plan
3.3 Other standards and documents

- AS/NZS 4026 Electric cables - For underground residential distribution systems
- ECS Guide to Protective Earthing (Electricity Council of NSW)
- ENA Doc 025-2010 EG-0 Power System Earthing Guide
- Service and Installation Rules of New South Wales
- TR IEC 61000.3.7:2012 Electromagnetic compatibility (EMC) - Limits - Assessment of emission limits for fluctuating installations to MV, HV and EHV power systems

3.4 Acts and regulations

- Community Land Development Act 1989
- Conveyancing Act, 1919
- Electricity Supply Act 1995
- Electricity Supply (General) Regulation 2014 (NSW)
- Electricity Supply (Safety and Network Management) Regulation 2014
- Real Property Act
- Strata Title Act
- Work Health and Safety Act 2011 and Regulation 2017

4.0 DEFINITIONS

- Accredited Service Provider (ASP): An individual or entity accredited by the NSW Department of Planning and Environment, Energy, Water and Portfolio Strategy Division, in accordance with the Electricity Supply (Safety and Network Management) Regulation 2014 (NSW).
- ASP/1, ASP/2, ASP/3: As defined in the current version of the NSW Department of Planning & Environment - Accreditation of Providers of Contestable Services - Scheme Rules.
- Business Management System (BMS): An Ausgrid internal integrated policy and procedure framework that contains the approved version of documents.
- Client: A client is an individual or an entity which has responsibility for the design and construction of the electricity reticulation installation, and which enters into an agreement/contractual arrangement with accredited personnel and/or Ausgrid for developing the installation. A client could be a developer, accredited contractor or customer.
- Conventional Base Street Lighting Standard: A Street Lighting Standard with a planted-type base providing for the installation of either side-entry or post-top luminaires.
- Customer: A customer is an individual or an entity that is an end-user of electricity.
- Design Information: Information provided by Ausgrid to enable Designers to prepare electricity reticulation design of the proposed development. Provision of Design Information is in accordance with Ausgrid’s Policy for ASP/1 Premises Connections and Connection Policy – Connection Charges.
Designer
An Ausgrid employee, contractor to Ausgrid or authorised ASP/3 who is duly qualified to produce design plans.

Developer
A developer is an individual or an entity which has responsibility for arranging the supply of electricity to the development in accordance with Ausgrid’s policies. A developer could be a commercial developer, or customer.

Direct Buried Cables
Cables installed underground whose outer surface is in direct contact with the general mass of the earth.

Document control
Ausgrid employees who work with printed copies of document must check the BMS regularly to monitor version control. Documents are considered “UNCONTROLLED IF PRINTED”, as indicated in the footer.

Easement
An easement is a right of a definite limited character secured by one party to use a portion of land which is owned by another party. Common examples are rights of way, drainage easements and easements for services. Easements are created in accordance with the Conveyancing Act and the Real Property Act. Easements may be created for a definite period of time or in perpetuity.

Lease
A lease is a contract by which one party, the lessor, usually in consideration of rent, conveys exclusive possession of land or premises to another party, the lessee, for a specified time. The rights and obligations of both parties are usually set out in a lease document.

Licence
A licence in relation to land or premises may convey similar rights to a lease, the consideration generally being described as a fee. The existence of a licence is not recorded on a certificate of title.

Link Pillar
A pillar incorporating links which serves as a switching point using removable links.

Lot Boundary
The dividing boundary line between adjoining lots.

Low Voltage Distributor
An electricity line rated at 1000V ac which originates at the low voltage end of a distribution substation and serves to convey electrical energy to end users via their service mains. Low voltage distributors are usually laid in public roadways and through easements on private land.

Network Standard
A document, including Network Planning Standards, that describes the Company's minimum requirements for planning, design, construction, maintenance, technical specification, environmental, property and metering activities on the distribution and transmission network. These documents are stored in the Network Category of the BMS repository.

Pillar
An enclosure consisting of a base and a cover housing cable terminations and forming part of the low voltage distribution network.

Review date
The review date displayed in the header of the document is the future date for review of a document. The default period is three years from the date of approval however a review may be mandated at any time where a need is identified. Potential needs for a review include changes in legislation, organisational changes, restructures, occurrence of an incident or changes in technology or work practice and/or identification of efficiency improvements.

Service Enclosure
An enclosure providing a point of connection of service mains to the low voltage network. A service enclosure can be either a pillar or a pillar-standard. Note: Pillar-standards are no longer a design/construction option. Reference to them is only included in this Network Standard as connection may still be required to be made to them where they currently exist in Ausgrid’s network.

Service Mains
The electricity cable connecting the Consumer's first point of supply to Ausgrid's service enclosure located in a public footway.
**Solid Pillar**

A pillar where the distributor cables are solidly connected using either bolted lugs or mechanical connectors. Isolation of the distributor cables requires removal of the connection bolts under load-free conditions.

**Street Alignment**

The boundary line between the dedicated roadway and the allotment. This is also known as the property alignment.

