New developments: deployment of the nbn™ pit and conduit network

FTTx Engineering

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nbn has no control over new laws. nbn cannot and does not make any promises about the contents of new laws and how they will affect you. nbn has used its best efforts to prepare this document to provide you with an indication as to how installation of pit and conduit infrastructure may occur. If new laws are passed, substantial changes may be required to the guidelines and technical details set out in this document.

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Document control

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<tr>
<td>18 AUG 16</td>
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<td>• Removed Fibre Distribution Hub (FDH) information and added new diagrams for super lots and references for Flexibility Joint Location (FJL).</td>
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1 About this document

1.1 Background

This document is intended for developers to ensure they meet nbn’s requirements for the installation of pit and conduit for new broad acre developments.

1.2 Purpose

This document, in conjunction with documents listed in Section 1.2, provides guidelines for developers installing nbn™ pit and conduit infrastructure in real estate development projects.

This document provides guidelines and technical details for new development site developers and designers to install the pit and conduit infrastructure required for the nbn™ Fibre to the Premises (FTTP) network.

The developer is responsible for installing pit and conduit to nbn guidelines. nbn will only supply the fibre and other elements of a complete FTTP solution once fibre ready facilities are prepared to nbn’s guidelines.

Important: These guidelines are a guide for undertaking pit and conduit works installation for the nbn in new developments.

These guidelines are, for the purposes of the developer agreement, the nbn™ pit and conduit specifications and must be complied with to the extent specified in the developer agreement.

These guidelines should not be relied upon by any contractor or any other person as a substitute for knowledge, experience, care and skill or any other contractual obligation or as a guide to your rights and obligations under laws concerning the roll out of fibre by nbn to new developments.

The regulatory environment in connection with the installation of fibre ready facilities in real estate development projects is not yet settled. It is the responsibility of the developers and their contractors to become familiar and comply with all applicable laws and contractual obligations.

Nothing in these guidelines will affect any rights nbn has (whether at law or under contract), or any obligations or warranties given by the contractors to nbn.

1.3 Health, Safety & Environment (HS&E)

nbn is subject to the Work Health and Safety Act 2011 (Commonwealth). However, it is recognised that developers and their contractors may be subject to different health and safety legislation in place across the various jurisdictions in Australia. This includes relevant regulations, standards and codes of practice.

These guidelines provide guidance to assist nbn, the developers and their contractors to exercise due diligence in relation to safety practices. To this end, without limiting developer’s obligations under law:

- Developers are expected to have developed, understand and comply with their own Health, Safety and Environment policies and procedures.
• Consistent with Commonwealth and state and territory occupational HS&E legislation, it is expected that developers and their contractors consider the risks associated with their development that may impact on later stages of the asset lifecycle (including inspection/assurance, use, operation, construction and maintenance). Specific aspects which the developer and their contractors must consider include (but are not limited to) risks associated with the selection of pit and conduit components, and risks associated with the method of construction/installation selected by the developer.

1.4 Scope

1.4.1 In scope

• new Single Dwelling Unit (SDU) developments located within the FTTx footprint
• super lots, horizontal Multi Dwelling Units (MDUs), commercial, vertical MDU (lead-ins)

1.4.2 Out of scope

• new developments outside the nbn™ FTTx footprint
• new developments within the satellite footprint
• new developments within the fixed wireless footprint

1.5 Audience

• new development site developers
• new development site designers

1.6 Assumptions and constraints

The developer and/or their representative should have a sound level of knowledge, understanding and experience/accreditation for installing any telecommunications pit and conduit for nbn to utilise in its FTTx network.

1.7 Referenced documents

<table>
<thead>
<tr>
<th>Document number</th>
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<tr>
<td>AS/CA S008:2010</td>
<td>Requirements for customer cabling products</td>
<td>Communications Alliance</td>
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<td>AS/CA S009:2013</td>
<td>Installation requirements for customer cabling (Wiring rules)</td>
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<td>C524:2013</td>
<td>External Telecommunication Cable Networks</td>
<td>Communications Alliance</td>
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<td>G645:2011</td>
<td>Fibre Ready Pit and Pipe Specification for Real Estate</td>
<td>Communications Alliance</td>
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1.8 Changes in this revision

Changes in this document revision 7.0 dated 18 AUG 2016 compared to the previous revision 6.0 dated 21 OCT 2015 are summarised below:

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<td>ALL</td>
<td>Rebranding and security update.</td>
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<tr>
<td>1.1, 1.4.1, 1.4.2 and 1.6</td>
<td>Added statements for the Background, Scope (In scope and Out of scope) and Assumptions and constraints.</td>
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<tr>
<td>3 (and all sub-sections), 4.3 (Table 4), 4.3.2 (Table 5) and 4.3.5 (Table 6)</td>
<td>Removed Fibre Distribution Hub (FDH) information. Added new diagrams for super lots and references for the Flexibility Joint Location (FJL).</td>
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2 Assets

2.1 Asset protection

2.1.1 Verification

Prior to any excavation work being undertaken, all existing underground services within the proposed work zone shall be identified via Dial Before You Dig (DBYD), council plans and all other parties, services or contacts that may not be represented by the DBYD services. These may include:

- main road authorities
- rail services
- gas suppliers
- water utilities

Any pre-existing services in an area where pit and conduit works are to be deployed must be identified visually prior to commencement of the works, using methods such as strip exposure and non-destructive digging.

