MDU building Engineering and Design Standard - New Developments

FTTx Engineering, Capacity & Performance

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Document control

Revision history

Date	Revision	Details
13 SEP 2021	12.0	• End of Life Outdoor ONT for Essential Services • Added Fibre TV section • Updates to Appendix B and C
13 MAY 2021	11.0	• Rework of all sections • Removal of FTTB / FTTN • Include Type 3 FTTP product
13 NOV 2020	10.0	• Cabinet options for PCD and Building fibre devices

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1 About this document

1.1 Background

This document provides guidelines for developers building Multi Dwelling Units (MDUs), Commercial and retail developments or other large developments with internal network distribution requirements

1.2 Purpose

This document deals with the provision of appropriate pathways and spaces in MDU sites for the delivery of **nbn™** Fibre To The Premises (FTTP), in new developments. This includes the conduit and spatial requirements within a Multi Premises Site (MPS) that are required for the deployment of **nbn™** FTTP.

The Assisted Drafting Tool (ADT) information, **nbn** CAD standards and database compatibility requirements are to be followed when creating MDU pathway designs. Submission of ADT pathways design shall be uploaded via the **nbn** portal. Developers should also follow all requirements of their developer agreement or other agreement with **nbn**.

1.3 Health, Safety & Environment (HS&E)

nbn takes health, safety and environment management very seriously, and expects the same with all internal employees and our Delivery Partners. Whilst undertaking the activity associated with this document, all workers (both **nbn** employees and delivery partner's employees) must comply with relevant HSE legislation, their own HSE processes, contractual HSE obligations and **nbn**'s HSE Critical Risk Controls.

The Critical Risk Controls (CRC) set out **nbn**'s minimum expectations for carrying out work where there is a risk of exposure to one or more HSE critical risks. The mandatory requirements specified in the **nbn™** HSE Critical Risk Controls are in addition to other requirements under legislation and do not replace or limit any **nbn** or Delivery Partner obligation to manage HSE risks. It is also important to note that the Critical Risk Controls are not exhaustive of all controls required to manage HSE risks.

The information within this document has been prepared with an understanding that HSE risks may be evident and will require assessment with due consideration to CRC requirements by **nbn** or the Delivery Partner participating in any activity prescribed within the document and controls are documented in relevant safe work systems (e.g. SWMS, Procedure etc.) and adhered to.

1.4 Scope

1.4.1 In scope

The following are in scope for this document:

- new MDU developments located within the FTTx footprint
  - residential
  - Commercial and retail developments

- Developments with network distribution requirements
- Any combination of the above

- **nbn** FTTP - pathways and spatial requirements

1.4.2 Out of scope

The following are out of scope for this document:

- new developments within the satellite footprint
- new developments within the fixed wireless footprint
- Fibre to the basement
- Fibre to the node
- Copper backbone customer cable

1.5 Audience

The intended audience for this document is any of the following:

- new development site developer
- new development site designer
- new development site consultant
- building contractor
- **nbn** designer or planner
- **nbn** delivery partners
- **nbn** enAble Training partners

1.6 Assumptions and constraints

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

1.7 Referenced documents

Please ensure you are referencing the latest applicable version of any of the referenced documents.

Document number	Document name	Owner
AS 4086.2-1997	Secondary batteries for use with stand-alone power systems	Australian Standards
AS/NZS 3000:2018	Wiring Rules	Australian/New Zealand Standards
AS/NZS 3084:2017	Telecommunications installations - Telecommunications pathways and spaces for commercial buildings	Australian/New Zealand Standards
AS/NZS 4029.2:2000	Stationary batteries - Lead-acid	Australian/New Zealand Standards
AS/CA S009:2020	Installation requirements for customer cabling (Wiring rules)	Communications Alliance
0012-8-298	Critical Risk Controls	HSE
NBN-TE-CTO-194	New developments: deployment of the **nbn**™ pit and conduit network	FTTx Engineering
n/a	Building Code of Australia	www.abcb.gov.au/
NBN-DES-STD-3912	MT-LFN for MDU Engineering and Design Standard	FTTx Engineering

1.8 Changes in this revision

Changes in this document revision 12.0 dated 13 SEP 2021 compared to the previous revision 11.0 dated 13 MAY 2021 are summarised below:

Section	Details
7.4	• End of Life Outdoor ONT for Essential Services
8	• Added Fibre TV section

2 General requirements

2.1 New development MPS/MDU

The developer, developer's consultant or contractor is responsible for the following:

- Provision of a suitable lead-in from the property boundary to the building entrance facility, and through to any area designated for telecommunications services.
- 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 nominal P50 rigid, white communications conduit with Drawstring or suitable open cable tray from telecommunications room to risers and within backbone risers to all floors.
- Provision of a minimum of nominal P20 rigid, white communications conduit with Drawstring, from either the telecommunications room or riser/closet location to each NTD location.
- Compliance to the Building code for fire sealing and certification.
- Provision of mains power to all required **nbn**™ infrastructure equipment and end user modems as outlined by the specific technology being deployed.
- Provision of Communications Earth Terminal (CET) where required.

nbn is responsible for:

- Advising the developer, consultant, or contractor of the technology to be deployed to the development area.
- The cabling, installation, and maintenance of all network elements up to and including the NTD and PSU, with the exception of the optional PSU batteries originally supplied at the time of installation.
- Compliance to the Building Code of Australia (BCA) for all cabling and products up to the network boundary point and with reasonable directions provided by authorised developers, builders, owners, managers and customers in respect to building and fire authority requirements. Advice may be sought in instances where a building request is regarded as unreasonable.

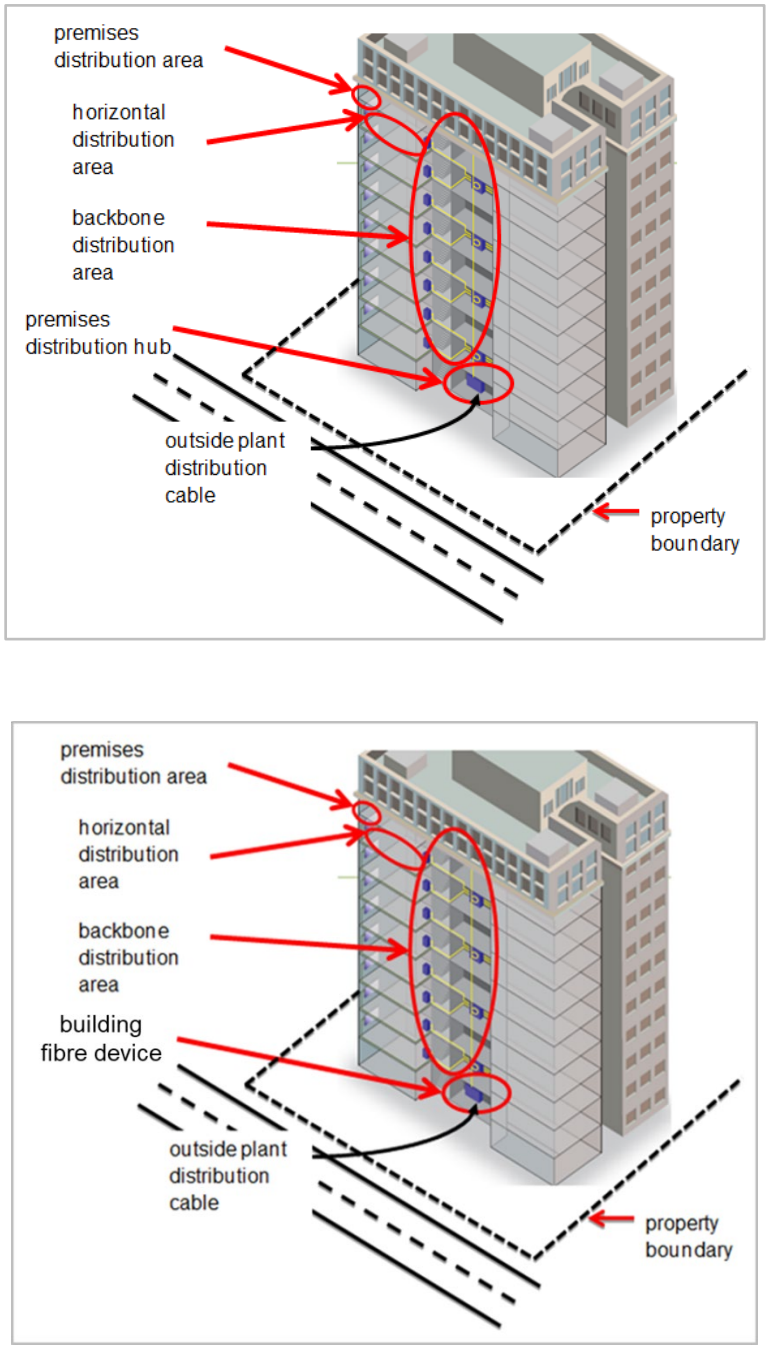


Figure 1. Basic network elements in relation to a typical vertical MPS

Australian Communications and Media Authority (ACMA) wiring rules

2.2 NBP (Network Boundary Point)

The point which is deemed to be the boundary of a Carrier's Telecommunications Network for determining whether cabling or equipment is customer cabling or customer Equipment for the purpose of technical regulation under Part 21 of the Telecommunications Act 1997 (the Act).

The **nbn** NBP shall be:

- FTTP: the service output ports on the **nbn™** NTD (i.e. the data [UNI-D] and phone [UNI-V] service sockets at the rear of the **nbn™** NTD) (in accordance with *AS/ACIF S009:2013 Installation requirements for customer cabling (Wiring rules)* the **nbn**™ NTD is labelled as an NTD).

2.3 nbn™ MDU/MPS classification

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

An MDU/MPS is classified by **nbn** according to the types of buildings on a site or development. Each MDU/MPS within a development can be categorised according to the following definitions and can fully residential, commercial or a combination of both:

Table 1. MDU/MPS categories

horizontal	• close resemblance to single dwelling units in a street • buildings may be clustered into semi-detached or terrace arrangements, but the entry facility is common for at least two (2) living units • pathways between living units resemble those detailed in the document ***NBN**-TE-CTO-194 New developments: deployment of the nbn™ pit and conduit network*.
vertical	• multiple floors and/or multiple living units per floor; likely to have several vertical spaces for services • includes one (1) or more telecommunications rooms/spaces as per *AS/NZS 3084:2017 Telecommunications installations - Telecommunications pathways and spaces for commercial buildings*.
hybrid	• 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

2.3.1 Basic principles and requirements

The following installation principles apply:

- Space requirements shall be applied in accordance with *AS/NZS 3084:2003 Telecommunications installations - Telecommunications pathways and spaces for commercial buildings*, unless otherwise specified in this document.
- Customer cabling shall be applied in accordance with AS/CA S009:2020 Installation requirements for customer cabling (wiring rules)

Requirements

- The FTTP NTD and PSU shall be located in an area that is controlled by the end user at all times.

All communication rooms, cupboards and riser cupboards will be available for **nbn** to install equipment and with the required space and pathways provided and shall have a secure lockable door.

2.3.2 Lead-in to the building entry requirements

- Individual SDU Like Multiple premises sites requires a min P20 to each Premises with a minimum wall thickness of 1.7mm.
- Two (2) to 60 premises: **nbn** requires one (1) x white P50 PVC conduit, with a minimum wall thickness of 3.65 mm.
- Greater than 60 premises: **nbn** requires a minimum of one (1) x white P100 telecommunications conduit with a minimum wall thickness of 4.5mm.

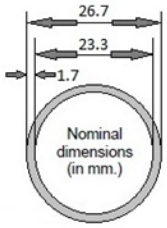
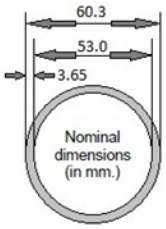
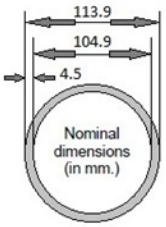
Conduit Dimensions	Nominal Size (Inside Diameter)	Conduit Dimensions	Nominal Size (Inside Diameter)	Conduit Dimensions	Nominal Size (Inside Diameter)
	20 mm PN 12 AS/NZS 1477:2006 table 4.2(A)		50 mm PN 12 AS/NZS 1477:2006 table 4.2(A)		100 mm PN 9 AS/NZS 1477:2006 table 4.2(A)

Figure 2. Normal conduit dimensions

3 Fibre to the Premises (FTTP)

nbn Fibre to the Premises utilises **nbn**'s Type 3 fibre architecture. Type 3 architecture minimises the amount of riser cables required and reduces the overall footprint required for installation while allowing for future capacity requirements with plug and play type connections.

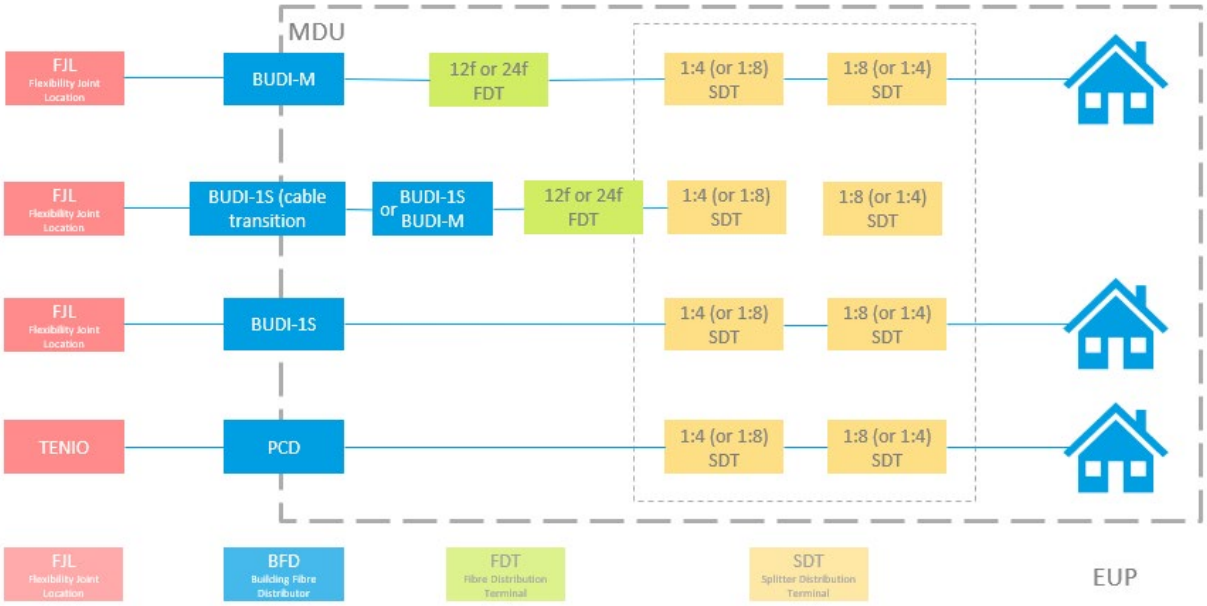


Figure 3. FTTP Type 3 Architecture Overview

The lead in fibre from **nbn** local Network is terminated within a Building Fibre Device (BFD), this acts as the central distribution point for **nbn** internal fibre network and the type of device selected is based on a number of characteristics of the MDU, such as size of development, number of End user Premises and the layout of building.

