# Building Design Guide – New Developments

**Engineering External Plant - FTTX**

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Revision History

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1 About This Document

This document, in conjunction with documents listed in 1.7 – Related documents, provides guidelines for developers building Multi Premises Sites (MPS)

1.1 Purpose

This document deals with the provision of appropriate pathways and spaces in vertical and horizontal MPS sites for the delivery of fibre to the premises infrastructure in new developments. This document outlines nbn’s conduit and spatial requirements within an MPS in order for its fibre to the premises infrastructure to be deployed.

1.2 Scope

1.2.1 In Scope

Building design guidelines for the clearances and pathways required to survey, design and install equipment for nbn within a New Development MDU

1.2.2 Out of Scope

- Any building design guidelines for the clearances and pathways for Brownfield MDU/MPS sites
- Any specific recommendations for acceptable vendor products in relation to cable management options

1.3 Audience

- New Development site developers
- New Development site designers
- Building Contractors

1.4 Related Documents

<table>
<thead>
<tr>
<th>Document</th>
<th>Owner and Link</th>
</tr>
</thead>
<tbody>
<tr>
<td>[1] AS/NZS 1477:2006 PVC pipes and fittings for pressure applications</td>
<td>Standards Australia</td>
</tr>
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1.5 What's Changed In This Release

Changes in this document revision 7.0 dated 07/09/15 compared to the previous revision 6.0 dated 15/06/13 are summarised below:

<table>
<thead>
<tr>
<th>Section</th>
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<tr>
<td>4.5, 4.9, 4.9.2, 4.9.3 and Appendix B</td>
<td>Addition of Outdoor NTD requirements for Essential Services, and NTD Enclosure. Included ventilation requirements.</td>
</tr>
<tr>
<td>Whole Document</td>
<td>General updates to all sections</td>
</tr>
<tr>
<td>Figure 24 and 25</td>
<td>Uploaded Pictures</td>
</tr>
</tbody>
</table>


[10] NBN-NO-GDE-0011 Residential preparation and installation
2 Introduction

The term Multi-Premises Site (MPS) refers to any development of two or more premises (also known as living units, premises or dwellings) that are joined by a common wall or property boundary and are generally managed by a Body Corporate. Examples of an MPS include apartments, town houses, retirement villages, groups of strata title units and the like. In addition to living units, an MPS can also include retail and commercial premises. An MDU (multi-dwelling unit) is a category of MPS that only contains living units (no retail/commercial premises).
3 Scope

This document addresses the internal space requirements and minimum clearances required to assist in the implementation of the nbn fibre network build where a shared common building services entry (Lead-in) is utilised to access the street fibre network.

The intended audience are any of the following:-

- Developer or Designer
- Developer’s Consultant
- Developer’s Building Contractor
- nbn Designer or Planner

![Diagram of network elements]

Figure 1: Basic network elements in relation to a typical MPS
4 General Requirements

4.1 New Development MPS/MDU

The Developer, Developer’s consultant or contractor are responsible for the following:-

- Provision of a suitable lead-in from the property boundary to the building entrance facility through to any area designated for Telecommunications services. Where diversity or other special needs exist, an alternative entry location may also be required.
- Provision of suitable space and access for the installation, maintenance and repair of all nbn. network elements up to and including the Network Termination Device (NTD) and Power Supply Unit (PSU).
- Provision of a minimum of P23mm nominal inside diameter, white, rigid communications conduit with draw string, from either the telecommunications room or riser/closet location to each NTD location.
- Provision of Mains Power to NTD locations
- Provision of Comms earth terminal where required

nbn is responsible for:

- The cabling, installation and maintenance of all network elements up to and including the NTD and PSU, with the exception of the PSU batteries originally supplied at the time of installation.
- Compliance to the Building Code of Australia for all cabling and with reasonable directions provided by authorised developers, builders, owners, managers and customers in respect to building and fire authority requirements. In the cases where requests are received which are regarded as unreasonable, advice may be sought.

4.2 ACMA Wiring Rules

The ACMA wiring rules do not apply to cabling up to and including the network boundary point. Any cabling work performed on the customer side of the network boundary point is subject to ACMA requirements. Cabling work includes the connection, installation or maintenance (repair) of customer cabling.

4.3 Network Boundary Point

The Network boundary point will be at the service output ports on the nbn. NTD, i.e. the data (UNI-D) and phone (UNI-V) service sockets on the rear of the nbn. NTD. (As per AS/ACIF S009 – 2006) the NTD is labelled as a Network Termination Device (NTD).

4.4 Essential Services

When provisioning for an essential service, such as a lift phone, managed alarm system or fire panel the Outdoor NTD device must be used. The Outdoor NTD unlike the Indoor NTD has specific earthing requirements as described below. Refer to Section 4.4.1 Mounting Surface Template for Outdoor NTD spatial requirements.
Note:

1) The CET earth must be provided by a licensed electrician engaged by the developer or construction contractor.

2) Whilst the NTD being used for essential services is called an “Outdoor NTD”, this will always be used/located (typically in a Comms cupboard or room) *indoors* for new development MDU/MPS’s areas.

The Outdoor NTD specific earthing requirements:

- Earthing conductor for the nbn Outdoor NTD must be earthed for safety reasons and for remote testing purposes.

- Where the electrical earth electrode is near the nbn Outdoor NTD and is accessible, a 6 mm² green/yellow equipotential bonding conductor may be run between the Outdoor NTD and the electrode and must be connected to the electrode by a separate earthing clip. The connection must be labelled “Telecommunications Bonding Conductor” or “nbn” in accordance with the requirements of AS/NZS 3000.

- Provide a 6 mm² green/yellow equipotential bonding conductor between the earthing bar in the electrical switchboard and a Communications Earth Terminal (CET) in the communications compartment of the combined enclosure or, where a combined enclosure has not been provided, located near — but not in — the switchboard (in accordance with Clause 5.6.2.7 of AS/NZS 3000:2007); and

- Where a combined enclosure is not used, run a 2.5 mm², 4 mm² or 6 mm² green/yellow earthing conductor from the CET to the NTD location.

This arrangement is shown below:

- The length of the equipotential bonding and earthing conductors is unimportant for the purpose of earthing the Outdoor NTD, as this earth is provided for electrical safety reasons, not for lightning surge protection purposes.

- The earthing conductor need not be installed in conduit within the wall cavity.

- The earthing conductor must be tied or taped to either the lead-in conduit or the customer cabling conduit (the earthing conductor may enter either the left hand or the right hand cable entry port, whichever is more convenient).
1. The bonding conductor must be labelled “Telecommunications Bonding Conductor” at the switchboard end and also at the Communications Earth Terminal (CET) end if the CET is not within sight of the switchboard.