**Street Lighting Customer**

The Body controlling the standard of lighting and responsible for the applicable Street Lighting charges.

For dedicated roadways, the Street Lighting customer is the local Council, and for Community Land Title developments under the Community Land Development Act, 1989 it is the Community Association responsible for that particular development.

### 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 comply with the Work Health and Safety Act 2011 (NSW) together with the Work Health and Safety Regulation 2017 (NSW) and confirm in writing that all products supplied to Ausgrid contain no Asbestos related materials.

### 6.0 RESPONSIBILITIES OF CLIENT

The client shall provide all information within the Connection Application to allow Ausgrid to determine the most appropriate method of supply. Ausgrid will prepare and provide design information sufficient to allow contestable design plans to be completed based on this information.

The client is responsible, as detailed in Ausgrid’s Ausgrid Connection Policy – Connection Charges and the design information, for:

- engaging an Accredited Service Provider Level 3 (ASP/3) to prepare and submit a compliant design package to Ausgrid, and
- engaging an Accredited Service Provider Level 1 (ASP/1) to supply materials and construct the certified design that supplies the new industrial and commercial development.

The client shall use Accredited Service Providers to complete the electrical design and construction for which they are responsible. A complete list of Accredited Service Providers can be found on the website of the Department of Trade & Investment with additional limitations being detailed in ES4 ‘Service Provider Authorisation’. Reference should be made to Ausgrid’s ‘Model Standing Offer (MSO) – Standard Connection Services for Contestable ASP/1 Premises Connection no greater than 11kV’, ‘ASP Level 1 Authorisation Agreement’ and ‘Design Contract – Connection Assets’. The client is also responsible for providing local authorities and the RMS (as appropriate) with copies of the proposed construction plans as detailed in NS104 Specification for Electrical Network Project Design Plans and the Environmental Impact Assessment. The client shall comply with the specific requirements of these authorities.

The customer (end user) is responsible for supplying and installing the portion of service mains from the street alignment to the point of supply in accordance with the Service and Installation Rules of NSW.
7.0 DESIGN INFORMATION

7.1 Methods of supply

7.1.1 Requirements
There are four approved methods of supply as indicated below. Ausgrid will assess the connection application to determine which of these methods is suitable for supplying the development.

The options for electricity supply are:

7.1.2 Service from the existing low voltage reticulation system - nominally 400/230V
This method of supply is limited by the available capacity of the existing reticulation system and the associated distribution substations.

Reference should be made to the Service and Installation Rules of NSW and Ausgrid Connection Policy – Connection Charges.

7.1.3 Direct distributor - nominally 400/230V
A direct distributor is an exclusive supply line to a customer’s switchboard from a distribution substation remote from the customer’s premises. This method of supply is restricted by the capacity of the distribution substation, the voltage drop in the distributor cable, fault current clearance criteria, and interference considerations.

The supply availability from a direct distributor and the route length permitted for a direct distributor will be as determined by Ausgrid.

The maximum underground direct distributor rating is nominally 800A. The actual maximum supply available will be determined by Ausgrid on a case-by-case basis. The route length for a 600A or 800A underground direct distributor should not exceed 30 metres.

7.1.4 Customer substation - nominally 11000V/400/230V
Ausgrid may determine that the existing network is unable to meet the clients supply requirements. Therefore, in accordance with the Service and Installation Rules of NSW, the client may be required to provide a suitable space and approved enclosure to accommodate Ausgrid transformer(s), switchgear and other associated equipment. The various categories of Customer Substations are:

• kiosk substations
• surface chamber substations
• basement chamber substations
• elevated chamber substations
• upper level substations

A list of all distribution substation types and their approximate ratings is as detailed in Annexure A of NS109 Design Standards for Overhead Supply Developments and Distribution Centres.

Where supply is taken direct from a customer substation, the customer’s main switchboard shall, wherever practicable, be located immediately adjacent to the substation. If the customer’s main switchboard cannot be located immediately adjacent to the substation, the proposed location must be approved by Ausgrid before the design proceeds.

7.1.5 High voltage supply - nominally 11kV, 33kV, 66kV and 132kV
For information on high voltage supply, refer to NS195, High Voltage Customer Connections (HVCs).
7.2 Underground/overhead policy

Refer to Section 6 of Ausgrid’s ‘Policy for ASP/1 Premises Connections’ for details of Ausgrid’s overhead and underground mains policy.

The general guidelines for the form of construction for each development shall be determined by Ausgrid and shall be in accordance with the prevailing Policy of the time. The final interpretation and decision as to the type of construction to be used shall be Ausgrid’s, and notification of the type of construction shall be issued in the preliminary design brief.

7.3 Underground construction

7.3.1 Cables and ratings

7.3.1.1 Standard cables

Standard cables approved by Ausgrid for use in commercial and industrial developments are described below. Ausgrid will specify the cable to be used on each project as part of the design information. Refer to NS100 Field Recording of Network Assets for cable nomenclature.