2.1.2 Installation

All nbn™ assets must be installed within the designated telecommunications alignment, established by any of the following:

- state and federal government
- street opening conference/bodies
- local council(s)
- a shared trench agreement

2.2 Asset identification

All design documentation (including initial development documentation, pit and conduit design and as-built or other documentation) prepared by the developer and its contractors must identify the proposed location of all network infrastructure and address, as a minimum, the following:

- the location of pits and conduits, including measurements in metres or parts thereof
- positioning information relative to known fixed assets (e.g. kerb lines, property boundaries)
- locations of roads, driveways and proposed roads and driveways.
- depth of cover for conduits

Depth of cover is the actual soil or backfill from the top of the conduit.

- trench cross-sections, showing all services within the same alignment
- identification of conduits (e.g. local or distribution)
• service drop locations and either local pit or boundary pit pre-allocations
• the final positioning of nbn™ network infrastructure is determined by nbn at its sole discretion

Specific drafting standards apply to both pre-construct and as-built documentation of nbn™ pit and conduit network designs. nbn’s requirements and required use in relation to these Computer Aided Design (CAD) standards - including the approved template, symbols and Assisted Drafting Tool (ADT) can be found in NBN-COO-EDS-017 New Development Pit & Pipe Design Guidelines.
3 FTTP network overview

The nbn™ FTTP network is designed to provide fibre connectivity to premises within new development projects.

Figure 1. FTTP network

The FTTP network is divided into hierarchical components which assist in the planning, design and implementation of the FTTP network. Network components shown in Figure 1 that are relevant to new development project deployment of fibre ready facilities are set out below.

3.1 Distribution network (DN)

The DN provides connectivity between the nbn™ Fibre Access Nodes (FANs), where the active equipment is located, and the FJL. The FJL represents the demarcation point between the DN and the Local Network (LN). The DN will also be installed between all FJLs in the new developments, as shown in Figure 2.
3.2 LN

The LN is installed between the FJL and the associated telecommunication pits located outside property boundaries.

3.3 Telecommunications pits

nbn requires pits for several distinct purposes including:

- managing connections between conduits
- housing fibre optic cabling and splice closures
- housing the Small Footprint Multiport (SFM) and Splitter Multiport (SMPs) required to connect End User Premises (EUP) to the LN

3.4 Telecommunications conduits

Conduits provide the pathways for the subsequent installation of fibre optic cabling.

The DN fibre and the LN fibre may be contained within the same conduit.

3.4.1 Telecommunications service drop conduit

The service drop conduit is located between the telecommunication pits and either the property boundary location or the EUP.
3.5 Network design guidelines

The design of the network ideally begins at individual lots and follows a modular approach as shown in Figure 2. That is, lots (typically four [4] but up to a maximum of eight [8]) are allocated to a service drop access pit or boundary pit, accessible by the local conduit network (refer to Figure 4).

| It is not always possible to get four (4) lots per pit. Conversely, there will be situations where the trenching is designed (for electrical reticulation, etc.) such that it may be expedient to service a fifth or sixth lot from a pit. |

3.6 DN guidelines

The DN requires a single P100 conduit installed between the entrance to the development and the first FJL.

Further FJLs may require a separate P100 conduit (express conduit) installed between them, with the last planned FJL requiring a P100 conduit to the development exit, as shown in Figure 2. nbn planning would provide feedback on the express conduit routes and FJL requirements. Feedback will be provided to the developer and/or design consultants.

The express conduit can share or where required bypass LN pits, but must connect to pits where the express conduit changes direction or exceeds a distance of 250 m.

| Important: The DN must also provide connectivity to the adjoining stage/s. |

3.6.1 Distribution entry and exit locations

A distribution pit will be installed at the DN entry and exit boundary locations of the development to provide a connection location between the development DN and the nbn™ DN, when available.

For developments that have an entry and exit on the same road, a minimum of one P100 conduit should be installed (unless otherwise specified by nbn) between the two distribution pits across the entrance road to the development, to allow for cables to be installed past the development.

3.7 LN guidelines

The LN requires a minimum of one P100 conduit. The conduit is installed along the property boundary before connecting into pits situated at, or near, each shared street facing the property boundary.

In a cul-de-sac scenario, the last section of the pit and pipe can utilise P50 to a P5 or P2 pit, if no further network is required.

| Important: The LN must also provide connectivity to the adjoining stage/s. |
3.7.1 Road crossing guidelines

- All road crossings associated with the LN use P100 conduits.
- All road crossings connecting to a service drop access pit or boundary pit used solely for service drops shall use P50 conduits.

3.7.2 Local duct network methods

There are two methods permitted for deploying the local duct network, depending on available trenches in the development:

- single side deployment
- dual side deployment

3.7.2.1 Single side deployment

A P100 LN conduit is installed on one side of the road only, as shown in Figure 4. This conduit is installed into pits located between property boundaries.