2. The CET must be located within 1m of the essential services outdoor NTD.

3. A licensed electrician must make the bonding conductor connection inside the electrical switchboard.

4. The earthing conductor will be connected to the Outdoor NTD by the nbn installer

5. CET not to be used for non nbn services

### 4.4.1 Mounting Template

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Mounting Surface Template for Outdoor NTD</th>
</tr>
</thead>
<tbody>
<tr>
<td>A landscape layout(^1) of the Outdoor NTD</td>
<td><img src="image" alt="Figure 3: Outdoor NTD Composite Layout (Landscape)" /></td>
</tr>
</tbody>
</table>

**Note:** A GPO must be provided by the end user outside the area assigned for the installation of nbn’s equipment\(^2\).

---

\(^1\) Additional area must be provided if the Open Enclosure / Home Distributor is designed for non-nbn cable patching, devices or equipment.

\(^2\) The position of the GPO is these diagrams are for illustrative purposes only. The GPO may be positioned anywhere adjacent to the perimeter of the Mounting Surface Template and as close as practical to it, in accordance with wiring standards. The electrician should avoid mixing power cabling with data, telephone, RF and fibre in the same vertical corridor.
A portrait layout of the Outdoor NTD

Figure 4: Outdoor NTD Composite Layout (Portrait)

**Note:** A GPO must be provided by the end user outside the area assigned for the installation of nbn’s equipment.

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Table 1: Outdoor NTD Mounting Template

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3 The position of the GPO is these diagrams are for illustrative purposes only. The GPO may be positioned anywhere adjacent to the perimeter of the Mounting Surface Template and as close as practical to it, in accordance with wiring standards. The electrician should avoid mixing power cabling with data, telephone, RF and fibre in the same vertical corridor.
4.5 nbn’s MDU/MPS Categories

An MDU/MPS is classified by nbn. according to the types of buildings on a building site or development. Each MPS within a development can be categorised by one of the following definitions:

<table>
<thead>
<tr>
<th>MDU Category</th>
<th>Characterisation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Horizontal</td>
<td>Close resemblance to single dwelling units in a street. Buildings maybe clustered into semidetached or terrace arrangements, but the entry facility is common for at least two living units. Pathways between living units resemble those detailed in document NBN-TE-CTO-194.</td>
</tr>
<tr>
<td>Vertical</td>
<td>Multiple floors, multiple living units per floor, likely to have several vertical spaces for services. Includes one or more telecommunications rooms/spaces as per AS/NZS 3084:2003.</td>
</tr>
<tr>
<td>Hybrid</td>
<td>Multiple buildings on a site. Apartments in horizontal and vertical configurations that may have common access pathways between structures. Multiple access spaces are generally required.</td>
</tr>
</tbody>
</table>

Table 2: MPS Categories

4.6 MDU/MPS Classification

This section specifies the minimum requirements for the various MDU/MPS types, however, these are standard guidelines only. Please refer any concerns to nbn for non-standard installations or specific recommendations.

4.6.1 Basic Principles

The following installation principles apply:

- Space requirements must be applied in accordance with AS/NZS 3084:2003, unless otherwise specified in this document.
- The NTD and PSU must be located in an area that is controlled by the end user at all times.

4.6.2 Lead-in to the Building Entry

- **2 – 60 premises**
  
nbn requires 1 x white P50 PVC conduit with a minimum wall thickness of 3.65mm.

- **Greater than 60 premises**
  
nbn requires a minimum of 1 x P100 telecommunications conduit.
4.7 Space and Location Requirements

4.7.1 Premises Connection Device

The PCDs will typically be mounted on the exterior of a premise (to include small MPS/MDUs). In some cases, the cabling design may require installation in an interior space such as under a stairwell. In these cases, the TE Connectivity PCD is preferred since it is constructed with low-smoke, zero-halogen (LSZH) material.

Preferred Location - Requirements

The PCD locations should be at a location minimum of 300mm from ground and no higher than 1.8m from ground level (that is without a ladder), and

- Accessible from solid ground, a slab, deck, veranda or balcony that is at ground level, or is elevated and supported or filled with no risk of falling off the edge, OR
- An elevated balcony with a rail or fence, provided a worker accessing the PCD remains wholly within the balcony without leaning out.

This will eliminate the risk of working at heights for future workers, and ensure the PCD is accessible for repair to minimise the impact of potential future service disruption.

The location must also meet all other location requirements described in this document.

The Delivery Partner must clearly communicate the safety and access reasons for the intended location to the Body Corporate (or equivalent).

Non-preferred location – Preferred Location is not reasonably practicable

In consideration of all the relevant safety risks, where it is not reasonably practicable to design a location consistent with the Preferred Location described above, the Delivery Partner must document on the design the risk based reasons for the non-preferred location.

Non-preferred location – Body Corporate Rejects Preferred Location

Where a preferred location is identified but this is rejected by the Body Corporate (or equivalent) the final design (with a non-preferred location) must state that the safety and access reasons for the intended preferred location were explained and still rejected.

Non-preferred location – Requirements
Where it is not reasonably practicable to design a location consistent with the Preferred Location described above, the non-preferred location must meet the following requirements:

- The minimum height reasonably practicable, but no higher than 4m to the top of the PCD from ground level (which where near an edge is the lowest level), and
- Sufficient extra fibre length is coiled in the PCD to allow it to be uncoiled so the PCD end/connector is accessible from the ground, and
- Must be accessible using a ladder that can be safely located, secured and used by one person, including but not limited to:
  - Flat stable ground surface
  - With sufficient clearance away from the wall and other structures
  - Not in an area of heavy vehicle or pedestrian traffic

4.7.1.1 Separation from other services

The following sections detail the clearances which must be maintained for safety and practicality of installing the PCDs.

4.7.1.2 Gas Meter Clearances

The clearance for a Gas Meter is dependent on whether the Gas Meter is enclosed within an enclosure or outside of a closure.