<table>
<thead>
<tr>
<th>Conductor type</th>
<th>Cross Sectional Area (mm²)</th>
<th>Cable Description</th>
<th>General Application</th>
</tr>
</thead>
<tbody>
<tr>
<td>Aluminium</td>
<td>500</td>
<td>11kV 500 AL3 polymeric cable</td>
<td>Feeder cable - urban areas</td>
</tr>
<tr>
<td>Aluminium</td>
<td>400</td>
<td>11kV 400 AL3 polymeric cable</td>
<td>Feeder cable - urban areas</td>
</tr>
<tr>
<td>Aluminium</td>
<td>300</td>
<td>11kV 300 AL3 polymeric cable</td>
<td>Feeder cable - urban areas</td>
</tr>
<tr>
<td>Aluminium</td>
<td>185</td>
<td>11kV 185 AL3 polymeric cable</td>
<td>Feeder cable - Hunter Region</td>
</tr>
<tr>
<td>Aluminium</td>
<td>95</td>
<td>11kV 95 AL3 polymeric cable</td>
<td>Substation tee</td>
</tr>
<tr>
<td>Copper</td>
<td>300</td>
<td>11kV 300 CU3 PILC cable</td>
<td>Feeder cable - Existing City pit and duct where 300 Triplex does not physically fit</td>
</tr>
<tr>
<td>Copper</td>
<td>185</td>
<td>11kV 185 CU1 polymeric cable</td>
<td>Feeder tails</td>
</tr>
<tr>
<td>Copper</td>
<td>300</td>
<td>11kV 300 CU1 polymeric cable</td>
<td>Feeder tails</td>
</tr>
</tbody>
</table>

In Sydney a pit and duct system is employed for electricity reticulation within its Central Business District (CBD). For this reason 300mm² copper cables are used as feeder cables.

Where a number of high voltage cables are to be laid in the same trench, mutual heating may be of concern to Ausgrid and therefore reference should be made to Ausgrid for suitable cable sizes. Where the cable installation depth changes due to increased cover or the cable needs to pass under a water main etc., reference should be made back to Ausgrid for a suitable cable size or possible alternative installation method i.e. Thermally Stable Bedding material (TSB).
Table 2: Low voltage distributor cables

<table>
<thead>
<tr>
<th>Conductor Type</th>
<th>Cross Sectional Area mm²</th>
<th>Cable Description</th>
<th>General Application</th>
<th>Summer Cyclic Cable Rating - Amps</th>
</tr>
</thead>
<tbody>
<tr>
<td>Aluminum</td>
<td>240</td>
<td>415 240 AL4 XQ Z / SAC</td>
<td>(a) Network distributor cable outside Sydney CBD. (b) Direct distributor.</td>
<td>440 355</td>
</tr>
<tr>
<td></td>
<td>185</td>
<td>415 185 CU1 XQ Z / COM# COL (4 cables) Not UV stable or 415 185 CU1 XQ Z (4 cables)</td>
<td>(a) Network distributor cable within or outside Sydney CBD. (b) Direct distributor.</td>
<td>520 420</td>
</tr>
<tr>
<td>Copper</td>
<td>240</td>
<td>415 240 CU4 XQ Z</td>
<td>Network distributor cable outside Sydney CBD – special cases</td>
<td>565 460</td>
</tr>
<tr>
<td></td>
<td>300</td>
<td>415 300 CU1 XQ Z (4 cables)</td>
<td>Direct distributor.</td>
<td>665 540</td>
</tr>
<tr>
<td></td>
<td>500</td>
<td>415 500 CU1 XQ Z (4 cables)</td>
<td>Direct distributor.</td>
<td>875 710</td>
</tr>
</tbody>
</table>

Distributors are nominally rated at 400A.

The above cable ratings are based on having no other cables in the trench and average soil thermal resistivity of 1.2Km/W (Kelvin * metres / watt). For different environmental conditions and cable configurations, reference must be made to Ausgrid for the applicable cable ratings.

**Note:** In some parts of the Newcastle-Hunter regions the current is limited to 350A which is set by the thermal limit of the low voltage fuse units.

For direct distributors that exceed the above ratings, two cables may be installed and operated in parallel.

### 7.3.1.2 Service cables

For services up to and including 200 amps the cable must be 4 core copper conductors, cross linked polyethylene insulated, PVC-sheathed manufactured to AS/NZS 4026 Electric cables - For underground residential distribution systems. The minimum conductor size must not be less than 16mm².

Table 3: Service cables

<table>
<thead>
<tr>
<th>Cross Sectional Area (mm²)</th>
<th>Cable Type</th>
<th>Rating of Service</th>
</tr>
</thead>
<tbody>
<tr>
<td>16</td>
<td>LV16CU4XQZ</td>
<td>100</td>
</tr>
<tr>
<td>50</td>
<td>LV50CU4XQZ</td>
<td>200</td>
</tr>
</tbody>
</table>

All underground service cables are three phase, except for builders’ services.