A P50 local lateral conduit is installed under the road between the LN pits on one side of the road and smaller boundary pits on the opposite side.

![Figure 3. Single side deployment](image)
3.7.2.2 Dual side deployment

A P100 LN conduit is installed in the following locations, as shown in Figure 5:

- on both sides of the road
- into the LN pits located between property boundaries

![Figure 4. Dual side deployment](image)

3.7.3 Local duct network methods - laneways

It is anticipated that in a small number of cases it may not be possible to deploy a single or dual sided LN. This will typically be as a result of physical access limitations to the premises; generically this is termed a laneway.

A laneway is identified as having no verge available to install pit and conduit as per nbn’s requirements outlined in Section 3.7.2 Local duct network methods.

To provide connectivity for developments situated in a laneway, the following options are available and listed in order of preference:

1. front loaded deployment (most preferable)
2. Public Open Space (POS) deployment
3. rear loaded deployment (least preferable)

For a developer to implement a subsequent preference, the developer must provide a justification as to why the preceding preference could not be met. This will then be presented to nbn for endorsement.
3.7.3.1 Front loaded deployment
Premises can be fed by the LN conduit. In this instance, the developer should service the property from the street and follow the single or dual sided deployment rules.

3.7.3.2 Front loaded using POS
Premises can be fed by a POS. In this instance, the developer should service the premises from the POS and follow the single or dual sided deployment rules.

3.7.3.3 Rear loaded deployment
In this instance, either service, boundary or LN pits will need to be installed on the customer boundary (refer to Figure 6).

Service easements should be provided by the developer inside the rear of the lots to allow pits and conduits to be installed. Service boundary or LN pits are to be installed:

- perpendicular to the street property boundary to maintain appropriate separation from other services (e.g. gas, power, water) (the conduit must still enter at the narrow end of the pit)
- a minimum of 100 mm inside the property boundary

This solution allows the developer to service a laneway of up to a maximum of 24 lots in total.

A SFM or SMP is installed in the LN connection pit and service drop cables are reticulated through each connected pit.

If the number of lots requires the use of a second SFM or SMP, this will be housed in the local connection pit at the other end of the laneway.
Important: In the laneway scenario, boundary and service pits shall be installed correctly on service easements provided by the developer.

### 3.7.3.4 Pit selection - laneways

**LN connection pit:** Located at either end of the laneway and connecting the distribution conduit reticulating the remainder of the stage.

**Boundary pit:** All boundary pits within a laneway are to be orientated as described in Section 3.7.3.3 Rear loaded deployment.

**Service pit:** All service pits within a laneway are to be orientated as described in Section 3.7.3.3 Rear loaded deployment.

Refer to Table 5 in Section 4.3.2 Pits and lids for details on pit dimensions.

Important: Pits shall not be located in driveways or proposed driveways.
3.7.3.5 Conduit selection - laneways

A P100 express conduit is installed between the LN connection pits. **This is mandatory.**

The first conduit at either end of the laneway linking the LN connection pit to the first boundary pit within the laneway **shall** be a P100.

A P50 conduit **shall** be installed from the first boundary pit within the laneway to the remaining boundary pits within the laneway.

A P50 conduit **shall** be used to connect a service pit to the boundary pit. Only one connection is permitted between a boundary pit and service pit.

All P50 and P100 conduit bends **shall** be long radius 90 degree bends.

3.7.4 Super lot

When servicing a super lot as part of a new development or development stage the following applies:

- all sides of the super lot that are street frontage must be adequately serviced by locating pits and minimum P100 conduit along the road reserve on all relevant sides connecting into the current stage/s of the LN
- service drop requirements (refer to Section 4.2.7)

3.7.5 Super lot pit and conduit internal reticulation

Internal pit and conduit:

- Where the super lots yield is three (3) or less internal premises, the premises can be serviced by three (3) individual P20 lead-in conduits located in common property (refer to Figure 6).

![Diagram of super lot with three (3) or less than premises](image-url)

*Figure 6. Example of super lot with three (3) or less than premises*
Where a super lots yield is four (4) to 24 internal premises it would require the installation of an internal pit and conduit network. This internal network will require P50 conduit, including lateral crossings to smaller pits on the other side to support service drop conduits and lead-ins to each dwelling (refer to Figure 7).

![Developer Provided Pit and Pipe](image)

**Figure 7. Example of super lot with four (4) to 24 premises**

Where a super lots yield is 25 or more internal premises, it will require the installation of an internal pit and conduit network. This internal network will require P100 conduit for the LN, with P50 lateral crossings to smaller pits on the other side to support service drop conduits and lead-ins to each premises (refer to Figure 8).
• The installation of the internal pit and conduit shall reflect either single side or dual side deployment as per Section 3.7.2 Local duct network methods.

• Pits shall be installed within the super lot in a suitable area not trafficable to vehicles.

• Pits and conduits shall not be installed in or cross individual titles within the super lot (excluding laneways, as per Section 3.7.3.3 Rear loaded deployment).

• Where pits are unable to be installed in landscaped areas or internal footpaths, they must be installed within barrier kerb for protection (refer to Section 3.7.6 Barrier kerb).