The following Figure 6 depicts the clearances required for a Gas Meter not enclosed:

![Figure 6: Gas Meter](image)

- The distances are measured from the surface of the gas meter, gas regulator or any gas fitting, whichever is the outermost

<table>
<thead>
<tr>
<th>Note</th>
<th>The hazardous area does not extend outside:</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>• An approved gas enclosure; or</td>
</tr>
<tr>
<td></td>
<td>• The gas compartment of a combined gas and telecommunications enclosure approved by the relevant gas utility</td>
</tr>
</tbody>
</table>
The following Figure 7 depicts the clearances required for a Gas Meter enclosed:

Figure 7: Gas Meter Enclosure

- A minimum clearance of 150mm is required from an approved Gas Meter Enclosure

4.7.1.3 Gas Cylinder Clearances

The following clearances apply to a fixed Gas Cylinder or a Exchangeable Gas Bottle. Figure 8 explains the required clearances:

Figure 8: Gas Cylinder Clearances

<table>
<thead>
<tr>
<th>Dimensions</th>
<th>Exchangeable Gas Bottle</th>
<th>In-Situ Gas Cylinder</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>500mm</td>
<td>1500mm</td>
</tr>
<tr>
<td>B</td>
<td>1500mm</td>
<td>3500mm</td>
</tr>
<tr>
<td>C</td>
<td>500mm</td>
<td>500mm</td>
</tr>
</tbody>
</table>

Table 3: Gas Cylinder/Bottle Clearances

- The horizontal distances are measured from the centre line of the Gas Cylinder or Bottle
- The vertical distances are measured from the top of any Gas Cylinder/Bottle valve
4.7.1.4 Other Utility and Obstruction Clearances

The following table covers the other utilities and obstructions where clearances must be adhered too.

<table>
<thead>
<tr>
<th>Obstruction/Utility</th>
<th>Clearance</th>
</tr>
</thead>
<tbody>
<tr>
<td>Working clearances</td>
<td>2000mm H x 900mm W x 900mm D</td>
</tr>
<tr>
<td>Fixed Services: Pipes, Taps, Water Meters</td>
<td>150mm</td>
</tr>
<tr>
<td>Power source: Including the point where the premises power supply cable connects to the property electrical board</td>
<td>150mm</td>
</tr>
<tr>
<td>Corner of wall and exterior structure such as window or balcony</td>
<td>100mm</td>
</tr>
<tr>
<td>Left of PCD for the door to open</td>
<td>255mm</td>
</tr>
<tr>
<td>Space under eaves from aerially fed PCD</td>
<td>100mm</td>
</tr>
</tbody>
</table>

Table 4: PCD Clearances
4.7.2 Basement or Telecommunications Room

The size of an MDU/MPS and the solution required will determine the amount of space required. A dedicated telecom room is desired but not required. For example, if a Premises Distribution Hub (PDH) is required to service the building, an adequate space to mount and work on and around the cabinet is required – whether or not it is in a dedicated telecom room.

The specific area and clearance requirements will depend upon the number of premises being supported since that will determine the number and type of hardware products to be installed. Refer to Figure 9 for the generic clearance/space requirements for an MDU/MPS that requires a PDH cabinet with dimensions of 800 x 600 x 400 (mm). Access clearances are defined in AS/ACIF S009:2006, figures D.2 and D3 [7] and must be referred to for complete guidance. This configuration may be replicated multiple times for very large developments, however it is recommended to refer the layout/design to nbn for each large installation to confirm compliance. The PDH is required when there are 60+ residential premises. Otherwise a CTL is used.

Where there are multiple PDHs required, the first PDH requires a total clearance of 1200mm horizontally and every subsequent PDH on the same wall will only require 900mm width of reservation.

**Figure 9: Example Fibre / Premises Distribution Hub/Internal Locations Clearance Requirements**

Note: The depth of the PDH is 400mm however a minimum depth of **450mm** is required in any communications cupboard where a PDH will be located.
4.7.3 Cable Transition Location (CTL) Enclosure

A CTL may be mounted outside on the side of the MPS or inside. The clearance requirements are shown below.

![Diagram of CTL clearance requirements](image)

**Figure 10: Example CTL clearance requirements**

Note: It is preferable that the full width of the CTL be kept clear for cable access.
4.7.4 Concept Drawing of Comms room layout (Combined PDH, FDT, Outdoor NTDs)

Figure 11: Concept design of typical front elevation Comms room

Figure 12: Example of typical Comms room
4.7.5 Telecommunications Riser/Closet

There are two main products that are mounted in a telecommunications riser/closet: The Fibre Collector Distributor (FCD) and/or the Fibre Distribution Terminal (FDT).

There are three types of dimensions referenced below:

1. The minimum space required to physically mount an FCD or FDT to a wall.
2. The minimum clearance required around a FCD/FDT or grouping of products (the working height and space)

4.7.6 Working Height and Space

Telecommunication products need to be mounted at a comfortable working height and need to have sufficient access space around the product(s) for initial installation, ongoing maintenance, configuration modifications, and troubleshooting.

An FCD and FDT have the following minimum requirements see below:

<table>
<thead>
<tr>
<th>CAUTION: Falls from heights can result in serious injury or death.</th>
</tr>
</thead>
<tbody>
<tr>
<td>nbn has developed equipment location information in consideration of the risk of working at heights. This information is designed to facilitate the elimination or minimisation of work at heights through the design and installation process by the surveyor, designer and installer. Before commencing any installation that requires working at heights, all personnel must be thoroughly familiar with their applicable, state or territories, Workplace Health and Safety regulations, as well as your companies’ and/or Principal Contractor’s safety practices and policies.</td>
</tr>
<tr>
<td>Working at heights requires the person or persons carrying out the work, to be properly trained and deemed competent. Personnel performing the work will require a SWMS (safe work method statement) or risk assessment that would identify the necessary controls in order to carry out the work safely. Refer to nbn Critical Risk Controls document NBN-HSE-SSW-STD-0249 (CRC #4), and applicable legislation and codes of practice.</td>
</tr>
</tbody>
</table>
- Mounted no closer to the floor than 450mm from the bottom of the FCD/FDT, and no higher than 1800mm to the top of the FCD/FDT.
- Minimum of 900mm clear space in front of the FCD/FDT.
- Minimum of 300mm on each side of the FCD/FDT (or on each side of a grouping of FCD/FDTs).

The telecommunications closet/riser is also required to have a minimum 50x50 mm floor slot or 1 x white telecommunications conduit cut nominally 25mm above or below the floor slab, as appropriate (see Figure 14/15). If there are living units above and below the floor slab, bi-directional access is required.

**Note:** The diagrams in this section do not include the conduit or other pathway to units.

Any fire stopping requirements for penetrations of the walls, floors or ceilings must be installed in accordance with the Building Code of Australia (BCA).

nbn does not provide or certify any fire stopping.

![Diagram showing access clearances for a single FDT or FCD](image)

**Figure 13:** Example of access clearances for a single FDT or FCD (all dimensions in mm)
Figure 14: Slot Example
Telecommunications Riser/Closet Floor or Ceiling Entry

Note: For vertical pathways between floors, as a minimum the ability to anchor cables every 800mm is required.

Figure 15: Sleeve Example
Telecommunications Riser/Closet Floor or Ceiling Entry
5 Pathways

5.1 Property boundary to Telecommunications room:

Communication pathways may be provided using the options below. At any pathway transition point, no fibre is to be self-supported over a distance greater than 200mm.