Service cables specifications are as follows:
- 100A service - 16 mm² or 25 mm², circular, stranded, copper conductor,
- 200A service - 50 mm² or 70 mm², circular, stranded, copper conductor;
• >200A service/direct distributor - 185 mm², circular, stranded, copper conductor, single core and 240 mm², 90 degree sector shaped, solid, aluminium conductor, multicore (240 mm² multicore cable is not suitable for use as a service cable in pillars detailed in NS224 Low Voltage Suburban Commercial and Industrial Underground Distribution Utilising Pillars).

Any intermediate service ratings (based on the assessed demand of the installation) must use the next largest service rating/cable available. The 50mm² cable may also be used for a 100 Amp service to satisfy voltage drop requirements.

7.3.1.3 Street lighting cables
For conventional street light standards, the minimum cable standard is 16mm² two-core copper, XLPE insulated PVC sheathed cable.

Dedicated street lighting circuits shall not be used in industrial and commercial developments. Street lights shall be supplied direct from the low voltage network via photo electric cells.

7.3.2 Cable installation and jointing
All civil work, installation and jointing of cables must be carried out in accordance with:

- NS127 Specification for Low Voltage Cable Joints and Terminations
- NS129 11kV Joints and Terminations – Paper Insulated Lead Covered Cables
- NS130 Specification for Laying Underground Cables up to and Including 11kV
- NS177 11kV Joints (including Transition Joints) and Terminations – Polymeric Insulated Cables

7.3.3 Pit and duct system
In the Central Business District of Sydney, and in some other locations, cables are pulled into pit and duct systems. Refer also to NS130 Specification for Laying Underground Cables up to and Including 11kV.

7.3.4 Industrial and commercial pillar and duct system
Some industrial areas and commercial shopping areas may require the use of the Industrial and commercial pillar and duct system. Refer to NS224 Low Voltage Suburban Commercial and Industrial Underground Distribution Utilising Pillars.

7.4 Distribution substations

7.4.1 Types and ratings
Supply negotiations between the client and Ausgrid may conclude that a distribution substation is required to satisfactorily supply the development. Substation options available and conditions of use are detailed in Annexure A of NS109 Design Standards for Overhead Supply Developments and Distribution Centres.

K type kiosks and single transformer high voltage circuit breaker controlled substations are restricted to installations for single industrial customers or single commercial customers. Intending customers should be made aware of the regular supply interruptions required for maintenance of these substations. Shopping centres are to be considered to be a multiple customer for the purposes of this Network Standard, and should not normally be supplied by K type kiosks.

In the case of multiple transformer substations the appropriate ratings given in Annexure A of NS109 Design Standards for Overhead Supply Developments and Distribution Centres are firm ratings based on one transformer out of service. Maintenance or failure of transformer or transformer associated equipment can generally be accommodated without restriction of supply. Loads in excess of the firm rating (up to the non-firm rating) can be accommodated by some substation options but will have the following consequences:

• Load must be restricted to allow periodic maintenance of each transformer.
• An interruption to supply for failure of any transformer or associated equipment will occur. However, restricted supply can be given within approximately one hour by re-energising healthy transformers.

The minimum design and construction requirements for kiosk, surface chamber, basement chamber and upper level substations are as defined in the following network standards:

NS114 Electrical Design and Construction Standards for Chamber Type Substations
NS116 Design Standards for Distribution Equipment Earthing
NS117 Design and Construction Standards for Kiosk Type Substations
NS141 Site Selection and Site Preparation Standards for Kiosk Type Substations

**Kiosk substations**

Current types:

- L type 400 kVA, 600 kVA, 800 kVA, 1000 kVA
- K type 1500 kVA.

**Notes:** 1. Maximum of one transformer per Kiosk Type substation.

**7.4.2 Substation siting**

**7.4.2.1 Industrial and commercial subdivisions**

Where maximum demand information is available at the time of subdivision development, and the required substation sites are able to be decided during the early stages of development, these sites shall be shown on the subdivision survey plan as unencumbered, obstruction free sites. Refer to NS141 Site Selection and Site Preparation Standards for Kiosk Type Substations for options.

The substations shall be sited close to the load centre to fully utilise the substation capacity. The electrical network designer shall also consider any requirements to feed future extensions to the subdivision.

Ausgrid reserves the right to approve or reject proposed sites.

Ausgrid will determine whether it is appropriate to install all designed distribution centres at the time of initial development of the subdivision. The developer shall comply with the requirements of NS141 for the site selection of Kiosk type substations.

**7.4.2.2 Industrial and commercial individual customer**

The general requirements for locating substations on customer premises are set out in:

NS141 Site Selection and Site Preparation Standards for Kiosk Type Substations
NS113 Site Selection and Construction Design Requirements for Chamber Substations

Within these guidelines, the client and Ausgrid’s negotiating officers shall determine a mutually acceptable site for the required substation.

For the various kiosk and chamber type substation options available, refer to Annexure A of NS109 Design Standards for Overhead Supply Developments and Distribution Centres.