3.7.6 Barrier kerb

Barrier kerb is for the protection of pits and is to be used within super lots, only where suitable pit locations such as raised garden beds are not available.

The barrier kerb type is B1 or similar (all dimensions are shown in millimetres).

Maintain a minimum of 150 mm separation from the back of the barrier kerb to the outer edge of the pit, along all exposed sides of the pit (refer to Figure 7).

The top of the pit must be level with the top of the barrier kerb.
Figure 9. Barrier kerb dimensions
4 Underground network components

4.1 Overview

All pits and conduits must be installed within the designated telecommunications alignment established by any of the following:

- state and federal governments
- street opening conference(s)/local council(s)
- in any shared trench

If for any reason this alignment cannot be used, a suitable alternative must be determined prior to design and installation, with approval from nbn.

4.2 Conduit guidelines

4.2.1 DN and LN conduits

nbn requires the following in connection with both DN and LN conduits:

- 50 mm and 20 mm nominal diameter conduits as detailed in AS/NZS 1477:2006 PVC pipes and fittings for pressure applications Table 4.2(A) for wall thickness tabled under PN12 nominal sizes (DN) of 20 and 50 mm, referred to as P50 and P20

- 100 mm nominal diameter conduits as detailed in AS/NZS 1477:2006 PVC pipes and fittings for pressure applications Table 4.2(A) for wall thickness tabled under PN9 nominal sizes (DN) of 100 mm, referred to as P100

- The conduit is white and labelled as required by AS/CA S008:2010 Requirements for customer cabling products, as it applies to customer cabling products.

- The conduit meets the minimum requirements of:
  - AS/CA S008:2010 Requirements for customer cabling products, as it applies to customer cabling products
  - CS24:2013 External Telecommunication Cable Networks

- All road crossing conduit installations are installed as close to 90° to the line of the road under which the conduits are being installed.
Conduit dimensions:

<table>
<thead>
<tr>
<th>Conduit dimensions</th>
<th>Nominal Size (Inside Diameter)</th>
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<tbody>
<tr>
<td>20 mm</td>
<td>1477:2006 table 4.2(A)</td>
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<tr>
<td>50 mm</td>
<td>1477:2006 table 4.2(A)</td>
</tr>
<tr>
<td>100 mm</td>
<td>1477:2006 table 4.2(A)</td>
</tr>
</tbody>
</table>

Figure 10. Nominal conduit dimensions

Important: Conduits should not be installed in runs greater than 250 m without transitioning through either local or distribution pits. If the distance is greater, too much stress might be placed on cable when it is hauled through the conduits.

4.2.2 Lateral conduits

nbn requires the following in connection with lateral conduits (i.e. conduits that feed across streets for service drop cables):

- The lateral conduits are P50 - 50 mm nominal diameter conduits as detailed in AS/NZS 1477:2006 PVC pipes and fittings for pressure applications Table 4.2(A) for wall thickness tabled under PN12 nominal size (DN) of 50 mm.
- The conduit is white and labelled as per AS/CA S008:2010 Requirements for customer cabling products, as it applies to customer cabling products.
- The conduit meets the minimum requirements of:
  - AS/CA S008:2010 Requirements for customer cabling products, as it applies to customer cabling products
  - CS24:2013 External Telecommunication Cable Networks
- All road crossing conduit installations are installed as close to 90° to the line of the road under which the conduits are being installed.

4.2.3 Conduit bends

nbn requires the following for conduit bends:

- all conduit bends are prefabricated
- conduit bends need to be of the same material and structure as the conduit
- a maximum sum of 180° of bend is allowed between pits (if this figure is exceeded, a pit needs to be installed as centrally as possible in the conduit run in order to bring the sum of bend angles into compliance)

The long run bend radius with manufactured or pre-formed bends (also referred to as cold form bends) are typically in multiples of 22.5° for P100 conduit.
The long run curve radius with no manufactured or preformed bends may be used on all conduit runs, including trunk runs (e.g. where there is greater than 100 m between pits).

A larger curve radius is required on long runs because there is typically more cable mass to haul through a conduit.

The short run bend radius is not to be used on express conduit routes.

Elbows (i.e. a sharp 90° change of direction) shall not be used.

Table 1. Minimum curve and bend radii

<table>
<thead>
<tr>
<th>Minimum internal conduit diameter</th>
<th>Minimum curve/bend radius</th>
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<tr>
<td></td>
<td>long run (mm) no pre-formed bends</td>
</tr>
<tr>
<td></td>
<td>long run (mm) using pre-formed bends</td>
</tr>
<tr>
<td></td>
<td>short run (mm) using pre-formed bends</td>
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<tr>
<td>100 mm</td>
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<td>50 mm</td>
<td>6,500</td>
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<tr>
<td>20 mm</td>
<td>2,600</td>
</tr>
</tbody>
</table>

To change the direction of a P100 conduit, use only combinations of bends with angles of:

- 30° x 5 m radius
- 45° x 5 m radius

Important: Short radius 90° conduit bends are not to be used for P100 conduit in the DN or LN when changing direction. However a 90° P100 1200 mm sweeping bend may be utilised to change direction for the DN or LN. A short run is up to 90 m. A long run is between 90 m - 250 m.