Note: Conduits require drawstring

Figure 16: nbn Pathway from Property Boundary to Communications Room
5.2 Telecommunications Riser/Closet to Living Unit

Communications pathways may be provided using the options below. Options 1 & 2 will be used in new development MDU/MPS.

Option 1: Dedicated Conduit

Cabling from the Living Unit to the Telecommunications Riser/Closet requires a minimum of a P23mm inside diameter rigid white communication conduit with a draw string from the Telecommunications Riser or Closet location to each NTD location within a premise. No section of conduit shall be longer than 50 metres between pull/draw points and contain the equivalent of no more than three 90° 300mm radius bends. Conduits can be surface mounted in common areas or cast “in slab”

Notes: All conduits and drawstrings must be labelled referencing the respective Apartment/Unit numbers.

A single 100mm radius bend maybe used to replace a 300mm radius bend as the final transition from horizontal to vertical with agreement of the relevant nbn representative

Figure 17: nbn Pathway using all P23 ID conduit to feed typical Apartment floor Example layout 1
Option 2: Cable Tray and Conduit

Where a combination of cable tray and conduit is utilised for cabling from the Telecommunications Riser/Closet to the living unit, access panels must be provided at any change of direction of cable tray, cable tray/conduit transition or no more than 15m apart.

Where cable tray is shared with other services, there must be a minimum of 100mm separation from the nbn network infrastructure.

![Diagram of nbn Pathway using combination Cable Tray and P23 ID conduit to feed typical Apartment floor Example layout 2](image)

Figure 18: nbn Pathway using combination Cable Tray and P23 ID conduit to feed typical Apartment floor Example layout 2

The allowable pathway solutions in order of preference by nbn are as follows:

3. P23mm nominal internal diameter rigid communications conduit
4. P50mm ID Rigid Communications Trunk Conduit
5. Cable tray
5.3 Concept Drawing Elevations

5.3.1 Vertical Distribution Single line Diagram

5.3.2 Living unit NTD elevations
6 Mounting Surface Templates and Locations

Builders and building owners must make one of the following types of location available for the installation of nbn equipment. Each must provide the minimum mounting template shown in figure 21.

6.1 Indoor NTD Mounting Surface Templates

Indoor NTD Mounting Surface Templates shows indoor NTD landscape and portrait indoor mounting surface templates. Space must be available for a 230VAC power outlet adjacent to the mounting surface template. The 230VAC power outlet may be positioned anywhere adjacent to the perimeter of the mounting surface template and as close as practical to it, in accordance with wiring standards, to minimise cable length.

Note:

Maximum mounting height above ground level is 1.7m to the top of the NTD Enclosure.
Minimum mounting height above ground level is 0.7m to the top of the NTD Enclosure.

![Figure 21: Indoor NTD Mounting Surface Templates](image)

6.2 Mounting Locations

nbn distinguishes between three types of mounting locations where equipment may be mounted within the confines of a mounting surface template. Table below summarises the types of mounting locations.

<table>
<thead>
<tr>
<th>Location Type</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Open Wall Areas</td>
<td>An area on an open wall with either no obstructions, or only partial obstructions. Open Wall areas use the bulk space of the room for air circulation</td>
</tr>
<tr>
<td>Open Enclosures</td>
<td>A partially-enclosed area that contains no internal obstructions. Open Enclosures use the bulk space of the enclosure and the absence of obstructions for air circulation.</td>
</tr>
</tbody>
</table>
Confined areas

A cabinet or cupboard (including a Home Distributor or Utilities Enclosure) dedicated to communications equipment. Confined areas need ventilation to be added to the design to improve the air circulation.

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Home Distributor Dimensions</th>
</tr>
</thead>
<tbody>
<tr>
<td>Minimum mounting surface area required for an Indoor NTD composite layout</td>
<td>2,000 square centimetres, measured within the Home Distributor.4</td>
</tr>
<tr>
<td>Minimum mounting surface area required for an Indoor NTD composite layout</td>
<td>2,000 square centimetres, measured within the Home Distributor.4</td>
</tr>
<tr>
<td>Minimum internal clearance between nbn equipment and Home Distributor door / cover</td>
<td>2 centimetres</td>
</tr>
<tr>
<td>Minimum internal clearance from the rear of the nbn equipment and Home Distributor/Cover</td>
<td>10 centimetres</td>
</tr>
<tr>
<td>Minimum inside volume required for a Home Distributor</td>
<td>20 litres.4</td>
</tr>
</tbody>
</table>

nbn requires Contractors to adhere to construction and ventilation requirements when installing equipment in mounting locations.

### 6.3 Minimum Home Distributor dimensions

nbn equipment may be installed into a Home Distributor that meets or exceeds the following size requirements.

---

4 This volume is sufficient to accommodate the I-240G-R Indoor NTD, the Battery Backup PSU, NTD Enclosure and GPO. Additional volume must be provided to accommodate patch panels or other end user equipment.
6.3.1 Indoor Composite Layouts

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Mounting Surface Template for NTD Enclosure</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mounting Surface Template for a landscape orientation</td>
<td></td>
</tr>
</tbody>
</table>

![Figure 22: NTD Enclosure Landscape Orientation](image)

Note: A GPO must be provided by the end user outside the area assigned for the installation of nbn’s equipment.

---

5 The position of the GPO is these diagrams are for illustrative purposes only. The GPO may be positioned anywhere adjacent to the perimeter of the Mounting Surface Template and as close as practical to it, in accordance with wiring standards. The electrician should avoid mixing power cabling with data, telephone, RF and fibre in the same vertical corridor.
Mounting Surface Template for a portrait orientation

Figure 23: NTD Enclosure Portrait Orientation

Note: A GPO must be provided by the end user outside the area assigned for the installation of nbn’s equipment\(^6\).

Table 7: NTD Enclosure Mounting Template

6.3.2 Power Outlet(s)

The GPO to power the installation is not included within the dimensions of the mounting surface, but is shown adjacent in each of the above examples.

Ensure that the GPO is positioned up to 200mm from the nbn equipment template.

**Recommended:** Provide a double GPO, so that one socket is available for customer devices, such as an internet router. Locating the new GPO as close as possible to the equipment location minimises safety issues with excess cord, and improves the look of the installation.

---

\(^6\) The position of the GPO is these diagrams are for illustrative purposes only. The GPO may be positioned anywhere adjacent to the perimeter of the Mounting Surface Template and as close as practical to it, in accordance with wiring standards. The electrician should avoid mixing power cabling with data, telephone, RF and fibre in the same vertical corridor.
6.3.3 Installation Specifications and Rules for NTDs and PSUs

**Note:** The Indoor NTD and its PSU are suitable for installation in Standard Circumstances.

All of the following checks must be true for an installation to be categorised as ‘Standard Circumstances’:

6. The NTD and PSU are installed in a building where people normally live, work or meet, but not in a place that is open to public access.

