



Appendix J of NS130

Installation of Network Ductlines Through Buildings

July 2009

Amendments included from NSA 1535 Aug 2009



Installation of Network Ductlines Through Buildings

Introduction

This Appendix provides supplementary information to NS130 and deals with EA's requirements where a bank of conduits is intended to carry distribution Network Cables through a building. It is anticipated that this situation would arise mainly in Central Business Districts where street congestion begins to limit the ability to effectively provide supply to all customers.

Definitions

Network Cables	11kV cables required to supply parts of Ausgrid's network other than just the building through which they are passing.
Ductline	A group or bank of conduits suitably spaced for required cable ratings and installed so that heat generated by the cables may be effectively dissipated. The cables are required to be protected from the effects of a fire in the building through which they pass, either by encasement in suitable materials or shielding and separation from sources of fire.

Property Requirements

Where a bank of conduits are to be run through a privately owned building, an easement covering the route and a right of way to permit access must first be negotiated as per NS143 and applicable Property Branch documents. The easement would normally be a stratum easement, confined to the boundaries of the materials encasing and supporting the conduits.

Policy

Wherever possible, Network Cables shall be routed through public roads or reserves in accordance with NS143 *Easements and Leases* and NS130 *Specification for Laying of Underground Cables up to 22 kV*.

However, where situations arise such that it is difficult to provide supply to all customers in this manner, Planners may determine that space is required through new or existing buildings for the construction of a Ductline. This new Ductline would not be intended to exclusively supply the customers in that building.

In such cases, other network customers are exposed to an additional risk of wider spread loss of supply in the uncommon event of a fire or catastrophic incident occurring within the building and impacting on the availability of the Network Cables passing through the Ductline.

It is therefore necessary that a policy be developed and requirements specified to ensure that Network Cables running through buildings are installed in such a manner that they are protected as far as possible from accidental damage and the impact of a catastrophic incident. If damaged, the Network Cables should be installed so that they are capable of being quickly restored to a serviceable condition.

Functional Requirements

The installation conditions should be such that the performance of the cables is not compromised by the additional measures required to protect them. The cable protection shall be such that the cables are capable of being quickly removed or replaced in the event of a major building failure.

EA's policy in this regard is as follows:-

Where Network Cables are to be run through a Ductline located inside a building, the Ductline shall be designed to provide at least a 3 hour fire rating (FRL 180/180/180) for the Network Cables unless special circumstances mitigate the risk of the Ductline being exposed to the fire.

At the end of 3 hours fire exposure, it shall be possible to withdraw existing cables installed in the Ductline and to install new Network cables without difficulty.

The Ductline and supporting structures shall be protected against a 2 kPa overpressure generated from within the building area.

Any proposed reduction in the fire protection or overpressure requirements shall be subject to the written approval of Ausgrid.

Where the above requirements are not fully achievable, or where there is considered a more significant potential consequence to the cables or conduits being severely damaged, the relevant section of Ductline shall be readily accessible. The conduit encasement shall be designed for ease of demolition so that it can be replaced or repaired in order to facilitate the speedy replacement of Network Cables contained in the Ductline. Alternative solutions such as the provision of an alternative back up route may also be considered acceptable.

While adequate fire and overpressure protection is to be established for the Ductline, the form of protection proposed shall not adversely impact on the design cable ratings of the Network Cables passing through the building. In particular, the thermal resistivity (TR) of the conduit encasement shall not be greater than that specified for the project.

Minimum Technical Requirements

A. Internal Building Areas with HV Conduits Above Ground and Exposed to Air

The following technical requirements are based on a concrete encased Ductline design. Alternative arrangements which provide the necessary protection and do not reduce cable ratings to unacceptable levels may also be submitted for consideration by Ausgrid.

1. The conduits shall be 150mm (160mm OD) heavy duty UPVC Orange and shall meet the minimum requirements of NS130 and AS 2053
2. Minimum conduit centre to centre spacing shall be 230mm
3. The conduits shall be encased in concrete with all exposed faces suitably reinforced. A high concrete density is required and lightweight aggregate and air entraining agents shall not be used.
4. A minimum three (3) hour (FRL 180/180/180) fire rating shall be achieved for the concrete encasement to the conduits and for any supporting structures. This requirement may be reduced in fire isolated areas such as fire stairs subject to approval from EA.
5. The conduit ductline and supporting structures shall be designed to sustain a minimum superimposed live load of 2 kPa overpressure, generated from within the internal building area.
6. A minimum concrete cover of 180mm to the conduits shall be provided at all exposed concrete encasement faces. This concrete cover shall be suitably reinforced and incorporate the required 3 hour fire rating. Reinforcement detailing shall be arranged to reduce the potential for induced currents in accordance with the requirements of EA.