Downstream of the BFD, Fibre distribution Terminals (FDTs) for large MDUs and Splitter Distribution terminals (SDTs) are deployed, these devises allow for aggregation and splitting of fibres closer to the end users.

The SDTs and are normally placed within risers on each hallway to allow connection of Premises Internal Cables (PICs) to be connected to the End Users Premises (EUP) and Network terminal device (NTD).

The following table gives a guide to the maximum end user capacity of devices and fibre.

Table 2. Fibre and BFD Equipment capacity Design Guide

MDU size and Design Solution	Design Incoming fibre Cable Options	BFD Connection Device *Note 2	Max Fibre Design usage at BFD	Design Maximum GPON FTTP *Note 1	Design Maximum Point to Point fibre (Enterprise Ethernet) *Note 1
Extra Small	1F	PCD	3 x 1f	24	3
Small	1F	PCD	3 x 1f	32	3
	12F	BUDI - 1S	10	32	10
	12F	BUDI - 1S	10	56	10
Medium	12F	BUDI - 1S	10	280	10
	12 F	BUDI M	10	280	10
Large	2 x 12F	BUDI M	20	560	20
	2 x 12F +	Multiple BUDIs	20 +	560 +	20+

*Note 1: GPON maximum number reduces for each Point to Point fibre allocated and point to point capacity reduced by 1 for each GPON fibre allocated.

*Note 2: BFD is guide only and devices shall be selected to meet building requirements and capacity future demand requirements

4 FTTP Type 3 Fibre products

4.1 Building Fibre Device

Building fibre devices are utilised to connect external fibres to the internal fibre cabling and devices there are two types PCD or BUDI, with the BUDI having two variants BUDI -1S or BUDI-M.

4.1.1 BFD - Premises Connection Device (PCD)

The PCD is used as the small BFD.

It can be used FTTP connections for small MDU and SDU- like MDUs, that require a maximum of three incoming fibres and used to terminate up to 4 x 1f lead in cables and connect either single 1f Premises Internal Connection cables (PIC) SDTs tails.

Figure 4. PCD

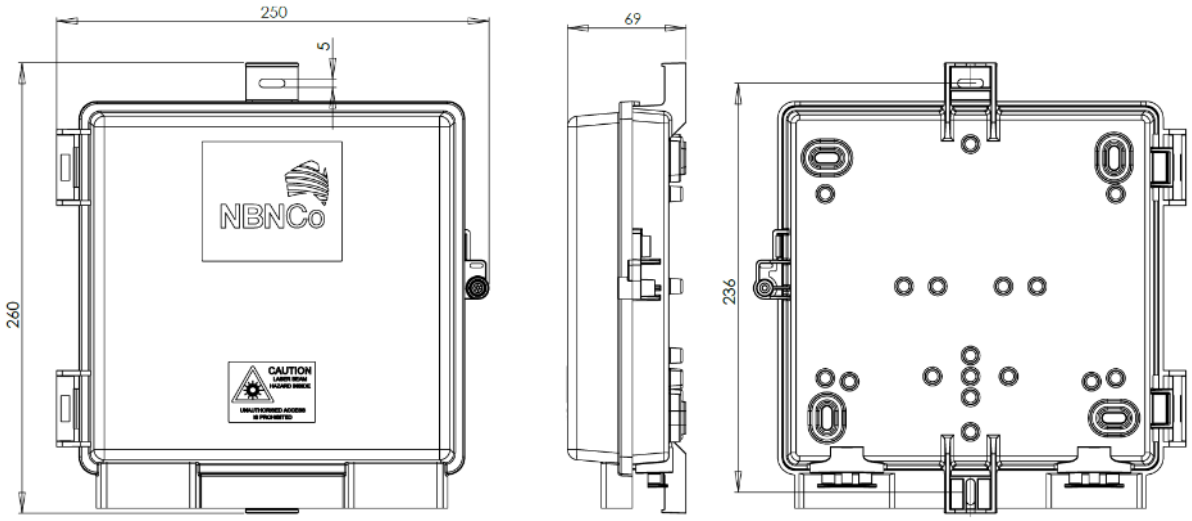


Figure 5. PCD – Dimensions

4.1.1.1 Installation and clearance requirements

The PCD is an internal / external connection device that is normally deployed externally next to lead-in conduits, it can also be used internally within comms rooms or risers or internal /external locations as the first termination location of external cables and for downstream connection to internal cabling or SDTs.

Preference is for the PCD to be installed within a secure lockable comms room when used internally

250 mm shall be left clear at the base of PCD for cable installation and PCD shall maintain clearances from utilities as specified in Figure 6. PCD – Clearances.

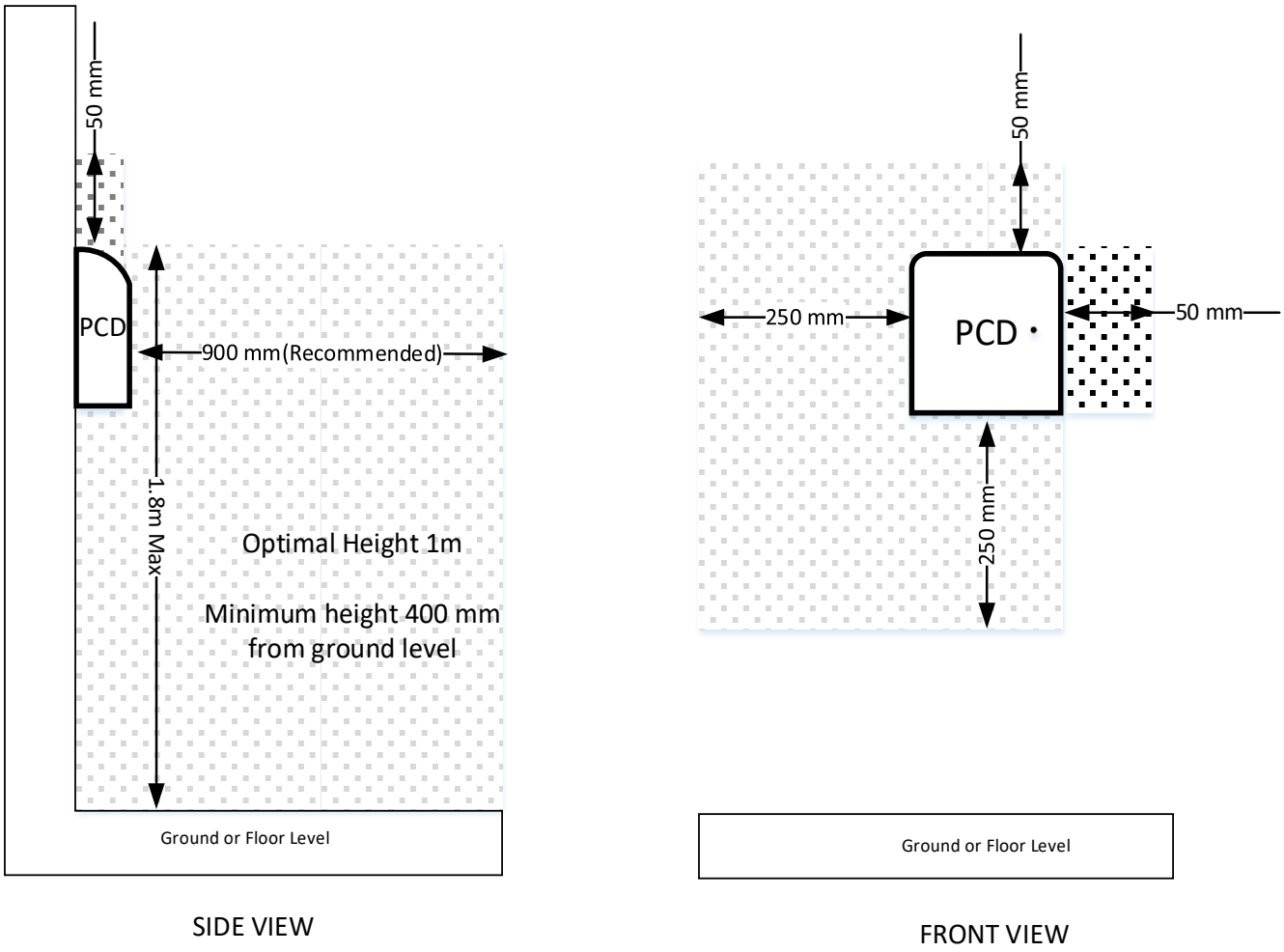


Figure 6. PCD – Clearances

4.1.1.2 Installation Locations

The PCD is an internal / external device, and where possible is placed in secure and lockable rooms or risers such as an MDF or comms room as a preference, it can be placed externally on the building exterior near to where the existing P20 lead-in conduit finishes or within a suitable external enclosure as detailed in Section 4.4 External enclosures for Building fibre devices.

4.1.2 BFD - BUDI-1S

The BUDI-1S, is the medium sized BFD, that can be used for managing 12 fibre cables it is used for medium to large MDU developments.

The BUDI-1S is not able to be used in designs that require Fibre TV or FDT installation.

Figure 7. BUDI - 1S

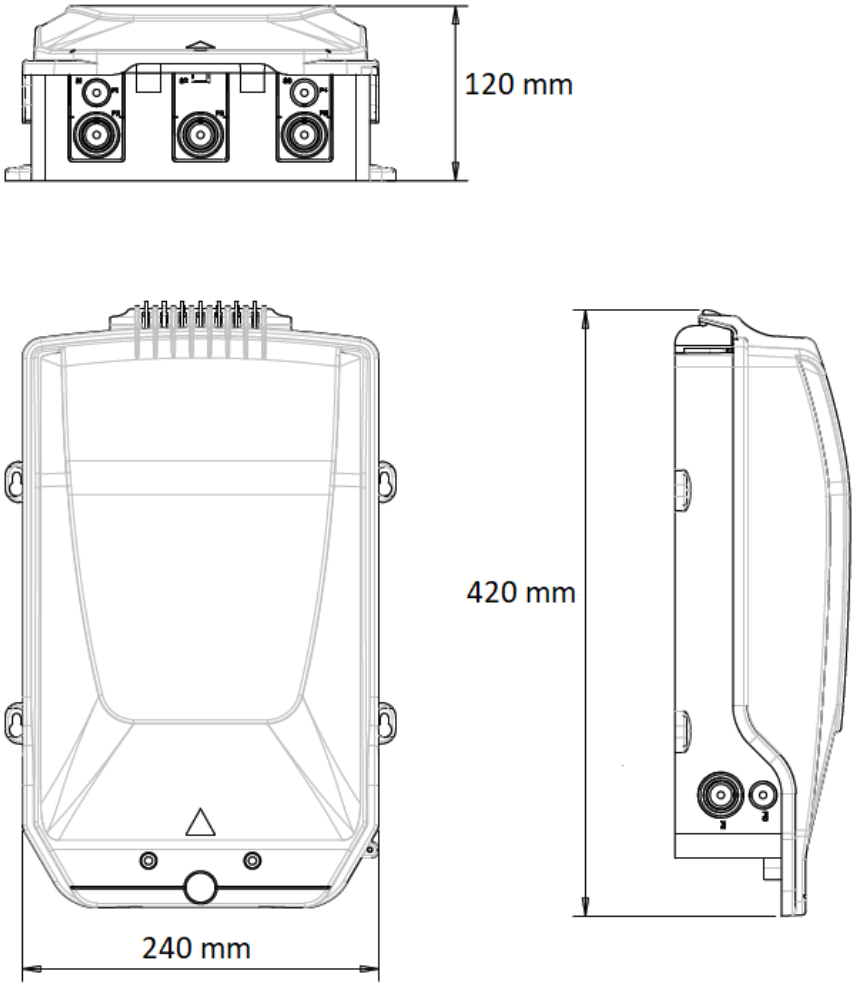


Figure 8. BUDI-1S - Dimensions

4.1.2.1 BUDI-1S Clearance requirements

The BUDI-1S has a 900 mm recommended front clearance, 900 mm is to allow a **nbn** personnel to have adequate spatial requirements for accessing and maintaining the device, the 900 mm can be achieved by the opening of doors or partitions when placed in cupboards or risers.

Items may be installed underneath the BUDI, that encroach the 900 mm, but it will be still able to support **nbn** personnel to stand directly in front of the BUDI without effecting the ability to work on the device.

The optimal height is 1.25 m from the ground, and ideally the BUDI should be as closed to this height as possible, it can go to maximum height of 1.8 m to the top of the BUDI, and a minimum height of 400 mm the floor can be allowed when there is no option, or the optimal height cannot be met.

Conduits and pathways should not be brought up to the BUDI or within 250 mm clearances of the cable ports.