7. The NTD and PSU
   a. are installed inside the same building as each other
   b. are not installed on the external surface of an external wall, and
   c. are not installed in an enclosure situated on or embedded into the external surface of an external wall of the building;

8. The end user cabling remains wholly within the same building containing the NTD and PSU.

9. If a Battery Backup PSU is deployed, it is mounted and semi-permanently secured to a wall or permanent fixed enclosure.

10. Neither the NTD nor PSU are installed in a situation where they might be reasonably expected to experience damp, moist or excessively humid conditions.

11. Neither the NTD nor the PSU are installed within a roof cavity.

12. Neither the NTD nor the PSU are installed below a floor outside the normal living, working or occupancy areas of the building.

13. Neither the NTD nor the PSU are installed in a cupboard / Enclosure / Home Distributor or in a confined space where
   a. it might reasonably be expected that linen, clothing or towels might be stored in direct contact with the NTD or PSU, or
   b. it might be reasonably presumed that items could be stored that restrict free airflow around the NTD or PSU, or
   c. Gases may be trapped due to limited or no ventilation, or because the design or situation of the Enclosure / Home Distributor is such that there is a potential for ventilation to be inhibited.

---

7 This means that the Indoor NTD and PSU should not be installed in a building or structure separate from where the services will be reticulated, or in a hut or street cabinet or another kind of enclosure such as a telephone booth where the environmental conditions may extend outside the specifications permitted for the NTD, PSU or battery.

8 The ‘external surface of an external wall’ refers to the outside of a building, and would include, as an example, an undercover area within an enclosed patio, plus similar circumstances. The installation of an NTD and PSU on the ‘internal surface of an external wall’ refers to the inside of a building and this situation is not meant to be precluded by these points, however may fall under other circumstances outlined later in this list.

9 End user cabling includes any cables that contain electrical conductors or conductive components, for the purpose of reticulating any UNI-V or UNI-D service, or reticulating PSU power. This term is intended to mean the same as the term ‘customer cabling’ in AS/CA S009.

10 This means that there must not be any electrically conductive telephone or data or PSU power cables between the main building and a separate freestanding building.

11 This means that neither the NTD nor the PSU may be installed under a home between the floor and bare earth, or in a location that cannot be locked up.

12 VRLA batteries, of the kind used in the Battery Backup Power Supply Unit, may emit hydrogen and oxygen gas under some circumstances, such as battery overcharging. VRLA batteries may be installed into office or end user enclosures providing the enclosure provides for exchange of air with the ambient atmosphere, as described in section
14. Neither the NTD nor the PSU are installed
   a. in a location where the ambient temperature in the immediate vicinity of the NTD or
      PSU might routinely exceed +40°C or fall below 0°C or
   b. On a surface where the surface temperature might routinely exceed +40°C\textsuperscript{13} or fall
      below 0°C.

15. Neither the NTD nor the PSU are installed in a location where the power or end user
    cabling\textsuperscript{9} might
    a. be a tripping or strangulation hazard\textsuperscript{14} or
    b. Be accidently wrenched or damaged by tripping, passing by, or another inadvertent
       disturbance.

16. Neither the NTD nor the PSU are installed
   a. onto an accessible conductive / metallic surface or
   b. Encompassing a General Purpose Outlet (powerpoint) unless all accessible conductive
      surfaces and parts have been protectively earthed in accordance with AS3000 and
      AS/CA S009\textsuperscript{15}.

17. The PSU AC power cord is not routed through an opening in a metallic surface unless the
    metallic edges of that opening are appropriately protected by a grommet or similar device.

18. Neither the NTD nor the PSU are at risk of being damaged.

\textsuperscript{13} This means that neither the NTD nor the PSU may be installed directly onto a northern or western facing masonry
    wall where (a) the wall is likely to be subjected to heating through solar loading and the heat may be transferred to
    the surface on which the NTD or PSU is mounted, or (b) near a space or water heater or a heater vent.
Note that Indoor NTDs and PSUs may be installed on northern or western facing masonry cavity walls if the cavity is
fitted with R1.5 or higher rated batts.
Also note that if a wall would be subjected to solar loading but for a tree that is currently providing shade, the installer
should assess future circumstances assuming the tree has been removed.

\textsuperscript{14} Cables and equipment must be installed in accordance with local OH&S regulations and requirements. It is beyond
the scope of this document to specify values.

\textsuperscript{15} This addresses potential breaches of primary insulation, inadvertent detachment of live conductors coming into
contact with exposed metallic parts, and other potential risks in situations where conductors carrying mains potential
are routed into conductive / metallic enclosures. Refer to 2.7 of AS/CA S009.
6.3.4 Ventilation requirements

nbn requires that enclosures for the nbn Equipment only, satisfy the following thermal ventilation requirements:

<table>
<thead>
<tr>
<th>Volume of Open Enclosure or Home Distributor</th>
<th>Required ventilation area (for each of the Upper and the Lower ventilation region)</th>
</tr>
</thead>
<tbody>
<tr>
<td>20 litres (minimum volume requirement)</td>
<td>60 square centimetres.</td>
</tr>
<tr>
<td>Between 20 litres and 60 litres</td>
<td>60 square centimetres, plus an additional 1.5 square centimetres per litre of volume over 20 litres.</td>
</tr>
<tr>
<td>Greater than 60 litres</td>
<td>120 square centimetres, plus an additional 0.1 square centimetres per litre of volume over 60 litres.</td>
</tr>
</tbody>
</table>

Table 8: Ventilation requirements

Calculating Ventilation Area

For each ventilation region, use the following steps to calculate the required ventilation area (in square centimetres):

19. Use the following formula to calculate the volume:

\[
\text{volume} = \left( \frac{W \times H \times D}{1000} \right)
\]

Where:

- \( W, H \) and \( D \) are the internal width, height and depth of the enclosure (in centimetres)
- \( \text{volume} \) is expressed in litres

20. Based on the volume you calculated in step 1, determine the required ventilation area (in square centimetres):

- For volumes **between 20 litres and 60 litres**:
  \[
  \text{ventilation area} = 60 + \left( \text{volume} - 20 \right) \times 1.5
  \]

- For volumes **greater than 60 litres**:
  \[
  \text{ventilation area} = 120 + \left( \text{volume} - 60 \right) \times 0.1
  \]

**Example**

An enclosure with internal dimensions of width 38 cm, height 65 cm and depth 13 cm, has the following volume:

\[
\text{volume} = \left( \frac{38 \times 65 \times 13}{1000} \right) = 32.13 \text{ litres}
\]