**7.5 Earthing**

The design and construction of all earthing systems forming part of the works to be vested to Ausgrid shall comply with NS116 Design Standards for Distribution Equipment Earthing. Earthing system design involves modelling of the proposed arrangement to ensure it will comply with appropriate safety criteria in keeping with the principles of ENA Doc 025-2010 – EG-0 Power System Earthing Guide.

In the majority of cases an acceptable (combined) earthing system design for a distribution substation requires not only the mandatory local electrodes but also LV neutral and/or 11kV cable
screen connections to the surrounding distribution network. If adequate earthing system connections are not possible a segregated earthing system design may be necessary but this usually requires considerably more separation distance from other facilities which may be adversely affected such as swimming pools, fuel stations, telco equipment, metallic fences and the like.

All substations are required to have local earth electrodes. For Kiosk type substations these are generally installed in the easement area surrounding the kiosk base. For chamber type substations the electrodes are generally installed directly under the footprint of the substation.

7.6 Street lighting

Street lighting equipment to be installed in an Industrial and Commercial subdivision will be determined by the requirements of the Street Lighting Customer (the local council for streets to be dedicated, or the Community Association in the case of Community Land Title developments under the Community Land Development Act 1989).

Lighting requirements should be determined at an early stage of negotiations between the Electricity reticulation Designer and the Street Lighting Customer. Design parameters which need to be identified include the standard of lighting to be provided and any preferences for lamp types and sizes, luminaire types and standards, and any other requirements for street lighting furniture.

All lighting designs must be referred to Ausgrid for approval. The submission must include a schedule of all street lighting furniture and associated hardware proposed to be used.

Approval by the customer to accept annual charges for the proposed street lighting must be obtained before construction work commences.

Pillar standards are not an option in Industrial and Commercial subdivisions and therefore conventional base street lighting standards shall be utilised.

The design and construction of street lighting in Industrial and Commercial developments shall comply with NS119 Public Lighting Design and Construction.
8.0 DESIGN PARAMETERS

8.1 Assessment of maximum demand

8.1.1 Individual customer development

The demand shall be assessed by the designer and provided to Ausgrid based on appropriate diversity factors and building efficiency ratings (e.g. NABERS energy rating) being applied to a submitted list of the clients’ maximum demands for all items of equipment. These factors should be used in conjunction with discussions with the client to ensure there are no mitigating circumstances that would negate or reduce their use.

If a full list of connected loads is not initially available Ausgrid may nominate a load density value in VA per square metre for floor area used.

The maximum demand should include the size and timing of the client’s expectations of future expansion of their installation. This will enable the designer to prepare a network design compatible with the client's future requirements.

It can also be cost efficient for the client to provide up front for their future development requirements; common examples include providing additional spare ducts, facility for a larger or additional transformer, or a different cable configuration.

8.1.2 Subdivision development

An assessment of final maximum load details for each lot in the subdivision is required in order to determine the type and size of distribution centres and other distribution system requirements. This assessment is determined (in order of preference) based on:

- the client’s determination of the load details for the site;
- an estimate based on the floor area for each lot following the method in Annexure B of NS109 Design Standards for Overhead Supply Developments and Distribution Centres, and summated to obtain an approximation of the load requirements of the overall entire subdivision. An allowance for future load growth may be made by reference to Annexure B of NS109; or
- an estimate based on similar developments.

The developer shall ensure that all distribution centres can be established by the provision of appropriate property easements on development lots and the installation of suitable conduits. Generally all designed distribution centres are to be installed at the time of initial development of the subdivision.

8.2 Maximum low voltage distributor loading

The following design criteria for the initial electrical loading on low voltage distributors must be satisfied:

- The nominal rating of each distributor will be as advised by Ausgrid. Distributors to the network from kiosk and chamber type substations commonly have nominal ratings of 400 amps, except for older type kiosks in the ex-Orion Energy area, which have nominal distributor ratings of 350 amps.
- The designed maximum loading on any distributor must not exceed 75% of the distributor's nominal rating, unless indicated otherwise by Ausgrid. This provides a reasonable margin for load growth and paralleling requirements.
- The load to be connected to a distribution centre must be balanced across the distributors and their respective phases, unless agreed otherwise by Ausgrid.

8.3 Maximum voltage drop

The designed maximum voltage drop along a low voltage distributor must not exceed 9 volts phase-to-earth at the extremities when the distributor is loaded to 75% of its nominal rating, as indicated in Clause 8.2.

Note: Service mains are not regarded as part of the distributor.
The voltage drop in the service mains shall not exceed 3% at full load in accordance with the Service and Installation Rules of NSW.