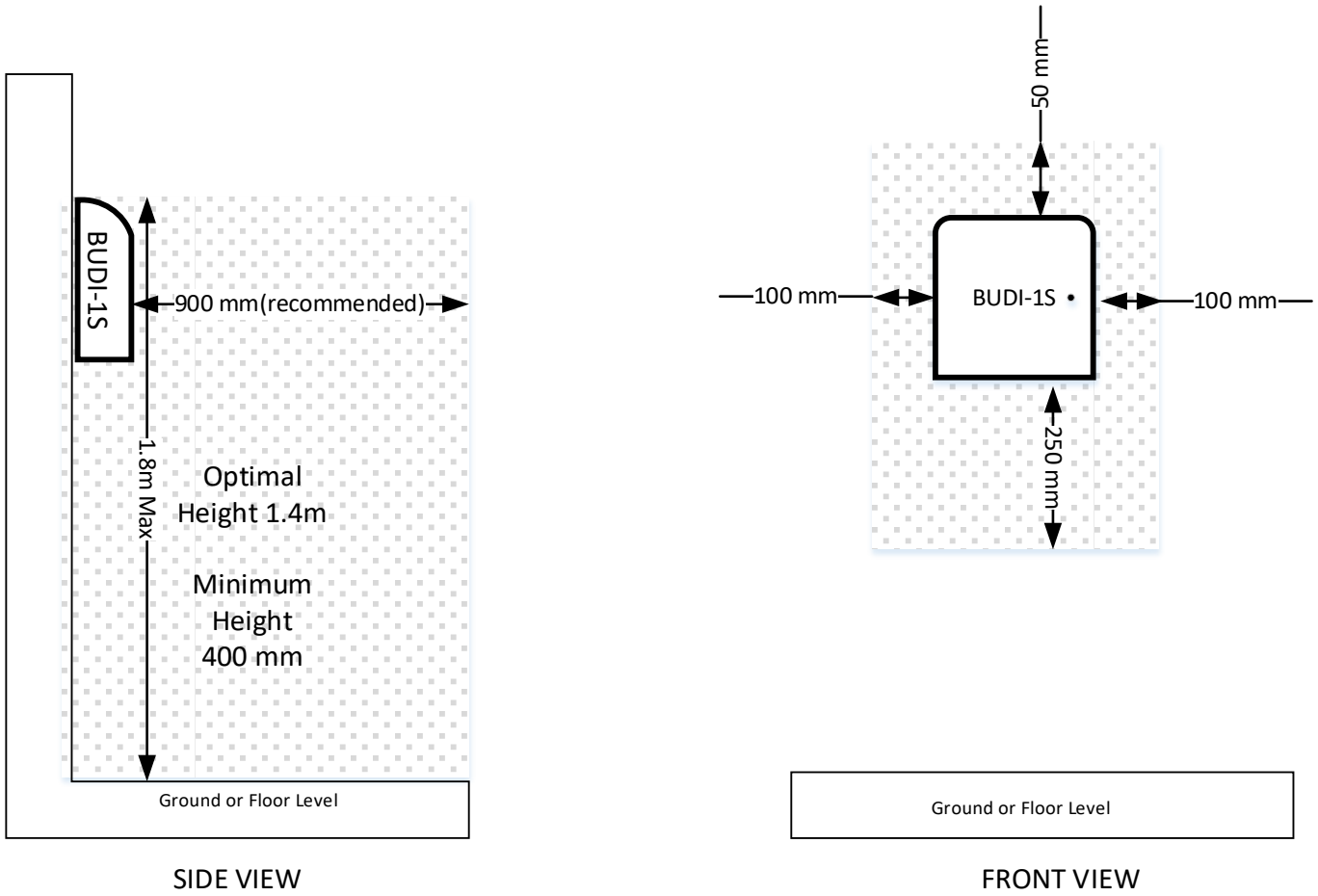


Figure 9. BUDI - 1S - Clearances

4.1.2.2 Installation Locations

The BUDI-1S shall be placed in secure and lockable rooms or risers such as an MDF or comms room. It can be placed externally within an enclosure for small to medium MDUs when required.

4.1.3 BUDI-1S - Cable transition device (splice case)

The BUDI-1S can be utilised as a cables transition device for transitioning from external to internally rated riser cables. One Budi is placed at the BEP, this also allows the second Budi to act as a BFD and be installed deeper with the building, strategically placed to best serve EUP.

The riser cable is 24f.

The BUDI-1S shall only be utilised as a transition device for use in large MDUs when there is a requirement to transition to internally rated cables when one of the below reasons for use is met:

- centrally located BUDI location means the external FSD cable is crossing multiple floors, or
- distance from the building entry point is greater than 100m to the location of the main BUDI or
- developer has requested their preference to transition lead in cable to a LSZH cable type.

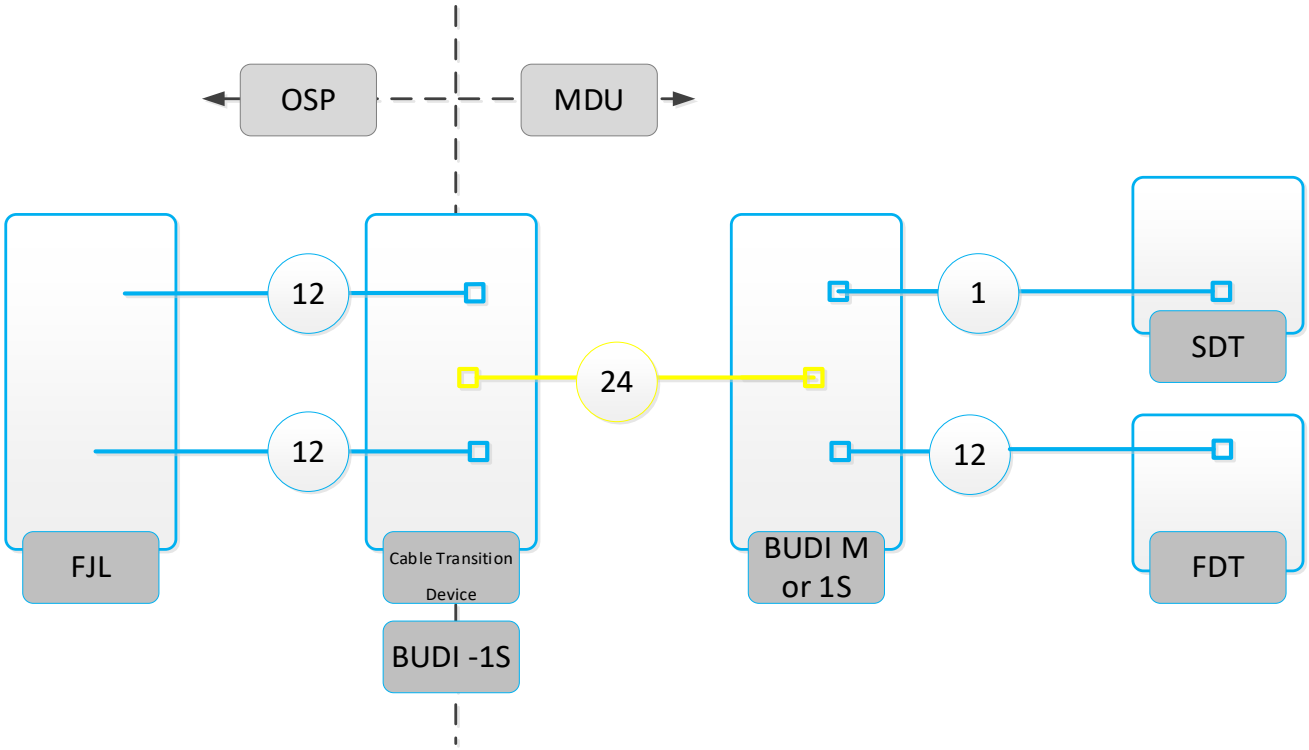


Figure 10. BUDI-1S as a Cable transition device

4.2 BUDI-M

Th BUDI-M is the large BFD, it is used on buildings that have a fibre demand greater that 10 fibres, it has the largest capacity of the BFDs ,and is used for large MDUs and when the building or development has a Fibre TV build requirement or the design needs to aggregate fibres via an FDT.

For large and complex MDUs multiple BUDI's can be deployed to meet the requirements of the building.

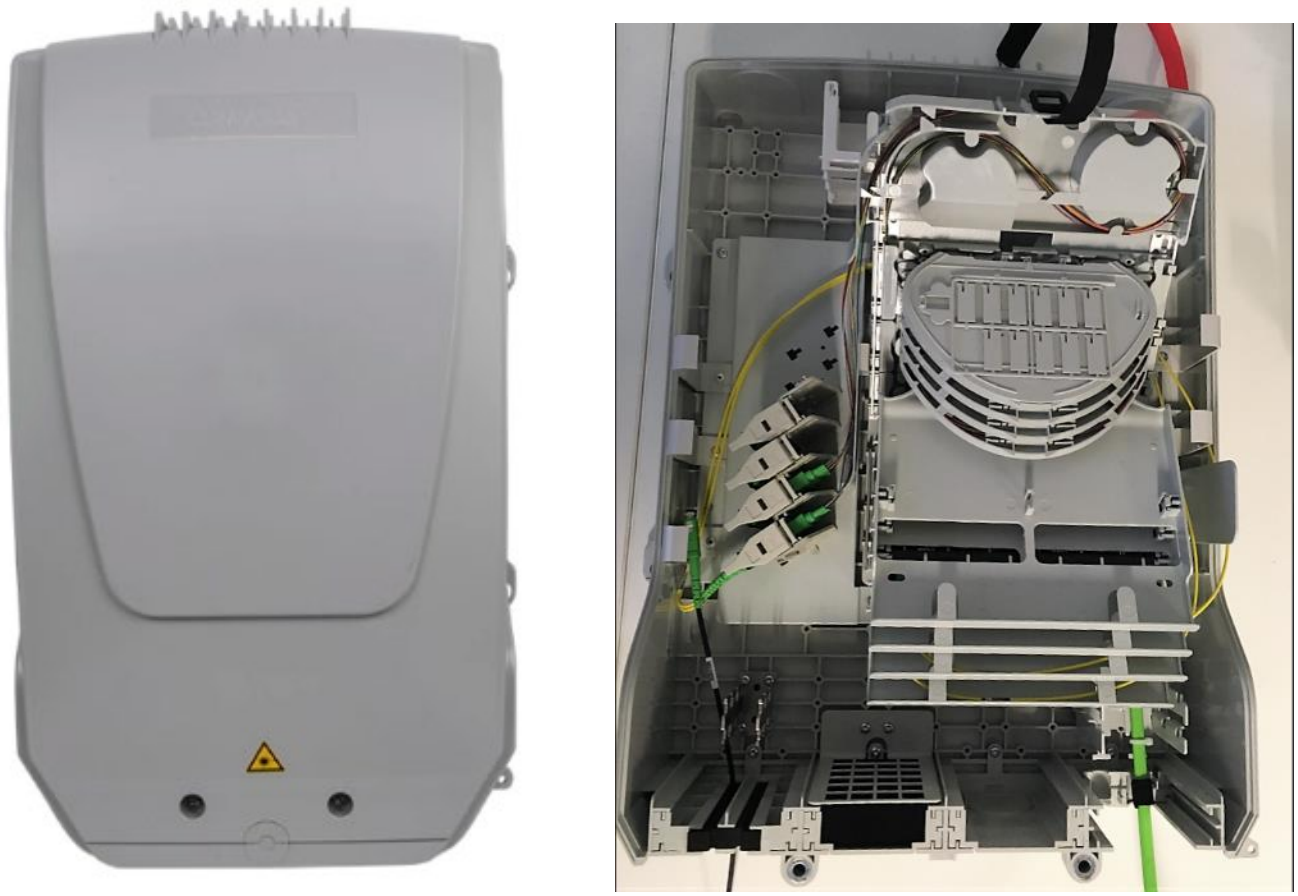


Figure 11. BUDI-M

4.2.1 BUDI-M Dimensions

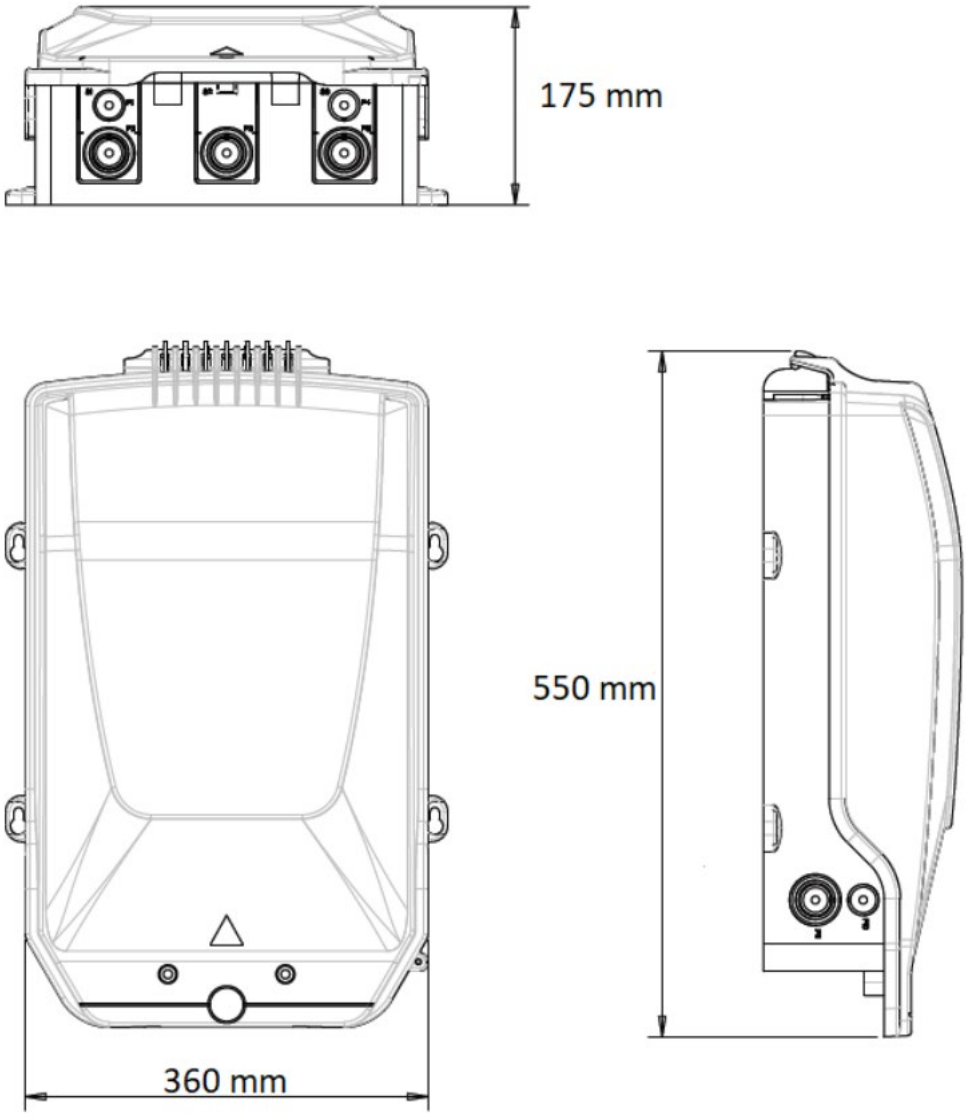


Figure 12. BUDI-M - dimensions

4.2.2 BUDI-M Clearance requirements

The BUDI-M has a 900 mm recommended front clearance, 900 mm is to allow a **nbn™** personnel to have adequate spatial requirements for accessing and maintaining the device, the 900 mm can be achieved by the opening of doors or partitions when placed in cupboards or risers.