As this volume is **between 20 litres and 60 litres**, we calculate the required ventilation area for each of the upper and lower ventilation areas as:

\[
\text{ventilation area} = 60 + \left[ \left( \frac{38 \times 65 \times 13}{1000} - 20 \right) \times 1.5 \right] = 78.2 \text{ cm}^2
\]
### Additional Requirements

<table>
<thead>
<tr>
<th>Rule</th>
<th>Notes</th>
</tr>
</thead>
<tbody>
<tr>
<td>Doors or covers must not obstruct ventilation</td>
<td>An Open Enclosure or Home Distributor design must not rely on a cover or doors being opened to meet the thermal ventilation requirements.</td>
</tr>
</tbody>
</table>
| Obstructed ventilation does not count towards thermal ventilation assessment | Examples of obstructed ventilation include (but are not limited to) the following:  
  - An Open Enclosure or Home Distributor is installed into a cavity  
  - An Open Enclosure or Home Distributor is surrounded by a purpose-designed architrave  
  - An Open Enclosure or Home Distributor is fitted with fixed shelving  
  - An Open Enclosure or Home Distributor has the capability of being fitted with removable shelving |
| Ventilation openings must not be used for cable ingress/egress at any time | This ensures that cables can neither obstruct nor reduce the free flow of air into and out of the Open Enclosure or Home Distributor, and compromise its effective ventilation. |

*Table 9: Additional ventilation requirements*
### Ventilation Requirement

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Ventilation to dissipate gases released during battery charging</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>a. Ventilation must be provided in an 'Upper Ventilation Region' no further than 100mm from the top surface of the Open Enclosure Area or Home Distributor</td>
</tr>
<tr>
<td></td>
<td>b. Ventilation must be provided in a 'Lower Ventilation Region' no further than 100mm from the bottom surface of the Open Enclosure Area or Home Distributor</td>
</tr>
<tr>
<td></td>
<td>c. The combined cross sectional ventilation area in the Upper Ventilation Region must be at least 5 square centimetres unimpeded(^{16})</td>
</tr>
<tr>
<td></td>
<td>d. The combined cross sectional ventilation area in the Lower Ventilation Region must be at least 5 square centimetres unimpeded.</td>
</tr>
</tbody>
</table>

\(^{16}\) 'Unimpeded' is also intended to mean 'unobstructed', and refers to the minimum effective cross-sectional area of airways intended for ventilation.

\(^{17}\) The requirements for separate upper and lower ventilation areas may be met with (a) upper and lower circular holes each of at least 25mm diameter, (b) multiple circular holes with areas that sum to at least 5 square centimetres in each of the upper and lower enclosure spaces, (c) one or more ventilation slots in each of the upper and lower enclosure spaces with cross-sectional areas that sum to at least 5 square centimetres each.

---

*Figure 24: Ventilation Upper/Lower*

This ventilation must exit towards the top/bottom, sides or front of the Open Enclosure Area or Home Distributor and must not exit into a wall cavity.\(^{17}\)

Ventilation that may be obstructed when an Open Enclosure Area or Home Distributor is embedded into a wall cavity or surrounded by a purpose designed architrave is to be disregarded when the adequacy of ventilation is assessed.

---

\(^{17}\) The requirements for separate upper and lower ventilation areas may be met with (a) upper and lower circular holes each of at least 25mm diameter, (b) multiple circular holes with areas that sum to at least 5 square centimetres in each of the upper and lower enclosure spaces, (c) one or more ventilation slots in each of the upper and lower enclosure spaces with cross-sectional areas that sum to at least 5 square centimetres each.
<table>
<thead>
<tr>
<th>Arrangement of Enclosure / Home Distributor ventilation openings</th>
<th>Where feasible, ventilation openings should be arranged in accordance with the recommendations of AS 4086.2\textsuperscript{18}, and in particular: ventilation openings should be distributed across the breadth of the upper and lower ventilation regions of the Enclosure / Home Distributor, as close to the top and as close to the bottom of the enclosure as practical ventilation openings should be positioned to ensure airflow across both the NTD and the Battery Backup PSU</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Proximity of a ventilation opening to the face of a device</strong></td>
<td>The area delimited by the perimeter of the inner opening of a ventilation opening must be at least 20mm from any of the six faces of an active or passive device\textsuperscript{19}</td>
</tr>
<tr>
<td><strong>Cable ingress / egress and ventilation</strong></td>
<td>Ventilation openings must not be used or intended to be used for cable ingress / egress\textsuperscript{20}.</td>
</tr>
<tr>
<td><strong>Doors or covers may not obstruct ventilation</strong></td>
<td>An Open Enclosure or Home Distributor design must not rely on a cover or doors being opened to meet any of the ventilation requirements.</td>
</tr>
</tbody>
</table>

\textsuperscript{18} AS 4086.2 covers ‘secondary batteries for use with stand alone power systems’, and so is not strictly applicable to nbn’s application which draws power from the consumer AC mains. In the absence of a relevant standard covering the battery capacity deployed in nbn’s Battery Backup PSU, we have referenced sections of AS 4086.2, which are arguably agnostic to the source of power, and provide relevant guidance regarding ventilation.

\textsuperscript{19} This is equivalent to saying that a device may not be mounted within 20mm of a ventilation hole, either in the two dimensions of the mounting surface, or in the third dimension above the mounting surface.

\textsuperscript{20} This requirement is to ensure that cables cannot obstruct and reduce the free flow of air into and out of the Open Enclosure or Home Distributor, thereby compromising the ventilation.
<table>
<thead>
<tr>
<th>Compliance with standards governing safe location of VRLA Batteries and Battery Backup PSUs</th>
<th>Battery Backup PSUs must not be installed onto a wall area, or into an Open Enclosure or Home Distributor if an unenclosed Battery Backup PSU would be contrary to local standards or regulation at that location(^\text{21})</th>
</tr>
</thead>
</table>

**Table 10: Ventilation Requirements**

\(^{21}\) Batteries should not be situated in areas where gas emission, however minor, could give rise to safety risk. Installing the Battery Backup PSU into an Open Enclosure or Home Distributor that is itself in such an area will not mitigate a latent safety risk so the BB PSU should not be installed in such locations.
# Appendix A Key Terms