4.2.4 Local duct network conduit

The short run bend radius may be used on road crossings and starter conduit. The short run bend radius should only be used in close proximity to a pit or opening of a conduit (e.g. turning up a building wall).

Elbows (i.e. a sharp 90° change of direction) must not be used.

- P50 conduit bends utilised for local lateral conduits use a 90° x 305 mm radius bend where required.
- The bend radius of the P20 conduit bends is to be a minimum of 15 times the outer diameter of the conduit.

4.2.5 Conduit joints

Conduit joints for PVC pipes are achieved using ‘socket and spigot’ or ‘coupler’ and sealed with solvent cement.
4.2.6 Conduit installation

nbn requires the following when installing a conduit:

- Conduits are installed into trenches and must be supported with the appropriate bedding and suitable backfill for their length between pits, in accordance with the following guidelines (or as required by the local government authority):
  - AS/NZS 2032:2006 Installation of PVC pipe systems
  - C524:2013 External Telecommunication Cable Networks
  - AS/CA S009:2013 Installation requirements for customer cabling (Wiring rules), as it applies to customer cabling products
- Conduits are installed in trenches with the minimum separation from other utilities, as per applicable local utility requirements, legislative requirements and shared trenching agreements (refer to Table 3 for information on clearances from other carriers and services).
- When multiple conduits are installed in one trench, the largest conduits are installed at the bottom of the trench.
- To facilitate future cable installation, conduits are placed as straight as possible within the trench.

4.2.7 Service drop conduits

nbn requires the following when installing service drop conduits to residential and commercial premises:

- for SDUs (including duplexes and triplexes), one P20 service drop conduit is required per premises
- for small commercial premises (i.e. small strip shops), one P20 service drop conduit is required per premises
- for all other commercial/industrial premises, a minimum P50 service drop conduit is required per premises
- for a vertical MDU (such as an apartment building or office block) of up to 60 internal premises, a P50 service drop conduit is required per premises.
- for a vertical MDU with more than 60 internal premises, a P100 service drop conduit required
- this conduit should meet the minimum requirements of:
  - AS/CA S008:2010 Requirements for customer cabling products, as it applies to customer cabling products
  - C524:2013 External Telecommunication Cable Networks
- the conduit is labelled as per AS/CA S008:2010 Requirements for customer cabling products, as it applies to customer cabling products
- all service drop conduits are sealed at both ends using conduit plugs located within the pit, and conduit caps at the stub end of service drop conduits are fitted with a 3 mm draw cord rated at a minimum 90 kg break force or similar

All draw cord must be rot proof (i.e. be of a synthetic material such as polypropylene).
4.2.7.1 Service drop installation

To prevent future access issues, service drop conduits must not cross into neighbouring private property. Specifically for new development deployment:

- The service drop conduit is extended from either the LN or boundary pit (depending on whether it is a single or a dual side deployment) to the lot boundaries.
- The start of the conduit should be installed one (1) m inside the lot and sealed with an end cap. At the pit, the end of the conduit should be sealed with a plug and labelled for builders to easily locate.
- It must be labelled with the following information:
  - the lot which it is feeding (e.g. Lot 1234)
  - the position from the boundary (e.g. right = R or left = L)
  - the distance it can be located from the boundary in metres
- The label must be water resistant (typically nylon based) and can be handwritten using permanent marker or printed if desired.
- The label shall be securely affixed to the end of the drawstring itself, located inside the pit.

![Figure 11. Example service drop stub label](image)

- The furthest run of service drop conduit from the pit to the property boundary entry shall not exceed 25 m.
- Where practical to do so, multiple, individual service drop conduits should share property boundary pits.
- The conduit will be extended to the premises at a future date and should be located in a position to facilitate this.
- If the service drop conduit is less than 3 m from the pit to the property boundary entry, the minimum cover is 300 mm.
- If the service drop conduit is more than 3 m from the pit to the property boundary entry, the minimum cover is 450 mm.

4.2.7.2 Retaining walls

Service drop conduits (P20) must be installed under a retaining wall prior to the installation of the retaining wall. It is allowable to sleeve through a small section of P50 conduit from the property boundary.

The P50 conduit would add some form of protection from the retaining wall/footings. Refer to the examples in Figure 11.
The service drop conduit should be installed to the acceptable minimum depth of cover within the lot (refer to Table 2), taking into account accessibility from the property boundary and connection of the future lead-in conduit.

A minimum curve or sweep can be applied to the P20 conduits (refer to Table 1).

**Figure 12. Examples of service drop conduits under retaining walls**

### 4.2.8 Conduit testing

All installed conduits (except the service drop conduit) require testing via the use of a mandrel with a diameter of no less than 80% of the internal conduit diameter. This mandrel is hauled through to check for conduit concentricity and continuity.

After conduit testing has been performed:

- a 3 mm draw cord rated at a minimum 90 kg break force or similar (suitable for use as a cable hauling aid) shall be installed within each service drop conduit.
• a 6-6.5 mm draw rope rated at a minimum 595 kg or equivalent shall be installed for all other installed conduits

All draw cord must be rot proof (i.e. be of a synthetic material such as polypropylene).