Items can be installed underneath the BUDI, that encroach the 900 mm, but any obstruction should not impact the ability for **nbn™** personnel to stand directly in front of the BUDI without effecting the ability to work on the device.

The optimal height is 1.25 m from the ground, and ideally the BUDI should be as closed to this height as possible, it can go to maximum height of 1.8 m to the top of the BUDI, and a minimum height of 400 mm from the floor can be allowed when the optimal height cannot be met.

Conduit and pathways (cable tray) should not be installed directly to the BUDI-M, any conduits or cable pathways used shall not encroach the 250 mm from the BUDI-M cable entry, cables exiting the BUDI can hang free until they reach the cable management system.

Cables shall exit the ports / glands of the BUDI-M and be secured at the first point available point on new or existing pathway / conduit outside.

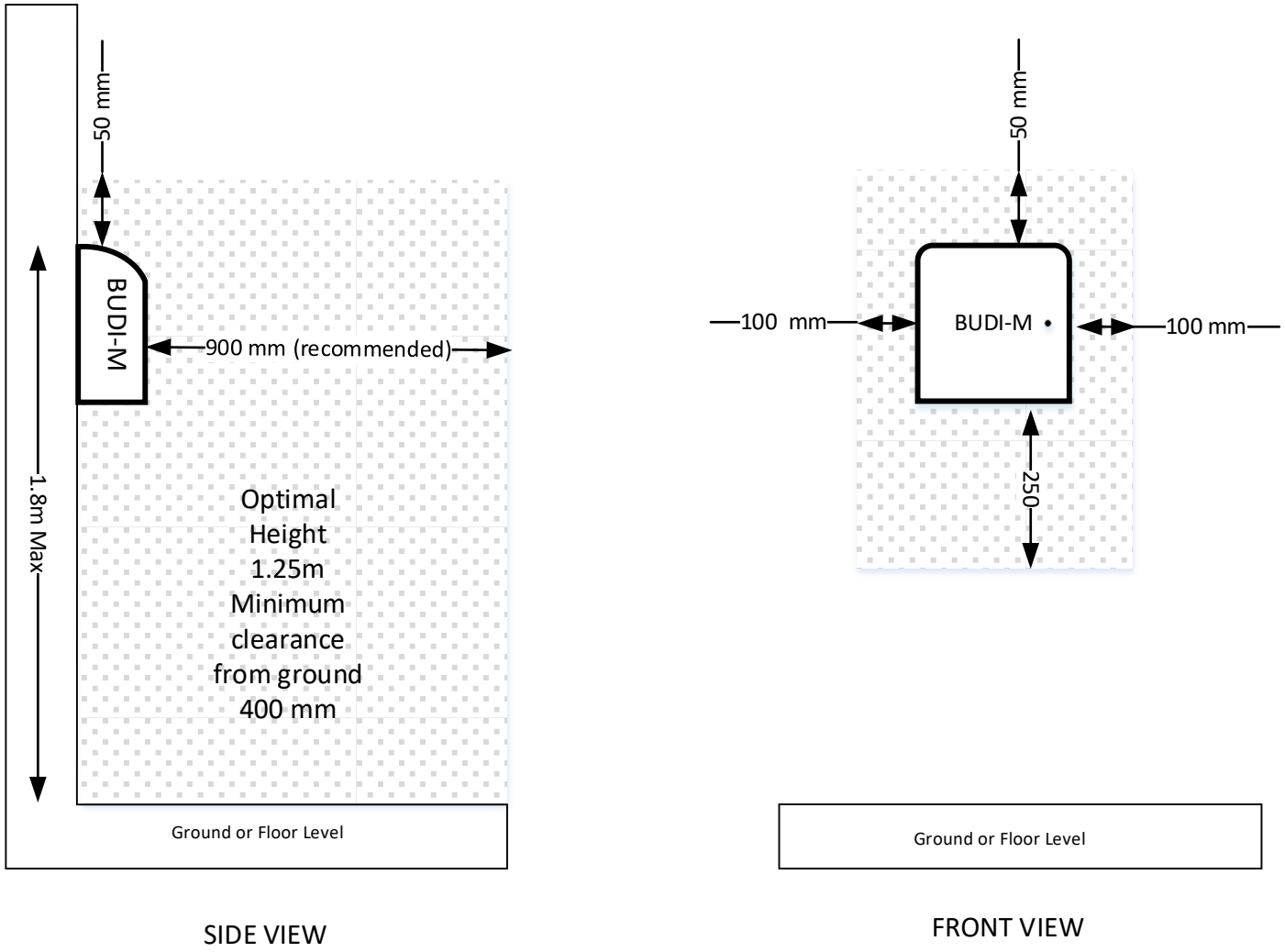


Figure 13. BUDI-M – Clearances

4.2.3 Installation Locations

The BUDI-M shall where possible be placed in secure and lockable rooms or risers such as MDF or comms rooms.

They can be centrally located within the building in either communications rooms within risers on higher floors depending on the fibre design and cable distribution.

Meeting the clearance requirements of Figure 13. BUDI-M – Clearances

4.3 FDTs – Fibre Distribution Terminals

FDTs are used in type 3 used to aggregate fibres deeper into the building and can be wall mounted in risers or suitable locations along the cable route.

FDTs connect directly to the BUDI -M BFD, and downstream connection to SDTs.

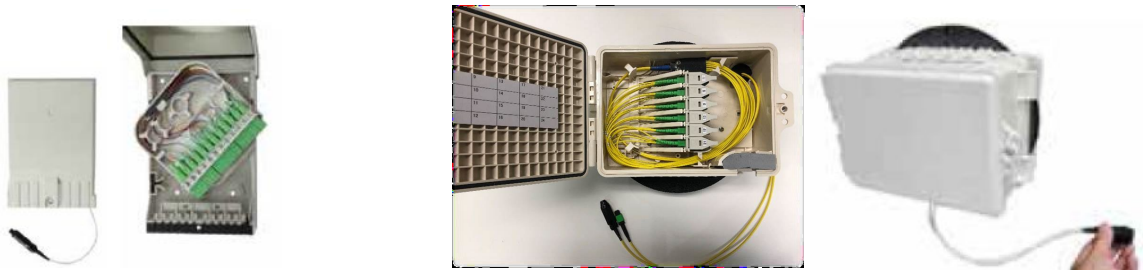


Figure 14. 12f and 24f MPO Connectorised FDTs

The FDTs contain either 12 or 24 SC/APC connectors, and 12 fibre input tail/s.

12f FDTs are supplied with a tail in 4 lengths, 30m, 60m, 90m , and 120 m with 30 m of the cable length is stored internally in the device with the remainder managed on a spool:

24f FDTs are supplied with tails in 3 lengths 30 m, 60m and 90m with 30 m of the cable length is stored internally in the device with the remainder managed on a spool

Placement of an FDT should either logically split the building within a vertical building or be centrally located in within horizontal campus style premises to reduce the SDTs tails that are required to run to the BUDI-M.

FDTs are internally rated and shall be housed internally in risers or comms rooms that provide a pathway to end users.