<table>
<thead>
<tr>
<th><strong>Term</strong></th>
<th><strong>Description</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td>ACMA</td>
<td>Australian Communications and Media Authority. It is the Federal Government body that licenses Australia’s telecommunications carriers and regulates fixed line and mobile telecommunications.</td>
</tr>
<tr>
<td>BCA</td>
<td>Building Code of Australia</td>
</tr>
<tr>
<td>CPE</td>
<td>Customer Premises Equipment</td>
</tr>
<tr>
<td>CTL</td>
<td>Cable Transition Location</td>
</tr>
<tr>
<td>FCD</td>
<td>Fibre Collector Distributor</td>
</tr>
<tr>
<td>FDA</td>
<td>Fibre Distribution Area. The area served via a single Fibre Distribution Hub (FDH)</td>
</tr>
<tr>
<td>FDH</td>
<td>Fibre Distribution Hub</td>
</tr>
<tr>
<td>FDT</td>
<td>Fibre Distribution Terminal</td>
</tr>
<tr>
<td>FSA</td>
<td>Fibre Serving Area</td>
</tr>
<tr>
<td>FSAM</td>
<td>Fibre Serving Area Module</td>
</tr>
<tr>
<td>GPO</td>
<td>General Purpose Power Outlet</td>
</tr>
<tr>
<td>IMC</td>
<td>Internal Multi-fibre Cable</td>
</tr>
<tr>
<td>ISDC</td>
<td>Internal Service Drop Cable</td>
</tr>
<tr>
<td>LFN</td>
<td>Local Fibre Network</td>
</tr>
<tr>
<td>Living Unit</td>
<td>A valid physical address in the Geocoded National Address File (GNAF) provided by PSMA Australia Limited.</td>
</tr>
<tr>
<td>MDU</td>
<td>Multi-Dwelling Unit: Refers to blocks of flats, apartments etc. that is made up entirely of residential premises. MDU is a type of MPS.</td>
</tr>
<tr>
<td>MPS</td>
<td>Multi-Premises Site: Refers to blocks of flats, apartments etc. that includes both residential premises and retail/commercial premises.</td>
</tr>
<tr>
<td>NTD</td>
<td>Network Termination Device. The NTD is an active device that terminates the optical signal from the nbn and then provides one or more Service Delivery Points (SDPs) as physical electrical interfaces.</td>
</tr>
<tr>
<td>Acronym</td>
<td>Definition</td>
</tr>
<tr>
<td>---------</td>
<td>------------</td>
</tr>
<tr>
<td>ODF</td>
<td>Optical Distribution Frame. A passive device which terminates cables, allowing arbitrary interconnections to be made.</td>
</tr>
<tr>
<td>ONT</td>
<td>Optical Network Terminal. Generic term for the device at the user / customer end of an optical communication network – referred in nbn documentation as an NTD.</td>
</tr>
<tr>
<td>OSP</td>
<td>Outside Plant</td>
</tr>
<tr>
<td>Patch cord</td>
<td>A cable with connector(s) on both ends.</td>
</tr>
<tr>
<td>PCD</td>
<td>Premises Connection Device. A connection-point; box, or connector where drop fibre cable finishes and Premises fibre cable commences. May incorporate ‘slack’ cable storage. A convenient place to cease build drop activity and commence customer connection activity.</td>
</tr>
<tr>
<td>Pigtail</td>
<td>A cable with connector(s) only on one end.</td>
</tr>
<tr>
<td>PDH</td>
<td>Premises Distribution Hub. Similar to a Fibre Distribution Hub however located within a premises</td>
</tr>
<tr>
<td>Premises</td>
<td>A Residence, Unit, House, Occupancy, Tenancy, Retail, Shop Front, Hotel, Hostel, Doctor, Medical, Clinic, Medical Imaging Centre, Laboratory, Living Unit etc. Also, a valid physical address in the Geocoded National Address File (GNAF) provided by PSMA Australia Limited.</td>
</tr>
<tr>
<td>POI</td>
<td>Point of Interconnect</td>
</tr>
<tr>
<td>PSU</td>
<td>Power Supply Unit</td>
</tr>
</tbody>
</table>

**Table 11: Acronym Definitions**
### Appendix B MPS/MDU Pathway Design Checklist

**Greenfield MPS/MDU Pathway Design Checklist**

Check the following detail:

|   | 1. Ensure a floor plan for each different floor layout is supplied depicting the communication pathway from Riser Cupboard to Apartment (like floors can be shown on one floor plan).
|   | **Note:** *All effort to ensure pathways are supplied in with minimal layers sufficient to capture nbn requirements. No other utilities to be reflected.*
|   | 2. Ensure the lead-in pathway is shown going from the Property Boundary to the Communications Room (conduit, cable tray or combination of both).
|   | 3. Provide a front elevation of riser cupboard layout with space reserved for nbn equipment is provided (FCD/FDT).
|   | 4. Ensure Communications Room has the spatial requirements for NTD/PSUs to service lifts and FIP. Note: 1 x NTD/PSU combination per lift and 1 x NTD/PSU per FIP.
|   | Provide a front elevation of communications room and/or cupboard layout with space reserved for nbn equipment is provided (PDH and essential services CPE).
|   | **Note:** NTD/PSU combinations for essential services can be located in alternate locations upon consultation and agreement with your nbn Account Manager.
|   | 5. Ensure pathways from the communications room to each riser are shown (conduit, cable tray or combination of both).
|   | 6. Ensure the riser cupboard shows an FDT on each floor and the spatial dimensions of the riser cupboards are in accordance with nbn guidelines on a floor plan.
|   | 7. Provide a schematic of the riser shaft depicting the distance between floors.
|   | 8. If the pathways from the riser cupboard to the apartment are a full conduit solution, then depict each individual pathway in no more than three bends.
<p>| | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>9.</td>
<td>If the pathway from the riser cupboard to the apartment is a combination conduit/cable tray then Access Panels must be depicted in the designs at every &quot;cable tray&quot; change in direction as well as any point where the individual P23 ID lead-ins meet the cable tray. Access Panels will be no longer than 15m apart.</td>
</tr>
<tr>
<td>10.</td>
<td>The location and spatial separations for the nbn CPE (NTD/PSU) must be in accordance with nbn Guidelines.</td>
</tr>
</tbody>
</table>
| 11. | All Design Drawings must be submitted in .dwg format **to scale.**  
**Note:** All .dwg format pathway design drawings must be a single DWG/CAD with all information built in the file. No attachment/ binding OR X-Ref. Minimum AutoCad version 2010.  
All Technical Guidelines can be found at the nbn Website http://www.nbn.com.au/develop-or-plan-with-the-nbn/new-developments/resources-guidelines.html#.VCD0CPmSxsM |
| 12. | Floor plans denote Apartment/ Unit numbers. |
| 13. | For Horizontal or Hybrid MDUs the Developer must submit Pit and Pipe Asbuilts that adhere to the nbn technical guidelines before nbn can deem the Design fit for purpose (for Hybrid MDUs checkpoints 1-11 must be checked as well) |