### 4.2.9 Conduit sealing

Once testing is finished and the conduit integrity has been identified as acceptable, all conduits are to be plugged within pits and conduit stubs capped (capped conduits include stage boundary and service drops).

### 4.2.10 Conduit depths and cover

The nbn minimum depth and cover of conduits in new development sites are listed in Table 2.

**Table 2. Conduit depths and cover**

<table>
<thead>
<tr>
<th>Location</th>
<th>Minimum Cover</th>
</tr>
</thead>
<tbody>
<tr>
<td>service drop conduit - less than 3 m from the pit to the boundary entry</td>
<td>300 mm</td>
</tr>
<tr>
<td>service drop conduit - more than 3 m from the pit to the boundary entry</td>
<td>450 mm</td>
</tr>
<tr>
<td>verge (walkways, footpaths)</td>
<td>450 mm</td>
</tr>
<tr>
<td>road (non-state or territory)</td>
<td>600 mm</td>
</tr>
<tr>
<td>road crossing</td>
<td>800 mm to 1200 mm (typically)</td>
</tr>
</tbody>
</table>

### 4.2.11 Conduit marker tape

Conduit marker tape is not required to be installed above the conduit.

### 4.2.12 Clearance from other carriers and services

**Table 3. Clearance from other carriers and services**

<table>
<thead>
<tr>
<th>Service item</th>
<th>Minimum radial clearances *1</th>
</tr>
</thead>
<tbody>
<tr>
<td>gas pipe</td>
<td>over 110 mm 300 mm</td>
</tr>
<tr>
<td></td>
<td>110 mm or less 150 mm</td>
</tr>
<tr>
<td>power</td>
<td>high voltage 300 mm</td>
</tr>
<tr>
<td></td>
<td>low voltage 100 mm*2</td>
</tr>
<tr>
<td>water mains</td>
<td>high pressure/capacity 300 mm</td>
</tr>
</tbody>
</table>
Service item | Minimum radial clearances *1
--- | ---
local reticulation | 150 mm
sewer | 300 mm
connection pipe | 150 mm
other telecommunications | 100 mm*1

*1 Reduced separation is possible where all parties (including nbn) are consulted and agreement is reached.

*2 Only where protection barriers are used, for example: conduit, bedding, marker tape and cover batten.

### 4.3 Pit guidelines

#### 4.3.1 Pit types

The following table lists the pit types and definitions as a guide only:

**Table 4. Pit types**

<table>
<thead>
<tr>
<th>Pit type</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>service drop access pit</td>
<td>Provides an access location between the LN conduit and the service drop conduit. Only used to provide an access location for service drop fibre cable. Not to be used for any planned LN fibre cabling.</td>
</tr>
<tr>
<td>boundary pit</td>
<td>Provides an access location between the LN conduit and the service drop conduit.</td>
</tr>
<tr>
<td>LN pit</td>
<td>Located on the LN duct. Provides an access location between the LN conduit, local lateral conduit and the service drop conduit. Houses an SFM.</td>
</tr>
<tr>
<td>LN connection pit</td>
<td>Located on the local duct network. Houses a fibre splice closure.</td>
</tr>
<tr>
<td>distribution pit</td>
<td>Located on the DN conduit. Provides mid-point hauling locations. Houses distribution splice closures. Also installed at entry and exit locations of the new development to facilitate cable installation.</td>
</tr>
<tr>
<td>FJL pit</td>
<td>Houses a fibre splice closure. Provides a demarcation point between the DN and LN.</td>
</tr>
</tbody>
</table>
4.3.2 Pits and lids

**Important:** Internal dimensions are measured using the following methodology only.

Depth is measured by the distance between the inside of the pit base to the surface below the pit lid. Length and width are measured as follows:

a. along the centreline of the pit
b. on the inside of the base
c. at right angles to each other
d. with no internal protrusions on the surface

**Table 5. Pit sizes (minimum internal and nominal external dimensions)**

<table>
<thead>
<tr>
<th>Pit purpose</th>
<th>Minimum internal dimensions (mm)</th>
<th>Nominal external dimensions (mm)</th>
<th>Industry pit type naming convention</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Length</td>
<td>Width</td>
<td>Depth</td>
</tr>
<tr>
<td>service drop access pit</td>
<td>490</td>
<td>150</td>
<td>500</td>
</tr>
<tr>
<td>service drop access pit or boundary pit or FJL pit</td>
<td>510</td>
<td>290</td>
<td>540</td>
</tr>
<tr>
<td>Service drop access pit or LN pit or FJL pit</td>
<td>1130</td>
<td>340</td>
<td>600</td>
</tr>
<tr>
<td>distribution pit or LN connection pit</td>
<td>1130</td>
<td>390</td>
<td>820</td>
</tr>
</tbody>
</table>

Pits and lids selected shall meet the following minimum requirements:

- Pit dimensions shall meet the requirements listed in Table 5.
- The pit construction shall ensure that the top rim of the lid will not warp or bend when installed as per the manufacturer’s specifications.
- The pit and its fittings shall not have exposed sharp edges.
- Pit lids shall be concrete and weigh no more than 38 kg each (which may mean larger pits have multiple lids), with the weight of the lid clearly labelled on the lid.
• Pit lids shall have a pit lid lifting tool hole at each end of the lid/s, capable of being used with an industry accepted standard lifting tool.