7. A minimum concrete cover of 100mm to the conduits shall be provided at non-exposed faces of the Ductline, for example, along external basement walls. This cover may be reduced in confined locations subject to approval from Ausgrid.
8. Suitable allowance shall be made for conduit installation and support along the Ductline route.
9. The use of core filled blockwork to form the exposed faces of the ductline is not acceptable due to its higher thermal resistivity. Blockwork may be used below the Ductline for support provided a 3 hour fire rating and 2 kPa overpressure resistance is achieved by the support structure.
10. All exposed faces along the route of the internal Ductline shall have suitable marking to the requirements for reduced cover specified in NS130, and approved by Ausgrid.
11. Internal building areas through which the ductline passes shall be suitably ventilated or air conditioned to allow for effective circulation of air to all exposed faces and to remove heat generated by the cables. Design information to be provided by Ausgrid shall include the estimated heat load per metre for the Ductline being designed.

B. Internal Building Areas with HV Conduits Below Ground in Trenches

1. The conduits shall be 150mm (160mm OD) heavy duty UPVC Orange and shall meet the minimum requirements of NS130 and AS 2053
2. Minimum conduit centre to centre spacing shall be 230mm
3. The conduits shall be encased in Thermally Stable Bedding (TSB) or concrete. Where concrete is used a high concrete density is required and lightweight aggregate and air entraining agents shall not be used.
4. A minimum cover of 100mm for the conduits shall be provided to the trench walls and floor. This cover may be reduced in confined locations subject to approval from EA. Minimum cover below the internal floor surface shall all be in accordance with NS130 requirements including those for reduced cover.
5. Within the building area all conduit trenches shall be provided with a reinforced concrete slab at the surface with a minimum thickness of 125mm.
6. Marking of the route of the Ductline on the floor surface shall be required as shown in NS130 and approved by Ausgrid for all internal Ductlines.
7. Internal building areas above the conduit trenches shall be suitably ventilated or air conditioned to allow for effective circulation of air and remove heat generated by the cables.

C. Concrete Requirements

Concrete used for encasement of ductlines shall be specified to ensure that it provides the required mechanical strength and fire rating, while not adversely impacting the thermal ratings of the cables. In particular, the following requirements must be adopted in designing the concrete mix:-

1. The specific concrete specifications required for the concrete encasement of the Ductline are to be indicated on the drawings. EA's requirements, including those indicated below, shall be referenced.
2. The minimum concrete strength for the encasement shall be 20MPa at fire exposed locations and shall be indicated on the drawings. To limit the heat of hydration, the cement content should be minimised to the extent possible given the other design requirements.

3. A low heat of hydration cement (Type LH) and appropriate concrete mix design shall be used to reduce the risk of the UPVC conduits softening during curing. Other measures to further limit the temperature rise in the concrete encasement during curing may be acceptable subject to approval by EA.
4. Admixtures in the concrete mix shall be subject to the approval of Ausgrid following the submission of a product specific data sheet. The use of accelerators to speed concrete curing or admixtures that entrain air will not be approved.
5. The total flyash in the concrete mix (by weight) shall not exceed 5% unless separately approved by EA. Flyash reduces the thermal performance of the installed Ductline.
6. Lightweight aggregate and air entraining agents shall not be used.
7. The concrete cover to reinforcement shall comply with AS 3600 to achieve a minimum three (3) hour (180/180/180) fire rating. Ausgrid requires a minimum concrete cover of 45mm to reinforcement at any fire exposed face.
8. Reinforcement detailing shall be arranged to reduce the potential for induced currents. In particular, transverse reinforcement around the Ductline shall not form a closed loop at any location.

ASPs or contractors wishing to vary concrete mix from approved requirements shall provide documentation demonstrating that their proposal achieves the specified functional requirements including Ductline integrity and thermal resistivity (TR) value without increasing the in-situ concrete curing temperature to a level where conduits are likely to be damaged.

D. Electric and Magnetic Fields (EMFs) and Electromagnetic Interference (EMI)

The selection of the route for network ductlines through buildings should take into account the possible effects of Electric and Magnetic Fields (EMF) and Electromagnetic Interference (EMI). The adjacent, current and expected building and land uses and locations of Ductlines and cables should be evaluated for EMI.

Evaluation by an approved Electrical Engineer is to be undertaken to ensure EMI does not disrupt sensitive electronic equipment or pose a health risk to persons who continuously occupy adjacent areas for long periods of time.

An EMI report must be provided as part of the design submission for the proposed Ductline.

Areas of particular relevance include hospitals, particularly operating theatres (Refer to AS/NZS 3003), computer rooms, laboratories, general offices and apartments.

Refer to NS114 for additional requirements and guidance.

Note: Installation of EMI screening is not permitted inside any Chamber Substation, at any HVC connection, or associated chambers and cable risers. The addition of EMI screening at other locations must not interfere with access to, maintenance of, air circulation around or the efficient operation of the Ductline and related equipment.

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