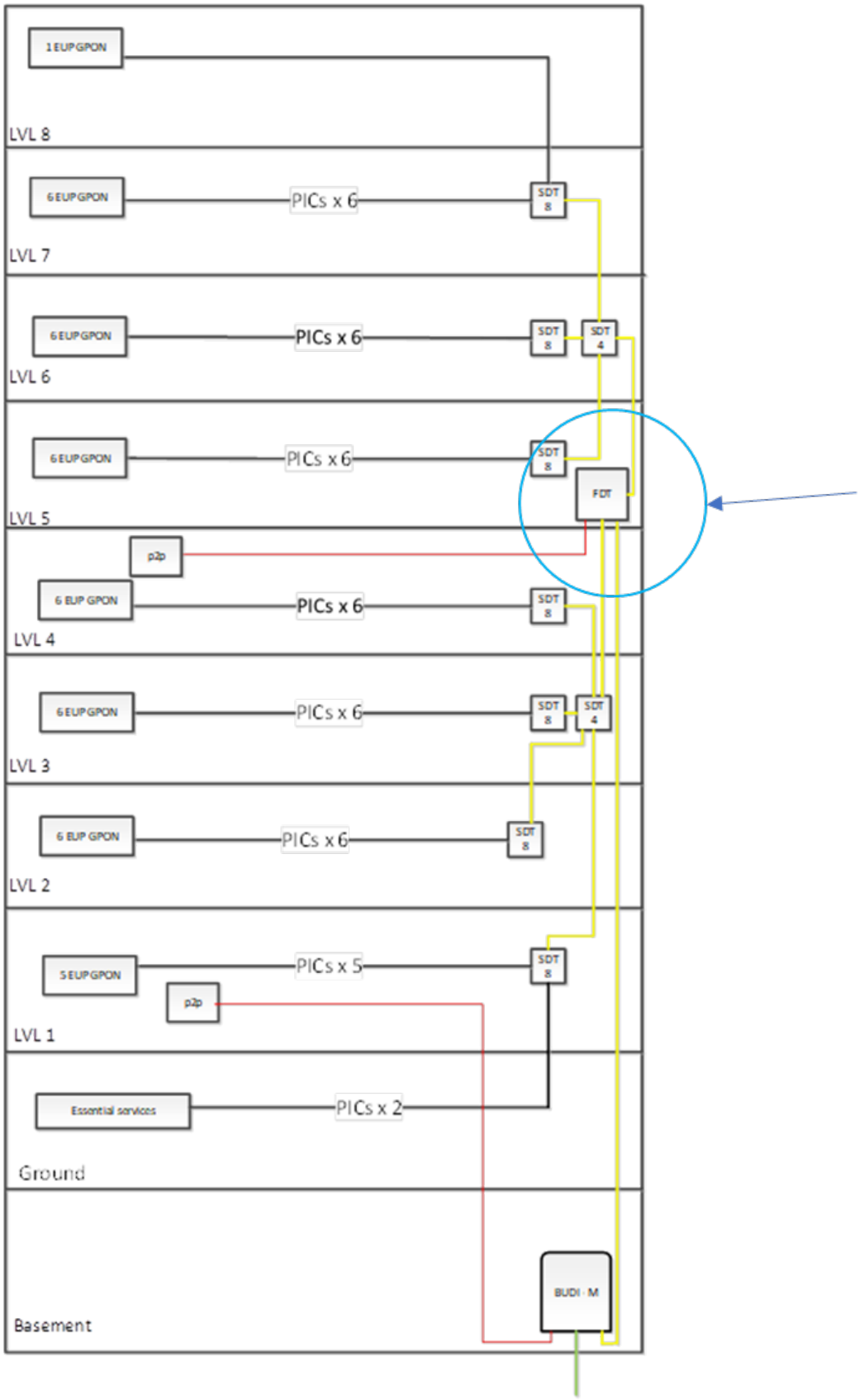


Figure 15. Example of FDTs located centrally in vertical MDU

4.3.1 FDT Dimensions

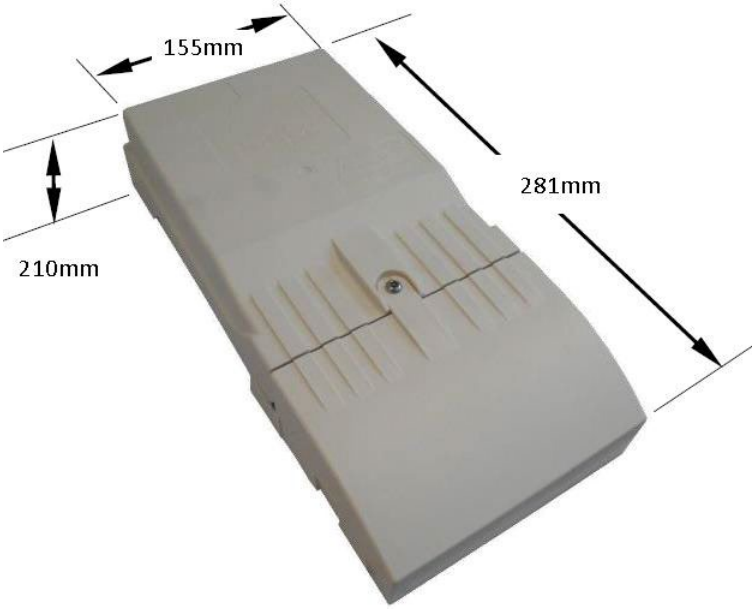


Figure 16. 12f FDTs Dimensions

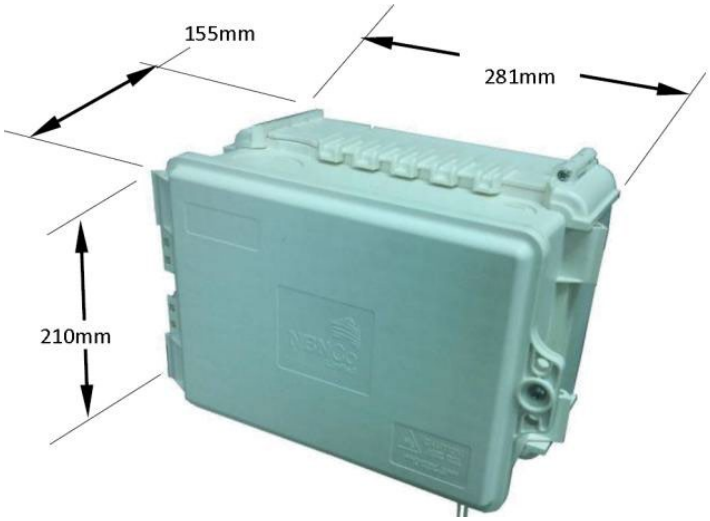


Figure 17. 24f FDTs (2 x 12 Tails) Dimensions

4.3.2 FDT Clearances

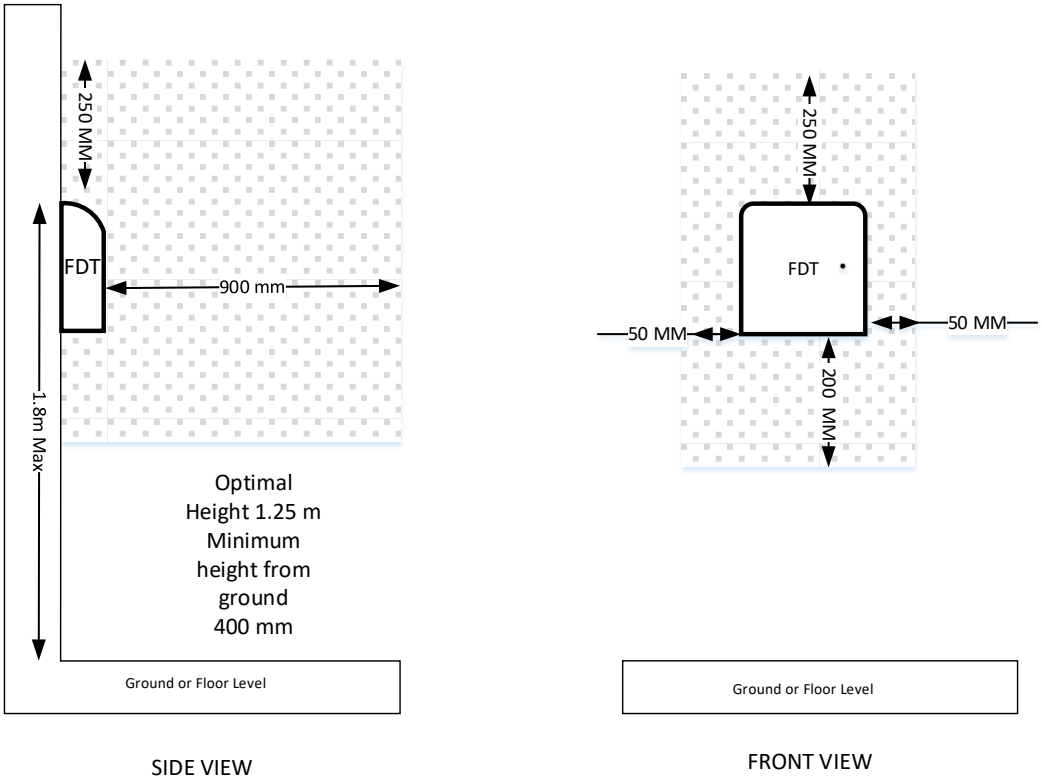


Figure 18. 12f FDTs Clearances

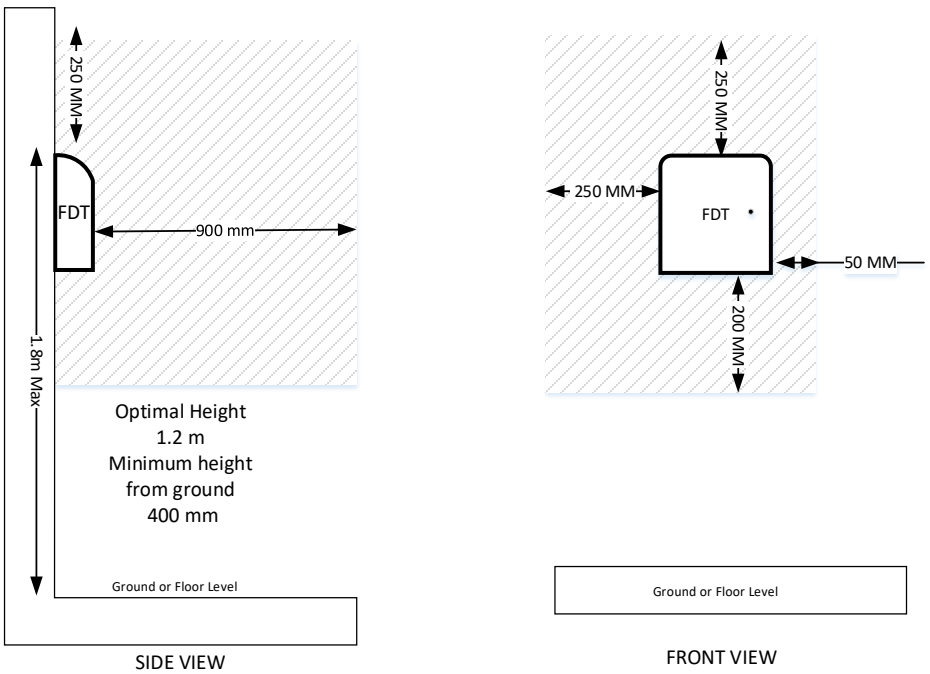


Figure 19. 24f FDTs Clearances

The FDTs have a 900 mm recommended front clearance, 900 mm is to allow a **nbn™** personnel to have adequate spatial requirements for accessing and maintaining the device, the 900 mm can be achieved by the opening of doors or partitions when placed in cupboards or risers.

Items can be installed underneath the FDTs, that encroach the 900 mm, but any obstruction should not impact the ability for **nbn™** personnel to stand directly in front of the FDT without effecting the ability to work on the device.

The optimal height is 1.25 m from the ground, and ideally the FDT should be as close to this height as possible, it can go to maximum height of 1.8 m to the top of the FDT, and a minimum height of 400 mm from the floor can be allowed when the optimal height cannot be met.

Conduit and pathways (cable tray) should not be installed directly to the FDT. Any conduits or cable pathways used shall not encroach the 200 mm from the FDT cable entry, cables exiting the FDT can hang free until they reach the cable management system, cables /conduit can be secured at this point.

4.3.2.1 Installation Locations

The FDTs shall be placed in secure and lockable rooms or risers, located in a central location to minimise PIC and SDT cable installation lengths.

4.4 Splitter Distribution Terminal (SDTs)

SDTs are utilised to provide a distribution point for FTTP, they can be used to provide first and second stage splitting within the MDU and are the connection point for the single premises internal cables that connect to the NTD.

SDTs are normally placed within risers with access to Conduits to end users.

SDTs are available with two variants of optical splitter pre-installed with the device:

- 1:4
- 1:8

Both splitter types are available in internal or external versions and both have two tail lengths available 30 m or 60 m.

SDTs can be placed adjacent to each other if required.

SDTs are pre-terminated with a single SC/APC connectorised input cable, the cable is a yellow jacketed metallic armoured cable with a 4 mm diameter. It is supplied with a hauling eye cover protecting the connector for use when hauling the cable either to a first stage split SDT or direct to the BFD. Hauling cover shall be removed only after tail has been hauled to the BFD , FDT or upstream SDT location.

Figure 20. 4 and 8 Port Internal SDT

SDTs with 30 m tails are supplied with 30 m of cable within the device.

60 m versions the additional 30 m is supplied on an additional spool that is utilised first and the spool discarded. The additional spools shall not to be installed on site and the entire 30 m spool shall use, no cable coils or maintenance loops shall be installed within the MDU.

Figure 21. External SDT (4 and 8 port available)

There outdoor versions shall only be used for Extra small and small MDUs only when there is no suitable internal location for installation and external rated cable is required for Pit and pipe installation

The outdoor SDT tail fibre has a black PE jacket covering a metallic armour and is suitable for installation without conduit externally, the tail is also suitable for installation underground via pit and pipe within Horizontal type MPS/MDU only.

SDTs shall not be placed within pits.

Conduit/trucking will be required to protect PIC cables exiting the outdoor SDT from external environmental conditions until they enter to the end user premises.

4.4.1 SDT Dimensions

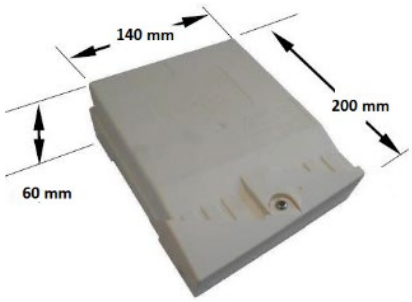


Figure 22. 4 and 8 port internal SDT Dimensions

Figure 23. 4 and 8 port External SDT Dimensions

4.4.2 SDT Clearances

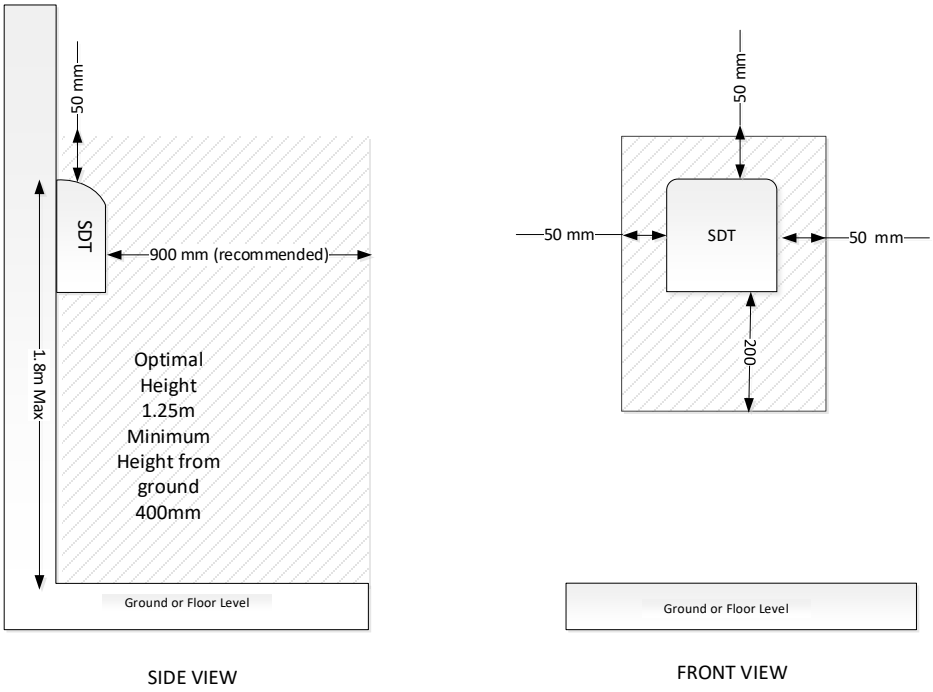


Figure 24. 4 and 8 port Internal SDT Clearances

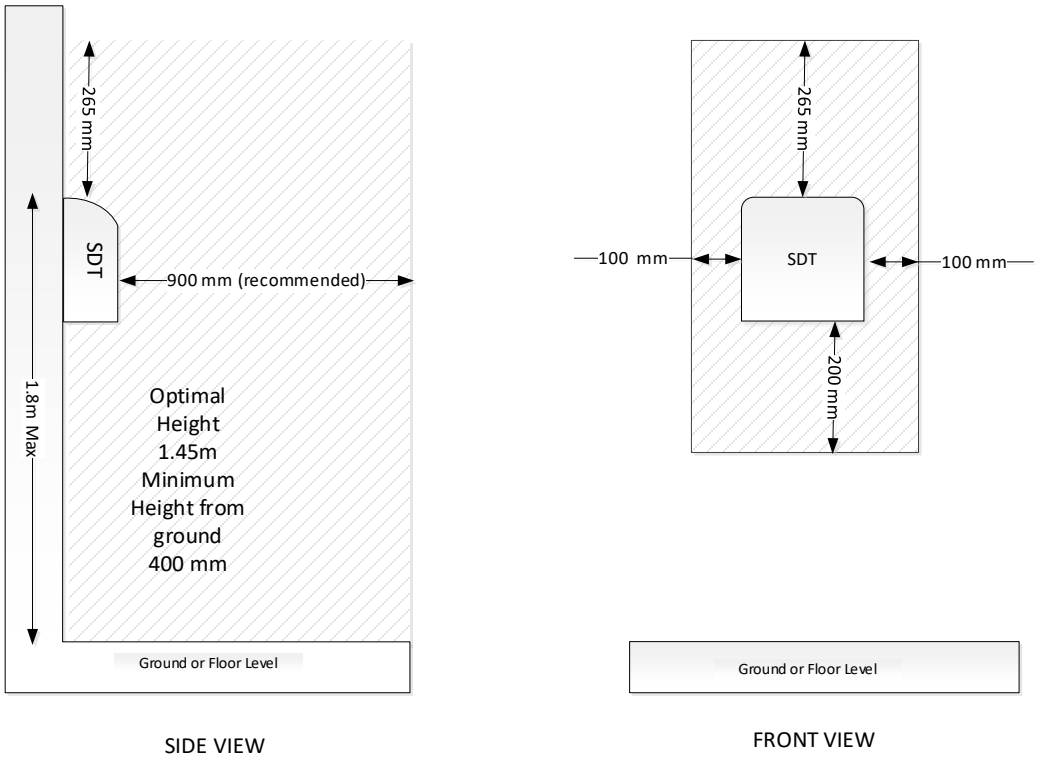


Figure 25. 4 and 8 port External SDT Clearances

The SDTs have a 900 mm recommended front clearance, 900 mm is to allow a **nbn™** personnel to have adequate spatial requirements for accessing and maintaining the device, the 900 mm can be achieved by the opening of doors or partitions when placed in cupboards or risers.

