NP001.4
General Specification for Overhead Rural Residential Subdivisions

This document is extracted from Network Policy NP 001, Design and Construction of Network Assets.

Other documents in this series include:

- NP001.1 Design and Construction of Network Assets – General Requirements
- NP001.2 General Specification for Underground Electrical Reticulation
- NP001.3 General Specification for Overhead Electrical Reticulation
- NP001.5 General Specification for Overhead Commercial and Industrial Subdivisions
- NP001.6 General Specification for URD Subdivisions
- NP001.7 Reliability Criteria for Distribution Networks
- NP001.8 Handover Documentation
- NP001.9 Conditions of Supply to Large Customers
- NP001.10 Documentation Requirements

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General Specification for Overhead Rural Residential Subdivisions

1. Contents

1. Scope

This document sets out specific Power and Water requirements for the design and construction of rural subdivisions. It should be read in conjunction with NP001.3 (General Specification for Overhead Work) and NP001.1 (Design and Construction of Network Assets – General Requirements).

2. General

2.1. Pole Alignment

Poles shall generally be aligned at the standard alignments shown in the S2-4-1 series of drawings in Volume 2 of the Standards Manual.

When designing a rural residential subdivision, poles shall be placed so that the minimum horizontal clearance of conductors to the property boundary under no-wind conditions is 1.5m. This is to minimise tree trimming problems. This may require offset construction on curved road sections.

Poles shall be placed where practicable opposite adjoining lot boundaries. Poles on bends or close to intersections shall be placed so as to minimise danger to vehicle traffic[1]. Where poles are located in a potentially dangerous position, Power and Water may require the fitting of suitable vehicle guards. These must also be approved by the road authority.

2.2. High Voltage Construction

Regardless of the voltage, 500mm post-type HV insulators shall be used. In addition, in areas deemed by Power and Water to be bat-prone, approved bat guards shall be used.

[1] Refer "Collisions with Utility Poles", Melbourne University, 1980.

The HV conductor size shall be as directed by Power and Water. In addition, Power and Water may require the installation of air or gas-break switches, high voltage links and/or live line clamps at strategic locations. These matters should be determined prior to commencing the design.

2.3. Stays

In general, stays shall be kept to a minimum. The availability of "D" strength class poles largely obviates their need. In particular, the practice of teeing off a pole at slack tension, and running a short span to a stayed strain pole, is only to be used as a last resort. Such constructions leave a legacy of unnecessary hardware needing maintenance.

Stays need not be fitted with pedestrian guards. Stays located on private property shall have a 3m easement registered on the property title (1.5m in all directions from any part of the stay, including parts below ground).

2.4. Surge Arresters

Low voltage surge arresters shall be fitted at every substation, at the end of each low voltage run, and at underground cable tees (excluding underground services).

2.5. Subdivision

Where a lot in an existing rural subdivision is subdivided, the subdivider may:

- redesign the low voltage run to comply with the requirements of this Appendix, or
- pay a capacity charge for each additional lot (see DSEP)

In addition, the developer shall install any internal reticulation required to service the new lots.

3. Substations

3.1. Size and Spacing

The designer has a certain amount of latitude when setting out distribution substations in a subdivision. There is a choice between fewer and larger substations, or more numerous but smaller substations.

In some areas where only single phase high voltage supply is available, there is a choice between 230 volt 2-wire and 230/460 volt 3–wire reticulation.

There are also some choices, as in URD substations, between fewer larger substations and more numerous smaller substations. However, as rural subdivisions have large frontages, very long LV runs would be required to pick up significant numbers of customers. Consequently, most substations are small already. Small substations have significant impedance, resulting in increased supply quality problems when large appliances or motors are switched.

Rural areas also have numerous bore pumps, and these are the cause of many voltage complaints in rural areas.

As a general rule, a basic supply per customer or known maximum demand shall be used for sizing substations. ADMD of 6kVA per rural residential customer or

25kVA per other rural zoned customer may be used for voltage drop calculations, with the design of low voltage systems based on loading as follows:

Table 1

6 kVA/lot	
Number of Lots	**Diversified Loading**
1 x RR lot	13 kVA$^{\alpha}$
2 x RR lots	20 kVA
3 x RR lots	27 kVA
4 x RR lots	33 kVA
Additional lots	6 kVA

The above loading figures will be applied using worst-case placement as follows – 13kVA single phase at the last service, 7kVA three phase at the second-last service, 7 kVA three phase at the third-last service, etc.

However, combined substation/low voltage systems shall be designed so that, when loads complying with Table 2 of Section 4.2.2.1 of the Service Rules are connected to the end of any low voltage run, voltage fluctuations do not exceed the limits imposed by Australian Standard AS/NZS 61000.3.3, *Electromagnetic compatibility (EMC), Part 3.3: Limits – Limitation of voltage fluctuations and flicker in low-voltage supply systems for equipment with rated current less than or equal to 16A.*

Refer to Section 4.2.2 of the Service Rules for more detailed information about the types of equipment that may be connected to distribution systems. In some cases this may prevent the use of 25kVA three phase substations of (typically) 3.3% impedance.

Table 2 from the Service Rules is reproduced below.

Table 2

<table>
<tr><td colspan="4"></td><td colspan="2">Limit Applying to Changes of Line Current (amperes)</td></tr>
<tr><td>Voltage</td><td>Connection</td><td>No. Phases</td><td>Switching Arrangement</td><td>Fluctuating or Intermittent (more than 4 changes per hour)</td><td>Continuous or Steady (less than 4 changes per hour)</td></tr>
<tr><td rowspan="3">230</td><td rowspan="3">Line-neutral</td><td>1</td><td></td><td rowspan="3">15</td><td rowspan="3">25</td></tr>
<tr><td>2 or 3</td><td>Phases NOT switched simultaneously</td></tr>
<tr><td>3</td><td>All phases switched simultaneously</td></tr>
<tr><td rowspan="2">400</td><td>Line-line</td><td>3</td><td>All phases switched simultaneously</td><td>30</td><td rowspan="2">50</td></tr>
<tr><td>No neutral connection</td><td>2</td><td></td><td>45</td></tr>
</table>

In Table 2 the term "fluctuating or intermittent" shall mean that the input current to the appliance changes in magnitude more than 4 times per hour, as occurs with the operation of welders, heating units controlled by thermostats, or energy regulators and machines such as X-ray units that are repetitively switched.

3.2. Losses in the LV System

The cost of losses should not be overlooked. Low voltage conductors shall be a minimum of 95mm^2 aluminium, but where the calculated maximum load exceed 100 amperes, a minimum 150mm^2 conductor shall be used. This may affect the economics of substation spacing.

3.3. Substation Placement

Substations must be so placed that the following two conditions are met:

(a) The voltage drop in the LV system under normal conditions, taking into account the distribution of load above, is limited to 4%, and

(b) The voltage drop under the emergency condition of loss of any interconnected substation shall not exceed 10%. Under these conditions only the ADMD figure need be used. This condition will not be enforced where it is impracticable to do so.

4. Low Voltage System

The designer has the basic choice between ABC or bare conductor. Refer to 3.3 above for voltage drop limits, and to 3.1 regarding the maximum voltage fluctuation permissible.

5. Low Voltage Protection

One particular problem found with long low voltage runs is protection. If, for example, a tree pushes conductors together, the fusing should disconnect supply within a reasonable time.

Consequently, fusing of long low voltage runs shall be installed in accordance with Network Policy NP 011, *Fusing Policy, Pole Mounted Transformers*.