• Pit lid lifting holes shall be designed to prevent the insertion of materials including needle sharps (e.g. by fitting a gasket).

• Pit lid surfaces shall be designed to prevent water gathering/pooling and have a slip resistance rating for wet conditions compliant with AS/NZS 4586 -2013 Slip resistance classification of new pedestrian surface materials. A certificate of compliance from the pit lid supplier must be available as evidence, if requested by nbn.

• Pits and pit lids shall have a load rating suitable for the location it is installed in as per AS 3996 - 2006 Access covers and grates Section 3.1.

• The pit lids shall be embossed with the descriptor ‘NBN’. The descriptor should resemble the format displayed in Figure 13.

• The descriptor shall:
  • be positioned in the centre of the lid
  • be embossed in alignment with the longest side of the pit lid
  • be approximately 200 mm in length with the height dictated by the typeface used
  • use the typeface Arial
  • use capital letters

4.3.3 Pit installation

4.3.3.1 Location

nbn requires the pit to be sited in accordance with the standards listed in Section 1.7 Referenced documents. Furthermore, the pit location should adhere to the following:

• Install pits in an easily accessible location to facilitate installation and operational tasks.

• The conduit network should be designed such that pits will reside in either a pathway/verge or in a garden bed. The installation of a pit across both a pathway/verge and a garden bed should be avoided.

• For single side and dual side deployments, position pits with their long side parallel to the adjacent property boundary or roadway.

• For laneway deployments, the boundary and service pits may be rotated 90° from the current standard of longest side parallel to the roadway.
• Pits are to be offset from the boundary so as to not interfere with any driveways or proposed driveways.

• Where practical, the longest side of the pit is to be offset 350 mm from the street facing property boundary.

• Ensure a minimum of one (1) m separation from any pole without a transformer and/or street light, as specified in AS/CA S009:2013 Installation requirements for customer cabling (Wiring rules).

• Ensure a minimum of 15 m separation from any pad mounted transformer or pole with a transformer (Earth Potential Rise [EPR] Zone), as specified in AS/CA S009:2013 Installation requirements for customer cabling (Wiring rules).

• Where practical, a minimum of one (1) m separation from the Back of Kerb (BoK).

• A pit shall be installed within 6.5 m of where a street conduit changes direction (measured from the outside edge of the preformed bend socket) by an angle equal to or greater than 90°.

  • Where the 6.5 m conflict with other requirements, install the pit at the nearest safe location but no further than 15 m.

• Pits shall be placed in line with the conduit they connect with.

• A pit shall be installed at the intersection of conduit runs that require a change in size of the conduit, where the alignment continues into a street crossing or bends around a street corner. In this instance, the pit(s) shall be installed not less than 3 m and no further than 15 m along the alignment, from the corner of the adjacent property (refer to Figure 14).
Pits shall not be installed:
- in unmade sections of carriageways
- outside a doorway
- in driveways
- in an area that is, or is to be, for use as a driveway
- in roadways areas
- on road edges (this includes parking bays)
- within a swale (i.e. open storm water drain, culvert or similar)
- in a hazardous area
- pits shall not be placed in areas that may be subject to EPR, as specified in AS/CA S009:2013 Installation requirements for customer cabling (Wiring rules),
- pit risers shall not be used on any pit within a new development
4.3.3.2 Practices

nbn requires the following practices to be adopted:

- The use of pit bedding and backfill is required prior to pit installation. Specifically the foundation will comprise of sand, stabilised sand or fine crushed rock approximately 100 mm in thickness. After installation, the foundation shall bring the top of the pit level with the surrounding area/final ground area. Additionally:
  - the backfill material shall not contain contaminants, debris, vegetation or waste
  - pits shall not be distorted by the backfill process
  - all backfilling shall be compacted using hand held rammers in layers not exceeding 150 mm in thickness, to minimise the risk of subsidence
  - in grassed areas:
    - backfill material shall stop within 50 mm of the finished surface level
    - a suitable top dressing shall be used to complete the reinstatement to the finished surface level
  - after installation, the pits shall conform to the surrounding soil and ground level or slope when reinstating
  - where the slope of the pit does not exceed a one (1) in eight (8) gradient, the pit shall be installed so the top of the pit:
    - is flush with the ground level or pavement
    - conforms to the general slope of the ground level or pavement on all sides

If the backfilling practices are not adhered to, the pits may buckle as soil subsides. If the pits buckle, the pit lids will no longer fit. Where a concrete collar surrounds the upper rim of the pit, it is important that its depth is constant.

For further information on backfill, refer to G645:2011 Fibre Ready Pit and Pipe Specification for Real Estate Development Projects.