Voltage drop constants for distributors and service cables at 50 Hz and 90°C conductor temperature are as indicated in the following tables:

**Table 4: Voltage drop constants for balanced loading**

<table>
<thead>
<tr>
<th>Underground Cable</th>
<th>Voltage Drop Constants for Balanced Loading* over Three Phases (mV/amp-metre)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td><strong>Phase / Earth</strong></td>
</tr>
<tr>
<td>415 16 CU4 XQ Z</td>
<td>1.472</td>
</tr>
<tr>
<td>415 50 CU4 XQ Z</td>
<td>0.501</td>
</tr>
<tr>
<td>415 240 AL4 XQ Z / SAC</td>
<td>0.175</td>
</tr>
<tr>
<td>415 240 CU4 XQ Z</td>
<td>0.118</td>
</tr>
<tr>
<td>415 185 CU1 XQ Z / COM#COL (4 cables) or 415 185 CU1 XQ Z (4 cables)</td>
<td>0.165</td>
</tr>
<tr>
<td>415 300 CU1 XQ Z (4 cables)</td>
<td>0.128</td>
</tr>
<tr>
<td>415 500 CU1 XQ Z (4 cables)</td>
<td>0.111</td>
</tr>
</tbody>
</table>

* Note 1. Consumers’ installations are to be designed for balanced loading, in accordance with the Service and Installation Rules of NSW.

** Note 2. Use this column for calculation of the designed maximum voltage drop in a low voltage distributor. The designed maximum voltage drop must not exceed 9 volts phase-to-earth at the extremities, when the distributor is loaded to 75% of its nominal rating.

**8.4 Quality of supply**

The designer shall ensure that the design is satisfactory to supply customer equipment that has the potential to cause interference to other customers. Arc furnaces, welding machines, X-ray units and frequently started large motors are examples of equipment that can cause excessive fluctuation of voltage. The design shall comply with the limits specified in the Service and Installation Rules of New South Wales (Clause 1.10) and also NS238 Supply Quality.

**8.5 Levels of reliability**

**8.5.1 Low voltage**

Alternate supply to LV distributors must be provided from adjacent distribution centres where practicable. Each distributor will normally require two alternate points of supply to allow low voltage paralleling under maximum demand conditions.

Every opportunity must be taken to establish loop feeds where loop roadways exist (i.e. interconnection between distributors from the same distribution centre or between different branches of the same distributor). Extension of distributors beyond that necessary to provide a paralleling path will not normally be required unless specified otherwise by Ausgrid.

**8.5.2 High voltage**

During the course of supply negotiations Ausgrid will determine the minimum level of high voltage reliability required and will confirm the high voltage connection arrangement to achieve the reliability as part of its design information. In doing so, Ausgrid will take into account the level of reliability of the existing network, type of existing construction (i.e. overhead or underground), permissible number of 'T' Joints allowed, permissible number of substations on a radial supply (both on a temporary and permanent basis), future load growth, and any other network requirements. All costs associated with levels of reliability in excess of Ausgrid’s determination of reliability requirements shall be met by the client.
8.6 Subdivision design (underground distribution)

8.6.1 General

Detailed design of high voltage and low voltage networks in new industrial and commercial or similar subdivisions is critically dependent on the expected maximum demand of individual services and the diversity of these services. Designs will vary between subdivisions and are normally project specific.

The development of new industrial and commercial subdivisions does not usually target certain industries or commercial ventures, therefore electrical load requirements at the subdivision design and development stages are usually not known. In these circumstances, Service Providers (Designers) will need to use previous experience and good judgement in their attempt to produce designs that are economically and operationally acceptable.

To help overcome these difficulties, in the absence of reliable load information the following guidelines should be followed:

- If initially considered necessary, substation(s) should be strategically positioned to cater for immediate and medium term load requirements. The estimated maximum demand should be based on average industrial and commercial maximum demand statistics. High voltage cables may be laid in the same trench as low voltage cables.

- At least one High Voltage cable must be laid through every street of the development to facilitate supply to future substations. The High Voltage cable must loop in and out of cul-de-sacs so as not to form an open point.

- For an anticipated demand of over 6MVA, a second High Voltage cable should be laid through the development.

- Low voltage distributor cable should be directly laid with 2 spare conduits on both sides of each roadway. Low voltage cables shall be looped into and out of the pillars. Pillars shall be installed adjacent to the lot boundaries and centred 400mm on the roadway side of the street alignment. It is preferred to direct lay cables in underground industrial developments providing it is a closed-off site.

- Roadway crossings consisting of a minimum of four conduits, complying with the Table of Conduit Specifications as detailed in NS130 Specification for Laying Underground Cables up to and Including 11kV, should be laid approximately every 75 metres and aligned with the nearest pillar.

- The first pillar from a substation on each distributor must have the facility to isolate the distributor by means of a link. (Note: This does not apply to direct distributors.)

- The last pillar on each extremity of a distributor must have the facility to allow for paralleling with adjacent distributors by means of a link.

- Street lighting design should be based on using conventional street lighting standards (or approved decorative lighting) in accordance with NS119 Street Lighting Design and Construction, and the requirements of the street lighting customer.

- Services up to 400A can be terminated into the distribution pillars (refer to NS224 Low Voltage Suburban Commercial and Industrial Underground Distribution Utilising Pillars). Services above 400A shall be supplied direct from the distribution substation.