Items can be installed underneath the SDTs, that encroach the 900 mm, but any obstruction should not impact the ability for **nbn™** personnel to stand directly in front of the SDT without effecting the ability to work on the device

The optimal height is 1.25 m from the ground, and ideally the SDT should be as close to this height as possible, it can go to maximum height of 1.8 m to the top of the SDT, and a minimum height of 300 mm from the floor can be allowed when the optimal height cannot be met.

Conduit and pathways (cable tray) should not be installed directly to the bottom of the SDT. Any conduits or cable pathways used shall not encroach the 250 mm from the SDT cable entry, cables exiting the SDT can hang free until they reach the cable management system, Cables /conduit can be secured at this point.

5 Pathways and Space allocations

5.1 Working height and space

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

The generic BFD clearances can be used to allocate sufficient space for placement of any type of BFD /FDT/SDT within in a communication room or riser space.

This allows for sufficient space to be allocated for **nbn** passive fibre devices to be installed with comms rooms and risers.

5.2 Generic Fibres Device Space Requirements

Generic space requirements are to be utilised to allow for sufficient space allocation for **nbn** devices within risers and communication rooms spaces to allow flexibility within the design when the design and device selection has not been confirmed.

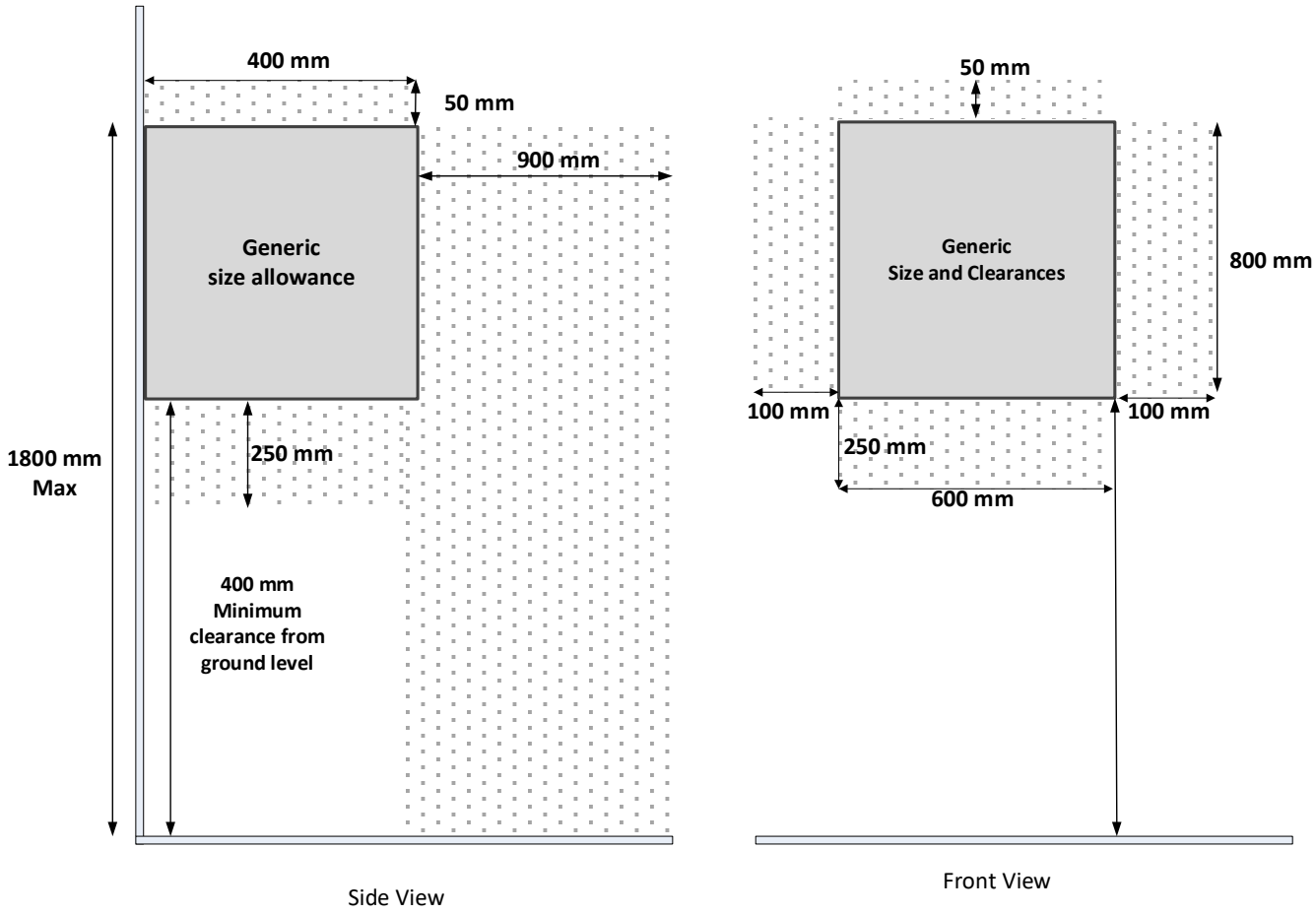


Figure 26. Generic Space and clearance requirements

CAUTION: Falls from heights can result in serious injury or death.

nbn has developed equipment location information that takes into consideration the risks involved in working at heights. This information aims to eliminate or minimise the risks involved in working at heights through the design and installation processes employed by the surveyor, designer and installer. Before commencing any installation that requires working at heights, all personnel shall be thoroughly familiar with their applicable state or territory WHS regulations, and their company and/or principal contractor's safety practices and policies.

Working at heights requires the person or persons carrying out the work to be properly trained and deemed competent. Personnel performing the work shall require a Safe Work Method Statement (SWMS) or risk assessment that identifies the necessary controls to carry out the work safely. Refer to the document *0012-8-298 Critical Risk Controls* and the applicable legislation and codes of practice for further information.

5.3 Basement or telecommunications room layout

The size of an MDU/MPS and the design solution required will determine the space requirements. A dedicated secure and lockable telecommunications room is ideal, but not essential (e.g. if a BUDI is required to service the building, then an adequate space to mount and work on and around the cabinet will be necessary - whether or not it is in a dedicated telecommunications room).

The specific area and clearance requirements will depend upon the number of premises being supported, and the number of Passive products being installed this will determine the amount and type of hardware products to be installed.

As a guide to the space required for the main passive fibre device / BFD within the comms room, refer to Figure 26. Generic Space and clearance requirements of to provide adequate space and Figure 27. Concept design of typical front elevation communications room as an example of the types products that are required to be installed with the main communications room,

In large developments multiple BUDIs BFDS and passive products may be required, in conjunction with multiple Outdoor NTDS to meet the essential services and EUP Numbers with the telecommunications room

Access clearances are also defined in *AS/ACIF S009:2013 Installation requirements for customer cabling (Wiring rules)* (Figures D2 and D3) and these requirements shall 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 for each large installation to **nbn** to confirm compliance.

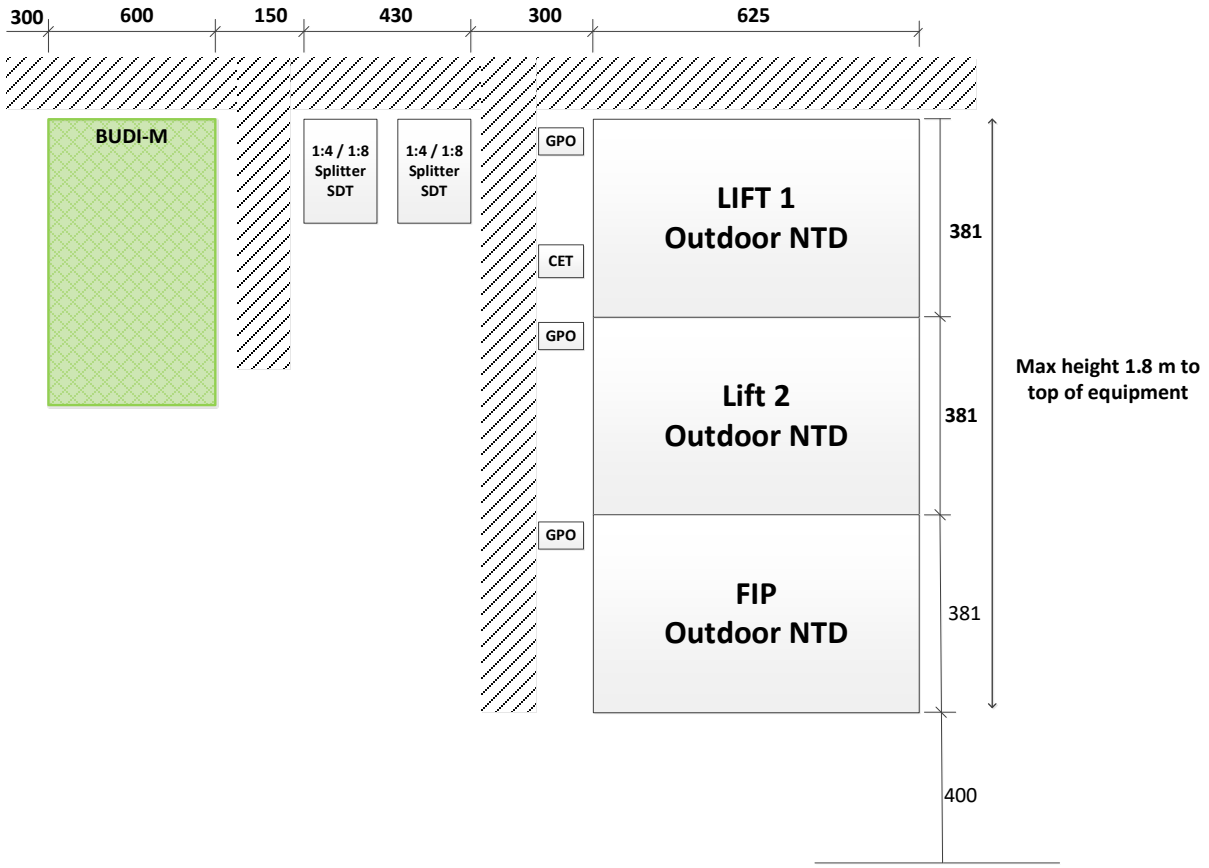


Figure 27. Concept design of typical front elevation communications room

Figure 28. Example of typical communications room Budi and SDTs and BBU and Outdoor NTD

5.4 Risers

Risers are used for **nbn**'s backbone cabling and for housing passive fibre devices, the main products commonly mounted in a telecommunications riser/closet are FDTs and SDTs with BUDI BFDs used as required larger developments when designs call for centrally located BFDs outside of the communications rooms.

Space allocation should be provisioned.

Cable trays can run adjacent to **nbn** passive devices.

5.4.1 BUDI, SDT and FDT within telecommunications riser/closet

The types of dimensions referenced below are:

- the minimum space required to physically mount a BUDI, SDT or FDT to a wall
- the minimum clearance required around a BUDI, SDT,FDT or grouping of products (the working height and space)

The following minimum requirements shall be provisioned:

- mounted a minimum of 400 mm from the floor to the bottom of the BUDI/SDT/FDT, and a maximum of 1800 mm from the floor to the top of the SDT/FDT

- a minimum of 900 mm clear space in front of the SDT/FDT
- a minimum of 300 mm on each side of the SDT/FDT (or on each side of a grouping of SDTS/FDTs)

5.4.2 Pathways in risers

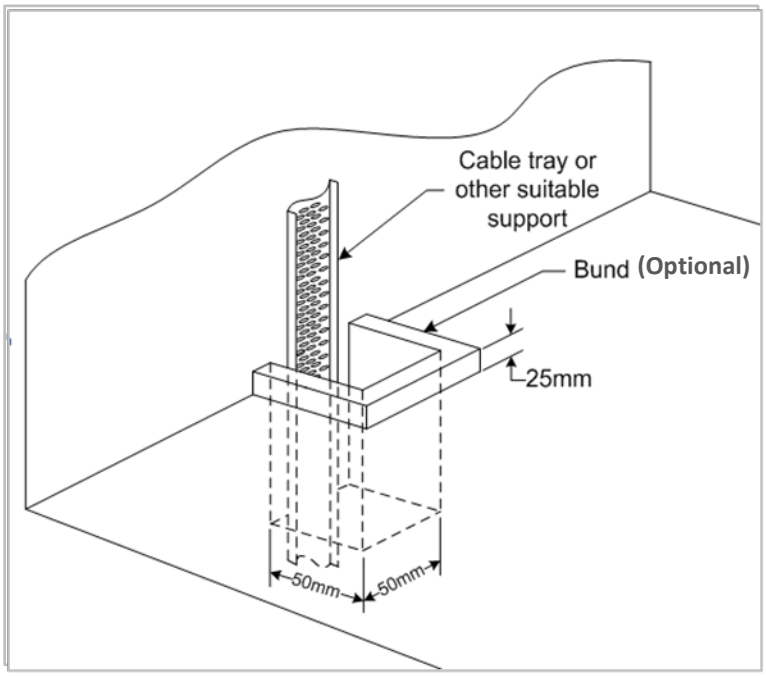


Figure 29. Slot example telecommunications riser/closet floor or ceiling entry

OR

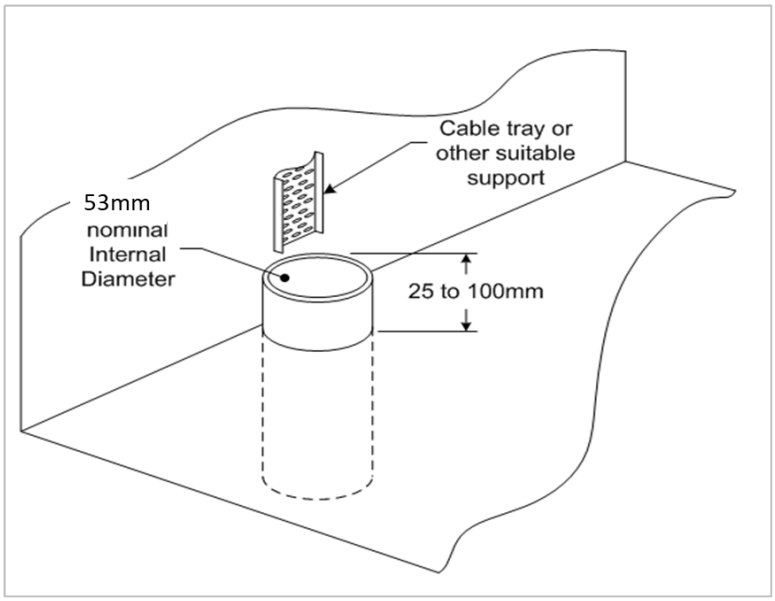


Figure 30. Sleeve example telecommunications riser/closet floor or ceiling entry

The telecommunications closet/riser is also required to have a minimum 50 mm x50 mm floor slot or one (1) x white telecommunications conduit cut nominally 25 mm above or below the floor slab, as appropriate Figure 30. Sleeve example telecommunications riser/closet floor or ceiling entry). If there are living units above and below the floor slab, bi-directional access is required.