4.3.4 Conduit installation into nbn™ pits

nbn requires the following when installing conduits into nbn™ pits:

- install all conduits within a single trench into the pit that is located in the trench
- conduits:
  - that are distribution or local through conduits, are placed at the lowest point of the pit end wall
  - that are road crossing or direction change conduits, are placed roadside
  - that are service drop conduits, are placed property side and above all local and distribution conduits
  - shall not be installed within 50 mm of any vertical or horizontal internal corner of the pit and all entries shall be via the pit end only (the narrow end) (refer to G654:2011 Fibre Ready Pit and Pipe Specification for Real Estate Development Projects)
  - are located centrally with at least 50 mm of space between the conduit exterior and the internal pit floor
  - where multiple ducts enter a pit, 25 mm minimum separation is required between each duct
• have a draw string or similar installed (suitable for use as a cable hauling aid)
• are sealed with duct plugs

• Where required, conduits from the trench should be gradually reduced from the minimum cover to align with the pit wall entry, so that any and all conduits do not have a reduced cover of 450 mm even when multiple conduits are stacked at either pit wall ends.

• conduit ends:
  • finish square and flush with the pit end walls
  • are fitted with bushes flush with the pit wall ends
  • adhere to the conduit

! Important: Holes in plastic pits for conduits shall be cut with the correct size hole saw to ensure a tight fit for bushes.

4.3.5 Maximum pipe combinations at each end of the pit

Table 6. Maximum pipe combinations at each end of the pit

<table>
<thead>
<tr>
<th>nbn™ pit type</th>
<th>Industry pit type naming convention</th>
<th>P100</th>
<th>P50</th>
<th>P20 (LIC)</th>
</tr>
</thead>
<tbody>
<tr>
<td>service pit</td>
<td>Type 2</td>
<td>0</td>
<td>1</td>
<td>2</td>
</tr>
<tr>
<td></td>
<td></td>
<td>0</td>
<td>0</td>
<td>2</td>
</tr>
<tr>
<td>service pit or boundary pit</td>
<td>Type 5</td>
<td>1</td>
<td>2</td>
<td>0</td>
</tr>
<tr>
<td>or FJL pit</td>
<td></td>
<td>1</td>
<td>1</td>
<td>2</td>
</tr>
<tr>
<td></td>
<td></td>
<td>1</td>
<td>0</td>
<td>4</td>
</tr>
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<td>4</td>
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<tr>
<td>LN connection pit</td>
<td>Type 6</td>
<td>2</td>
<td>0</td>
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<td>0</td>
</tr>
<tr>
<td>nbn™ pit type</td>
<td>Industry pit type naming convention</td>
<td>P100</td>
<td>P50</td>
<td>P20 (LIC)</td>
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<td>6</td>
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<tr>
<td>LN connection pit and distribution pit (standard)</td>
<td>Type 8</td>
<td>4</td>
<td>0</td>
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</tbody>
</table>
# 5 Glossary

<table>
<thead>
<tr>
<th>Term</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>ADT</td>
<td>Assisted Drafting Tool</td>
</tr>
<tr>
<td>BoK</td>
<td>Back of Kerb</td>
</tr>
</tbody>
</table>
| CAD    | Computer Aided Design  
A format developed by Autodesk and used by the AutoCAD software application for 2D and 3D design and drafting. |
| DBYD   | Dial Before You Dig                                                                                                                                 |
| DN     | Distribution Network  
The part of the network that connects the FAN to the FDH.                                                                                     |
| DP     | Delivery Partner                                                                                                                                 |
| EPR    | Earth Potential Rise                                                                                                                                 |
| EUP    | End User Premises                                                                                                                                 |
| FAN    | Fibre Access Node  
A facility that houses the active equipment providing services to a FSA. Urban FANs may also provide a POI to access seekers. |
| FDH    | Fibre Distribution Hub                                                                                                                                 |
| FJL    | Flexibility Joint Location  
The demarcation point between the DN and LN networks.                                                                                     |
| FSA    | Fibre Serving Area                                                                                                                                 |
| FTTP   | Fibre To The Premises  
The network design in which the fibre network is deployed to each premises.                                                                                  |
| HS&E   | Health, Safety & Environment                                                                                                                                 |
| LN     | Local Network  
The part of the network from the FDH down each street.                                                                                      |
| MDU    | Multi Dwelling Unit  
A premise that contains more than one dwelling unit. This term is                                                                                 |
<table>
<thead>
<tr>
<th>Term</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>MPS</td>
<td>Multi Premise Site</td>
</tr>
<tr>
<td>nbn</td>
<td>National Broadband Network</td>
</tr>
<tr>
<td>SFM</td>
<td>Small Footprint Multiport</td>
</tr>
<tr>
<td>SMP</td>
<td>Splitter Multiport</td>
</tr>
<tr>
<td>new developments</td>
<td>A new or undeveloped piece of land that represents the growth of the premises market.</td>
</tr>
<tr>
<td>POI</td>
<td>Point Of Interconnect</td>
</tr>
<tr>
<td>POS</td>
<td>Public Open Space</td>
</tr>
<tr>
<td>SDU</td>
<td>Single Dwelling Unit</td>
</tr>
<tr>
<td>WSE</td>
<td>Workplace Safety &amp; Environment</td>
</tr>
</tbody>
</table>