# NP001.6
# General Specification for URD 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
- NP001.4 General Specification for Overhead Rural Residential Subdivisions
- NP001.5 General Specification for Overhead Commercial and Industrial Subdivisions
- NP001.7 Reliability Criteria for Distribution Networks
- NP001.8 Handover Documentation
- NP001.9 Conditions of Supply to Large Customers
- NP001.10 Documentation Requirements



**Further Information:** For additional information or advice regarding this document, please contact the Manager Network Engineering on 08-89245191

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# General Specification for URD Subdivisions

## 1. Contents



## 2. Scope

This document sets out Power and Water's requirements for the design and construction of URD subdivisions. It should be read in conjunction with documents NP001.1 *Design and Construction of Network Assets – General requirements*, and NP001.2 *General Specification for Underground Electrical Reticulation*.

## 3 Planning

The design of particular parts of the distribution network must take into account the overall development of the suburb or area. Consequently, the designer must consult Power and Water to ascertain cable sizes, routes, switchgear requirements and the like, prior to commencing the design of the subdivision.

In a suburb of, say, 400 residences, it is expected that individual developers will install all of the reticulation required, including feeder loops, switching points, tie lines and the like. In some cases this may mean that an individual developer will install assets that other developers will benefit from.

## 4 Substations

### 4.1 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.

Power and Water experimented with 50 kVA substations in some areas in the 70's, and this philosophy is common in 120/200 volt countries, where long LV runs are uneconomic.

This extreme of the "numerous small substations" philosophy minimises losses in the low voltage network by minimising loads and length of runs. However, it has the disadvantage of numerous joints in the high voltage network, thus reducing reliability; cost per kVA of installed transformer capacity is also higher than for larger sizes; transformer utilisation also tends to be poor. Consequently, it is unlikely that Power and Water would approve any design based on this philosophy.

### 4.2 Losses in the LV System

The cost of losses should not be overlooked. The losses in 1 km of 185 $mm^2$ cable with an annual maximum demand of 100 amps, will average about 250 MWh over 20 years, representing 150 tonnes of $CO_2$ generated at a gas-fired power station, and a net present value of about $30,000.

This is the principal reason why 240 $mm^2$ cable has become standard for low voltage throughout Australia, including the NT.

### 4.3 Substation Size

Generally, substations should not be larger than 300 kVA. For a subdivision with a normal ADMD (After Diversity Maximum Demand) of 4.5 kVA, this represents some 67 residences. For high cost subdivisions with ADMD figures of 7 kVA, larger substations may be considered, although it is difficult to design for alternative supply with large substations.

Generally, individual LV circuits shall be protected by fast fuses no larger than 200A to ensure pillar faults are cleared with minimal damage.

In some cases, for example where there is a shopping centre or school, a larger substation may be required, supplying both the large customer and residential areas. In such cases the residential portion should not exceed 300 kVA.

### 4.4 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 in Table 1 of NP001.1, is limited to 4%, and

(b) The voltage drop under the emergency condition of loss of any substation, shall not exceed 10%. Under these conditions only the ADMD figure need be used.

In most cases substations will be located within a 3.5 x 3.5 m easement on private property adjacent to the road boundary. Alternatively, they may be located in readily-accessible areas of parks, car parks, school grounds or the like.

### 4.5 Substation Type

Package substations shall be of a type complying with Power and Water's standard specification. Substations are designed to be interchangeable as far as practicable, and so the physical size and shape of the foundation is important.

Substations used in the NT differ from those in other States in the vector grouping. Whereas Dyn11 is used elsewhere (except ACTEW), Dyn1 is used in the Territory.

### 4.6 Fitting Out

The low voltage compartment will normally be fitted out by the contractor with a "Striple" fuse arrangement, with a minimum of four circuits. Each circuit shall be fitted with a maximum fuse size of 200 A; these shall be fast blow fuses.

In most cases the high voltage compartment shall be fitted with a Holec "Magnefix MD4" series Ring Main Unit (RMU) in 11 kV areas. In main feeders a heavy duty RMU such as Schneider RM6 or ABB SafeRing, mounted in a separate enclosure, may be specified by Power and Water. In 22 kV areas Power and Water will advise the equipment to be used.

# 5 Cable Protection

High voltage cables shall be protected mechanically by a ducting system equivalent to Category A in AS 3000. Generally this requires the use of Heavy Duty conduit to AS 2053, or Light Duty conduit plus encasing in a minimum of 75 mm of concrete. The concrete may be in the form of stabilised sand having a 1:8 cement/sand ratio.

# 6 Cables in Shared Trenches

Where high voltage and/or low voltage cables are:

- installed in trenches shared by telecommunications cables or other services, and
- the relative position of the cables or services prevents ready access to the power cables,

all affected power cables shall be installed in a ducting system.