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 shall be installed in accordance with the BCA. **nbn** does not provide or certify any fire stopping requirements.

5.5 Lead in cable to telecommunications room

Communication pathways shall be provided for **nbn**'s lead-in cable/s from the Building Entry point to the first termination point situated with either a riser/cupboard or Telecommunications room.

Pathway shall be accessible cable tray or P50 conduit with drawstring.

No fibre is to be self-supported over a distance greater than 200 mm.

All Conduits shall contain a Drawstring.

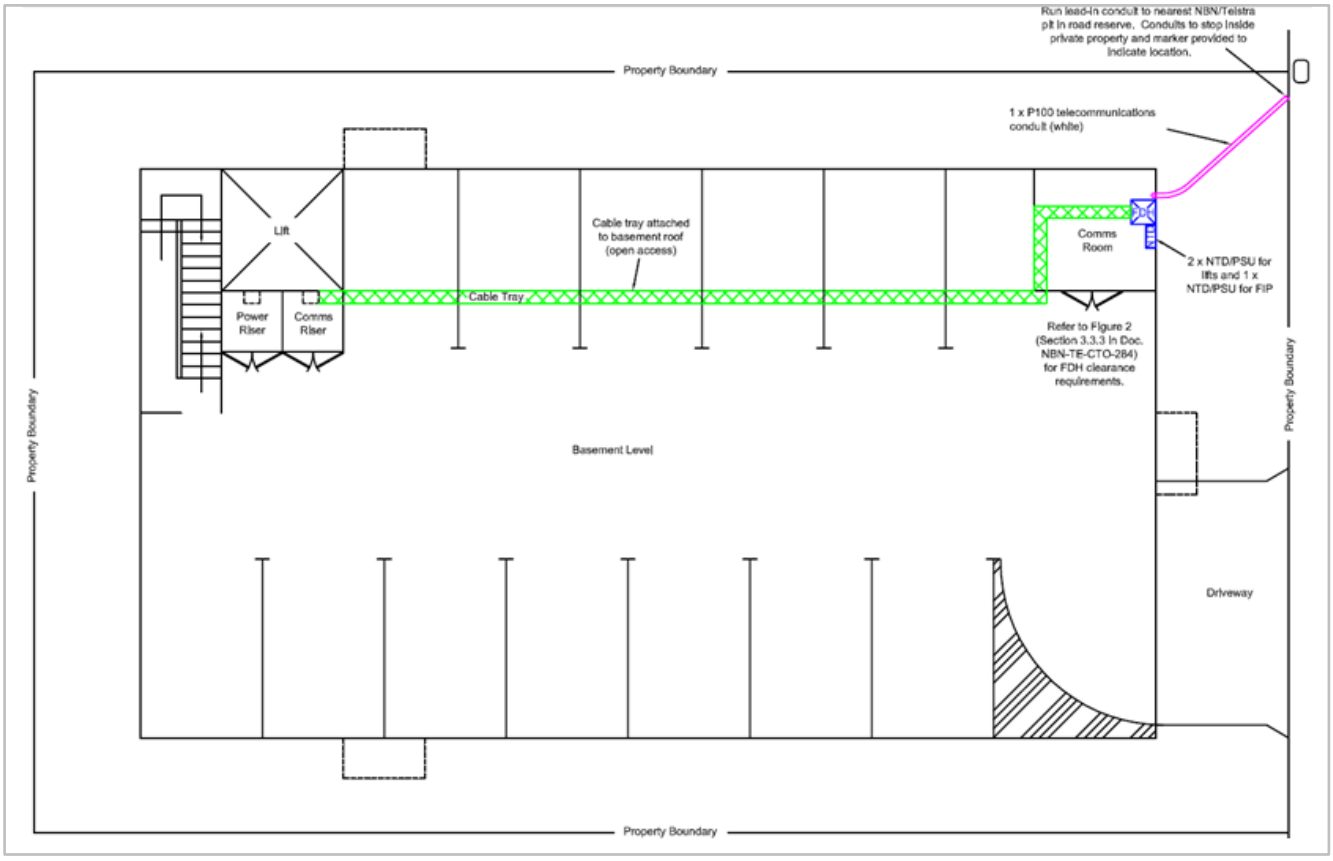


Figure 31. nbn™ pathway from property boundary to communications room

5.6 Telecommunications riser/closet to living unit

Communications pathways may be provided using the options below. Options shall 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 nominal P20 rigid white communication conduit, conduits shall be Drawstring d, from the telecommunications riser or closet location to each NTD location within a premise. (P50 ridged conduits can be utilised) No section of conduit shall be longer than 50 m between pull/draw points and contain the equivalent of no more than three (3) 90° 300 mm radius bends. Conduits can be surface mounted in common areas or cast 'in slab'.

> All conduits and Drawstring s shall be labelled to reference the respective apartment/unit numbers.

A single 100 mm radius bend may be used to replace a 300 mm radius bend at the final transition from horizontal to vertical, with the agreement of the relevant **nbn** representative.

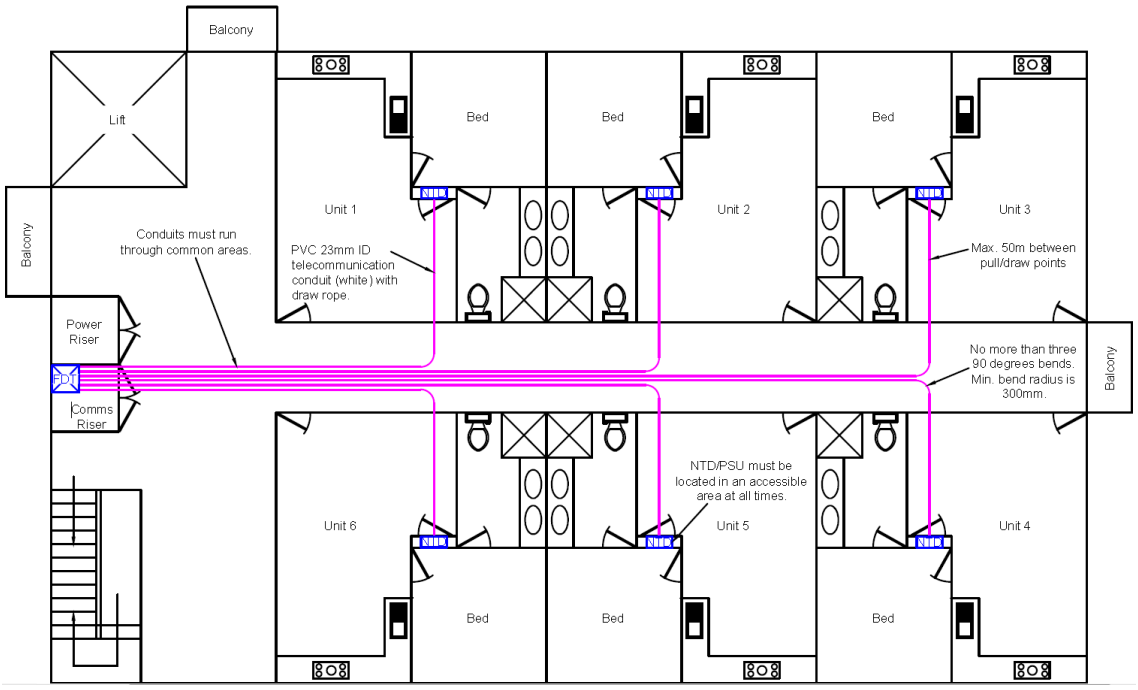


Figure 32. nbn™ pathway using all nominal P20 conduit to feed typical apartment floor (example layout 1)

Option 2: Shared conduit

Where a combination of shared P50 Truncation and dedicated conduits is utilised for cabling from the telecommunications riser/closet to the living unit, access panels shall be provided:

- at any cable conduit transition point
- 2 x P50
- Access panel shall be a minimum of 450 x 450 mm
- Cable tray 150 mm x 150 mm or other suitable anchor to act as fixing point for cables at cable transition locations

Access panels to be located adjacent and within arm's reach of transition and hauling points and placed where possible to avoid being placed at heights that required specialist equipment to access such as scissor platforms and boom lifts.

There shall be a minimum of 100 mm separation from the **nbn**™ network infrastructure and other utilities cables / Infrastructure.

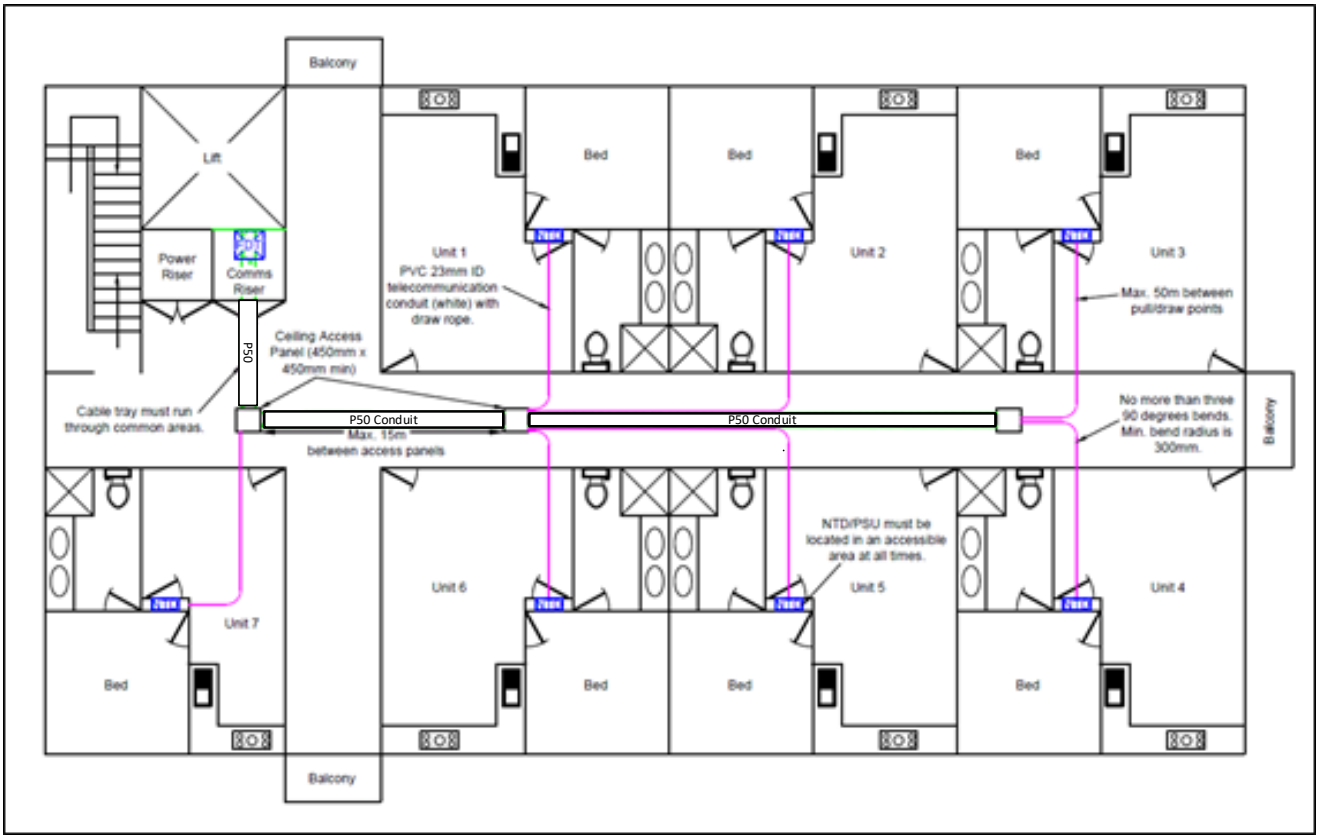


Figure 33. nbn™ pathway using combination P50 and nominal P20 conduit to feed typical apartment floor (example layout 2)

5.7 Concept drawing Drawings

The following two figures show straight line designs of typical **nbn** FTTP type 3 deployments.