8.6.2 Distribution pillars

Refer to NS224 Low Voltage Suburban Commercial and Industrial Underground Distribution Utilising Pillars for the different electrical configurations that are approved for use on Ausgrid’s Network in industrial and commercial and similar subdivisions. Construction details for these pillars are also contained in NS224.

Other approved pillar designs such as those used in Underground Residential Development (URD) areas may also be used in special circumstances subject to prior approval by Ausgrid. Refer to NS110 Design and Construction Standard for URDs for the electrical design requirements of these
pillars. Construction details for these pillars are given in NS127 Specification for Low Voltage Cable Joints and Terminations.

9.0 LEASES, EASEMENTS AND RIGHT OF WAYS

9.1 General
Leases, licences, easements and right of ways are generally required where distribution centres and cabling that will be vested to Ausgrid on completion of the works are not sited on public land.

Leases - the requirements for leases and their duration are as listed below.

Easements - an easement generally clear of other construction is required for the installation and future maintenance of mains associated with substations. The width of an easement shall be in accordance with NS143 Easements, Leases and Rights of Way.

Right of Ways - a suitable access way is required for personnel and equipment to gain access to substations on private land. Refer to NS143 Easements, Leases and Rights of Way for further details.

Where required, easements must be provided by the Developer in favour of, and at no cost, to Ausgrid. Easement sites must be free of encumbrances and be satisfactory for their purpose. The complete restoration of landscaping within easement sites is the responsibility of the Developer.

The Developer must include details of all easements to be created in favour of Ausgrid on the final subdivision plan lodged with the NSW Land Registry Services. If land involved with the required easements is not subject to sub-division, a separate Plan of Easement and the required Transfer of Grant shall be prepared.

Easements are to be created in accordance with:
For Torrens Title Section 88B of the Conveyancing Act, 1919 as amended
For Community Title Section 36 of the Community Land Development Act, 1989.

9.2 Industrial and commercial subdivision

9.2.1 Torrens title
The preferred siting of Kiosk substations is adjacent to the front road boundary of the development. The site tenure is by easement. (Refer to NS143 Easements, Leases and Rights of Way for details).

9.2.2 Strata title
All substations with the exception of Chamber substations require the creation of an appropriate easement. Chamber substations require the creation of a lease.

Where the subdivision is to be registered under the Strata Title Act, a Chamber substation site is to be secured by a 99 year lease. A suitable easement over the cables and right of way for substation access is also a requirement. All arrangements for substation tenure must be effected prior to lodgement of the Strata Plan.

9.2.3 Community title
The preferred siting is to be adjacent to the developments front boundary. The site tenure shall be in perpetuity together with suitable easement and right of way.

9.3 Industrial and commercial individual customers

9.3.1 Requirements
Leases are to be used for chamber substations only. All other substations are to be protected by appropriate easements.
9.3.2 Low voltage customer substation

Tenure over a Chamber substation site is secured by the establishment of a 50 year lease. A suitable easement over the cables and right of way for substation access is also a requirement.

Refer to NS113 Site Selection and Construction Design Requirements for Chamber Substations regarding requirements for tenure over ventilation ducts external to substation chambers.

9.3.3 High voltage customer substation

For the establishment of a high voltage customer a suitable easement over the cables and right of way for substation access is also a requirement.

In all cases minimum access requirements for personnel and equipment to the substations and cables shall comply with the relevant requirements of NS113 and the Service and Installation Rules of NSW.

Typical examples of layouts for leases, easements and rights-of-way are shown in NS143 Easements, Leases and Right of Way.

10.0 STORES AND MATERIALS

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

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

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

11.0 RECORDKEEPING

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

<table>
<thead>
<tr>
<th>Type of Record</th>
<th>Storage Location</th>
<th>Retention Period*</th>
</tr>
</thead>
<tbody>
<tr>
<td>Approved copy of the network standard</td>
<td>BMS Network sub process Standard – Company</td>
<td>Unlimited</td>
</tr>
<tr>
<td>Draft Copies of the network standard during amendment/creation</td>
<td>HPRM Work Folder for Network Standards (HPRM ref. 2014/21250/277)</td>
<td>Unlimited</td>
</tr>
<tr>
<td>Working documents (emails, memos, impact assessment reports, etc.)</td>
<td>HPRM Work Folder for Network Standards (HPRM ref. 2014/21250/277)</td>
<td>Unlimited</td>
</tr>
</tbody>
</table>

* 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.
12.0 AUTHORIZED AND RESPONSIBILITIES

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

13.0 DOCUMENT CONTROL

<table>
<thead>
<tr>
<th>Content Coordinator</th>
<th>Transmission &amp; Distribution Mains Engineering Manager</th>
</tr>
</thead>
<tbody>
<tr>
<td>Distribution Coordinator</td>
<td>Snr Engineer Guidelines Policies and Standards</td>
</tr>
</tbody>
</table>
Annexure A – Kiosk siting diagrams
Refer to NS141 Site Selection and Site Preparation Standards for Kiosk Type Substations for kiosk siting diagrams and the requirements for siting of kiosk substations.