**For any clarification on the Communications Pathway designs please refer to your nbn Account Manager.**
Appendix C nbn Fibre Pathways
Informal Visual Inspection Checklist – MPS/MDU

*THIS IS NOT A CERTIFICATE OF PRACTICAL COMPLETION*

<table>
<thead>
<tr>
<th>DEVELOPMENT SITE</th>
<th>PROJECT ID</th>
<th>ADDRESS</th>
<th>INSPECTION DATE</th>
<th>INSPECTED FLOOR/S</th>
</tr>
</thead>
</table>

<table>
<thead>
<tr>
<th>ITEM</th>
<th>DESCRIPTION</th>
<th>PASS Y/N or N/A</th>
<th>Photo taken Y/N</th>
<th>DETAILS</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Lead-in conduit (this is the conduit from the property boundary to within the communications room/ cupboard)</td>
<td>Lead in conduit is located at property boundary edge within 2m of nbn (or Telstra manhole/pit where applicable) pit in road reserve or as close to 2m as possible.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>Lead-in Conduit Strung?</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>Lead-in Conduit capped at property boundary</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>Lead-in conduit installed as per design?</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Communications Room (this is the room where the PDH/ CTL &amp; essential services will be located)</th>
<th>PASS Y/N or N/A</th>
<th>Photo taken Y/N</th>
<th>DETAILS</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Sufficient space for PDH &amp; CTL location as per Guidelines?</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>Sufficient space for essential services?</td>
<td></td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>Reserved location for essential service GPO sockets</td>
<td></td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>CET (Communications earth Terminal) 6mm² earth cable installed from electrical switch board</td>
<td></td>
<td></td>
</tr>
<tr>
<td>5</td>
<td>Reserved space and cable tray for cable management around nbn equipment</td>
<td></td>
<td></td>
</tr>
<tr>
<td>6</td>
<td>Pathway transition points, No fibre to be self supported over a max</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>---</td>
<td>---</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>distance of 200mm</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>7</td>
<td>Fibre route not crossing other services</td>
<td></td>
<td></td>
</tr>
<tr>
<td>8</td>
<td>Cable tray or min P50mmID used?</td>
<td></td>
<td></td>
</tr>
<tr>
<td>9</td>
<td>Permanent lighting available</td>
<td></td>
<td></td>
</tr>
<tr>
<td>10</td>
<td>Lockable door present</td>
<td></td>
<td></td>
</tr>
<tr>
<td>11</td>
<td>Comms Room clean, tidy and dry</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Trunk Pathways** (this is the pathways from the comms room to riser & from riser to P23 premises conduit)

<p>| | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Cable tray or min of Nominal P50</td>
</tr>
<tr>
<td>2</td>
<td>All conduit strung &amp; labelled where required</td>
</tr>
<tr>
<td>3</td>
<td>Fibre route not crossing other services</td>
</tr>
<tr>
<td>4</td>
<td>A min of 100mm separation from other services has been reserved within cable tray</td>
</tr>
<tr>
<td>5</td>
<td>450 x 450 Ceiling Access Panels installed in locations were cable tray will be enclosed. Small section of perforated cable tray to be installed at intersections of P50 and P23 conduits to tie up transitioning premise cables.</td>
</tr>
<tr>
<td>6</td>
<td>Ceiling Access Panels no more than 15m apart when cable tray in use.</td>
</tr>
<tr>
<td>7</td>
<td>No section of P50 conduit is to be longer than 50m.</td>
</tr>
<tr>
<td>8</td>
<td>Pre-formed 90 degree bends radius used for all P50.</td>
</tr>
<tr>
<td>9</td>
<td>Pathway transition points, No fibre to be self supported over a max distance of 200mm</td>
</tr>
<tr>
<td>10</td>
<td>Conduit/Cable tray installed as per design?</td>
</tr>
</tbody>
</table>

**Riser Cupboards** (this is the cupboard where the FDT FCD will be located)

<p>| | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Sufficient space for nbn equipment as per Guidelines?</td>
</tr>
<tr>
<td>2</td>
<td>Reserved space for cable management around nbn equipment and cable tray installed</td>
</tr>
<tr>
<td>3</td>
<td>Wall mounted Cable Management is installed from riser hole to riser hole</td>
</tr>
<tr>
<td>4</td>
<td>A min of 100mm separation from other services has been reserved within cable tray</td>
</tr>
</tbody>
</table>
### Premise conduit & NTD location

<p>| | |</p>
<table>
<thead>
<tr>
<th></th>
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</thead>
<tbody>
<tr>
<td>1</td>
<td>All Premise conduit must be rigid, white P23 ID telecommunications</td>
</tr>
<tr>
<td>2</td>
<td>All conduit must be strung</td>
</tr>
<tr>
<td>3</td>
<td>All conduit must be labelled with unit ID (on string and conduit)</td>
</tr>
<tr>
<td>4</td>
<td>Ensure no more than 3 x 90 degree bends between drawer points.</td>
</tr>
<tr>
<td>5</td>
<td>Pre-formed 90 degree bends used, 300mm for lateral pathway &amp; 100mm for ceiling drop to wall cavity. (No handmade bends)</td>
</tr>
<tr>
<td>6</td>
<td>No conduit section longer than 50 metres</td>
</tr>
<tr>
<td>7</td>
<td>NTD/PSU Spatial location reserved as per nbn Guideline templates</td>
</tr>
<tr>
<td>8</td>
<td>NTD/PSU location has sufficient ventilation as per nbn Guideline</td>
</tr>
<tr>
<td>9</td>
<td>All conduits installed as per design.</td>
</tr>
<tr>
<td>10</td>
<td>Conduit must finish maximum 100mm from NTD enclosure location.</td>
</tr>
<tr>
<td>11</td>
<td>All conduits must be glued</td>
</tr>
</tbody>
</table>

### OTHER/MISC

<p>| | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td></td>
</tr>
</tbody>
</table>

*Provision of this document does not confirm that the Developer has or will achieve Practical Completion in relation to the Pathway Works or any other works. If the Developer believes that it has achieved Practical Completion of the Pathway Works, it should give a formal Notice of Practical Completion to nbn in accordance with the requirements of the Developer Agreement. Upon receipt of the formal Notice of Practical Completion, nbn will assess whether Practical Completion has been achieved in respect of the whole of the Pathway Works (or any agreed separable portion). Unless nbn has agreed in its Developer Agreement with you, or signed a separate letter agreement confirming that separable portions apply, an inspection for the purposes of Practical Completion may only be conducted where the whole of the Pathway Works have been completed by the Developer.

**Construction Project Manager**

________________________________________________
QA & Construction
Supervisor______________________________

Photos of Observations