Annexure B – Distribution substation options
Refer to Annexure A of NS109 Design Standards for Overhead Supply Developments and Distribution Centres for distribution substation options.

Annexure C – Tables for assessment of maximum demand
Refer to Annexure B of NS109 Design Standards for Overhead Supply Developments and Distribution Centres for assessment of maximum demand tables.

Annexure D – Standard drawing symbols
Refer to Annexure A of NS100 Field Recording of Network Assets for standard drawing symbols.
Annexure E – Typical subdivision layout

(In the absence of Load details)

Figure E.1 Typical subdivision layout
Annexure E – Typical subdivision layout (continued)

Figure E.2 Typical Arrangement for Large UID Subdivisions
Annexure F – Pit and duct system
Refer to NS130 Specification for Laying Underground Cables up to and Including 11kV for pit and duct systems.

Annexure G – Cable nomenclature
Refer to NS100 Field Recording of Network Assets, Annexure C, for the cable nomenclature and cable codes.
Annexure H – Sample Compliance checklist

### Network Standard Checklist Form

NS112 Design Standards for Industrial and Commercial Developments

<table>
<thead>
<tr>
<th>Item</th>
<th>Description</th>
<th>Refer Clause</th>
<th>Completed/ Actioned</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>The client shall provide all information within the Connection Application to allow Ausgrid to determine the most appropriate method of supply.</td>
<td>2.0</td>
<td>X</td>
</tr>
<tr>
<td>2.</td>
<td>Notify the client of the most appropriate method of supply.</td>
<td>7.1</td>
<td>Yes/No/N/A</td>
</tr>
<tr>
<td>3.</td>
<td>Refer to Section 6 of Ausgrid’s Policy for ASP1-Premises Connections for details of Ausgrid’s overhead and underground mains policy.</td>
<td>7.2</td>
<td>Yes/No/N/A</td>
</tr>
<tr>
<td>4.</td>
<td>Specify the cable to be used on each project as part of the design information.</td>
<td>7.3.1</td>
<td>Yes/No/N/A</td>
</tr>
<tr>
<td>5.</td>
<td>All civil work, installation and jointing of cables must be carried out in accordance with NSS-127, 122, 130 and 1778.</td>
<td>7.3.2</td>
<td>Yes/No/N/A</td>
</tr>
<tr>
<td>6.</td>
<td>Investigate the need for the project to have its own distribution substations.</td>
<td>7.4.1</td>
<td>Yes/No/N/A</td>
</tr>
<tr>
<td>7.</td>
<td>If needed the substations shall be sited close to the load centre to fully utilise the substation capacity. The electrical network designer shall also consider any requirements to feed future extensions to the subdivisions.</td>
<td>7.4.2</td>
<td>Yes/No/N/A</td>
</tr>
<tr>
<td>8.</td>
<td>The design and construction of all earthing systems forming part of the works comply with NS116.</td>
<td>7.6</td>
<td>Yes/No/N/A</td>
</tr>
<tr>
<td>9.</td>
<td>The design and construction of all street lighting forming part of the works comply with NS115.</td>
<td>7.6</td>
<td>Yes/No/N/A</td>
</tr>
<tr>
<td>Item</td>
<td>Description</td>
<td>Refer-Clauses</td>
<td>Completed/Actioned</td>
</tr>
<tr>
<td>------</td>
<td>-----------------------------------------------------------------------------</td>
<td>---------------</td>
<td>--------------------</td>
</tr>
<tr>
<td>0</td>
<td>Maximum demand assessed on appropriate diversity factors.</td>
<td>8.1 &amp; 8.1.4</td>
<td>Yes/No/NA</td>
</tr>
<tr>
<td>10</td>
<td>Maximum low-voltage distributor loading satisfied for the initial electrical-</td>
<td>9.2</td>
<td>Yes/No/NA</td>
</tr>
<tr>
<td></td>
<td>loading on LV distributor.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>11</td>
<td>Maximum voltage drop in a LV distributor must not exceed 0V phase-to-earth</td>
<td>8.3</td>
<td>Yes/No/NA</td>
</tr>
<tr>
<td></td>
<td>when the distributor is loaded to 75% of its nominal rating.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>12</td>
<td>Design is satisfactory to supply customer equipment that has the potential</td>
<td>9.4</td>
<td>Yes/No/NA</td>
</tr>
<tr>
<td></td>
<td>to cause interference to other customers; see also NS238 and S.I.R. NSW.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>13</td>
<td>Alternate supply to LV distributors must be provided from adjacent distribu-</td>
<td>8.6</td>
<td>Yes/No/NA</td>
</tr>
<tr>
<td></td>
<td>tors or centres where practical.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>14</td>
<td>NS224 referred to for the distribution pillar configurations that are ap-</td>
<td>9.6.2</td>
<td>Yes/No/NA</td>
</tr>
<tr>
<td></td>
<td>proved for use in industrial/commercial subdivisions.</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Notes:**

The signatures panel of this document has been removed for privacy considerations. The remainder of the document is unchanged.