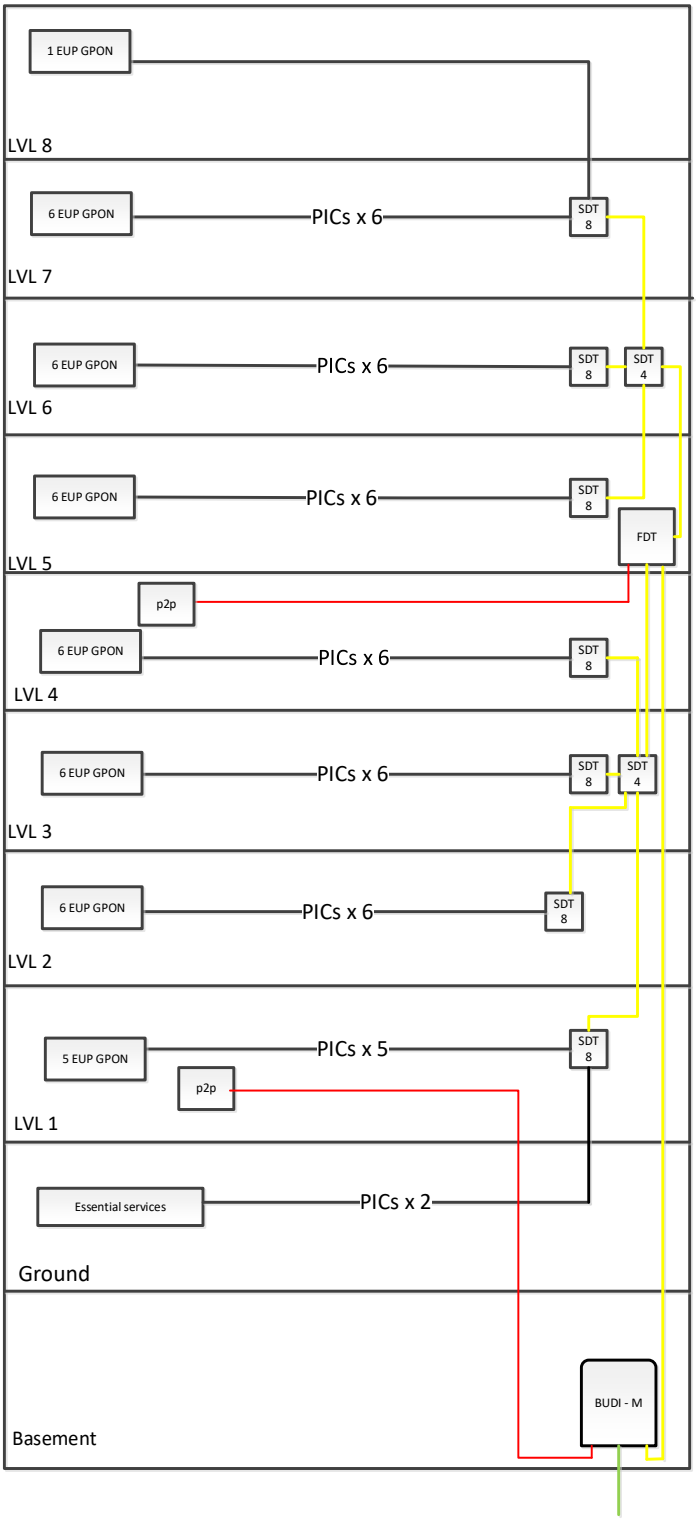


Figure 34. Concept design of vertical Building - single line diagram

6 nbn Passive products separation from other services

The following sections detail the clearances that shall be maintained for the safety and practicality of installing **nbn™** passive equipment within premises in relation to other services. Clearance from other utilities such as fixed services, including pipes and taps and meters shall adhere to the Building Code of Australia and the clearances listed below.

> The developer must confirm any additional spatial separation with its local gas distribution authority, relating to commercial gas applications.

6.1.1 Gas meter clearances

The clearance for a gas meter is dependent on whether the gas meter is located within an enclosure or outside of an enclosure. A minimum clearance of 500mm is required from an approved gas meter or gas meter enclosure.

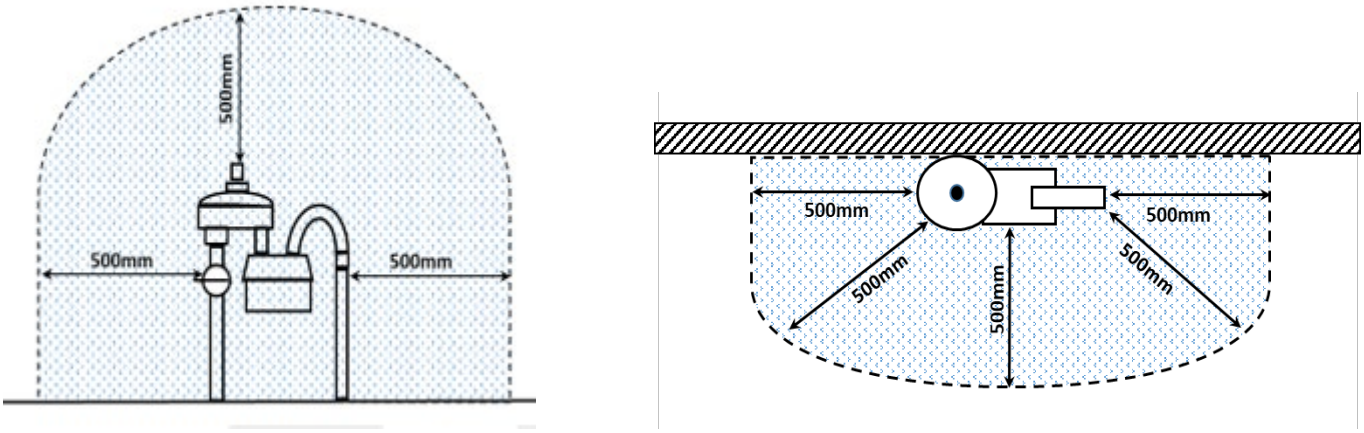


Figure 35. Gas meter exclusion zone without an enclosure

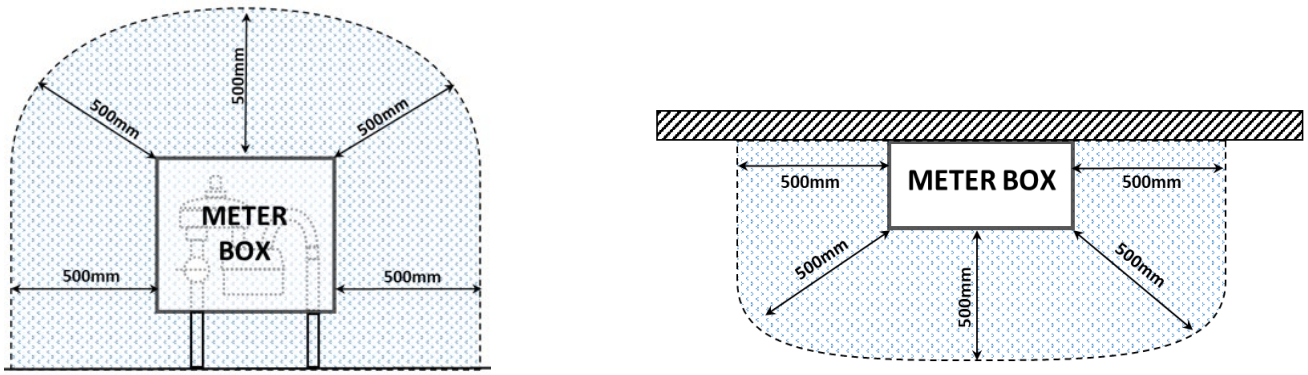


Figure 36. Gas meter front exclusion zone with an enclosure

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

6.1.2 Gas cylinder clearances

The following clearances apply to an in-situ gas cylinder or an exchangeable gas bottle.

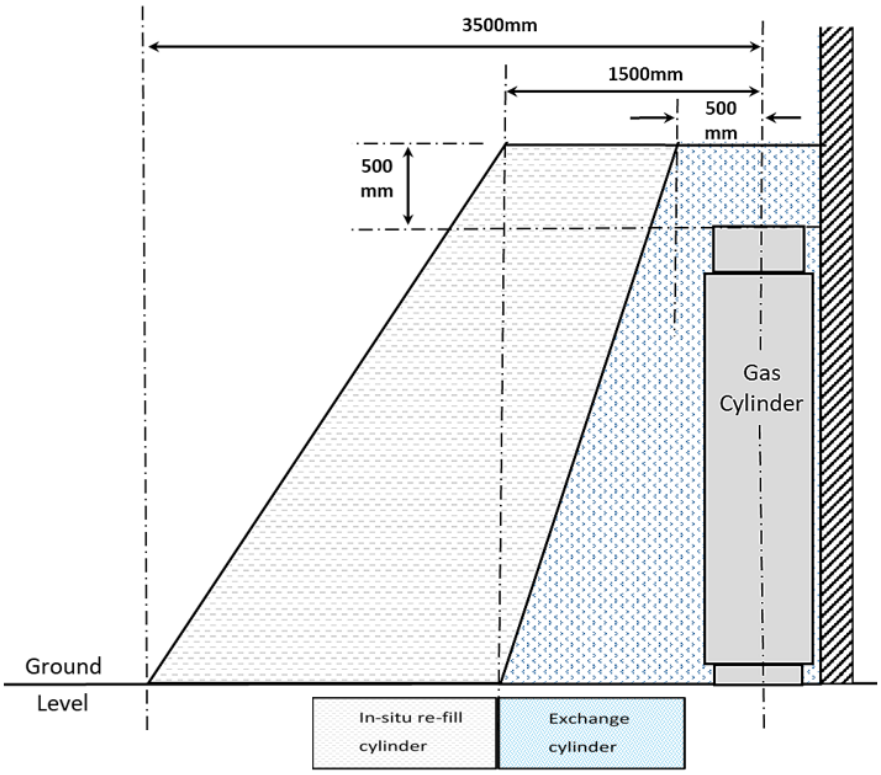


Figure 37. Gas cylinder clearances

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.

6.1.3 Other utility and obstruction clearances

The table below details the clearances for other utilities and obstructions.

Please refer to *AS/NZ 3000:2018 Wiring rules* for clearances from electrical switch equipment.

Table 3. Equipment clearances

Obstruction/utility	Clearance
fixed services: pipes, taps, water meters	150 mm
power source	150 mm
working clearance from Switchboard – as per AS/NZS 3000:2018	600 mm for SDU / 1000 mm for MDU
corner of the wall and exterior structure, such as a window or balcony	100 mm

Obstruction/utility	Clearance
left of the Premise Connection Device (PCD) to allow for the door to open	255 mm
space under the eaves from an aerially fed PCD	100 mm

7 Mounting surface templates and locations for nbn NTD and battery backup.

nbn NTD is managed within a mounting bracket and enclosure and can be supported with a Battery back-up.

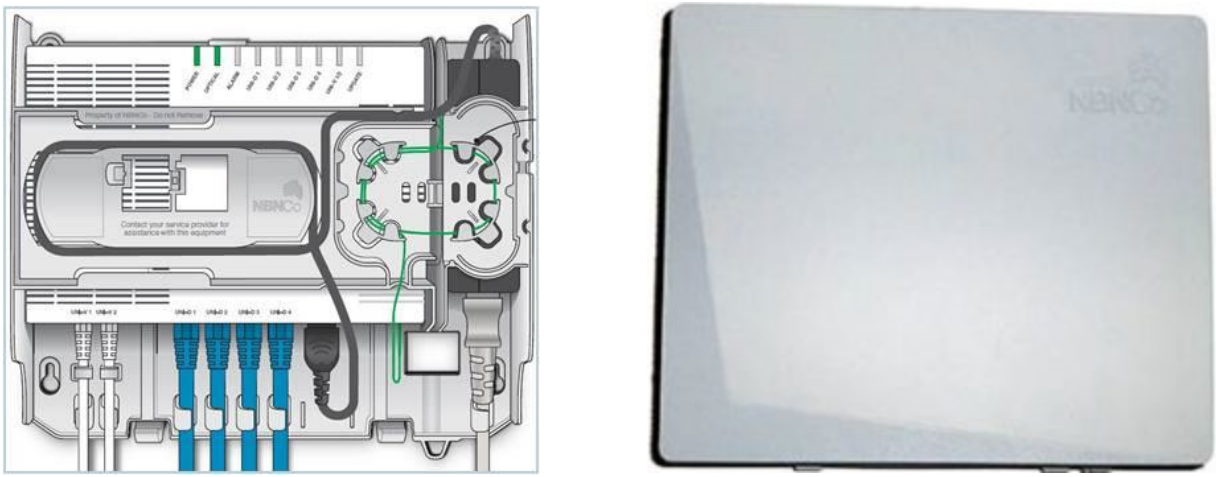


Figure 38. nbn™ Ethernet NTD Wall Mount bracket and NTD enclosure

Figure 39. nbn™ Ethernet NTD Battery Back-up PS/B

Table 4. Home distributor dimensions

Parameter	Home distributor dimensions
minimum mounting surface area required for an indoor NTD composite layout	2,000 cm^2, measured within the home distributor This volume is sufficient to accommodate the I-240G-R indoor NTD, the battery backup PSU, NTD enclosure and GPO. Additional volume should be provided to accommodate patch panels or other end user equipment.

Parameter	Home distributor dimensions
minimum mounting surface area required for an indoor NTD composite layout	2,000 cm^2, measured within the home distributor This volume is sufficient to accommodate the I-240G-R indoor NTD, the battery backup PSU, NTD enclosure and GPO. Additional volume should be provided to accommodate patch panels or other end user equipment.
minimum internal clearance between **nbn**™ equipment and home distributor door/cover	2 cm
minimum internal clearance from the rear of the **nbn**™ equipment and home distributor/cover	10 cm
minimum inside volume required for a home distributor	20 L This volume is sufficient to accommodate the I-240G-R indoor NTD, the battery backup PSU, NTD enclosure and GPO. Additional volume should be provided to accommodate patch panels or other end user equipment.

7.1.1 Indoor composite layouts

- A GPO shall be provided by the end user outside the area assigned for the installation of **nbn**™ equipment.
- The position of the GPO in these diagrams is 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 landscape orientation

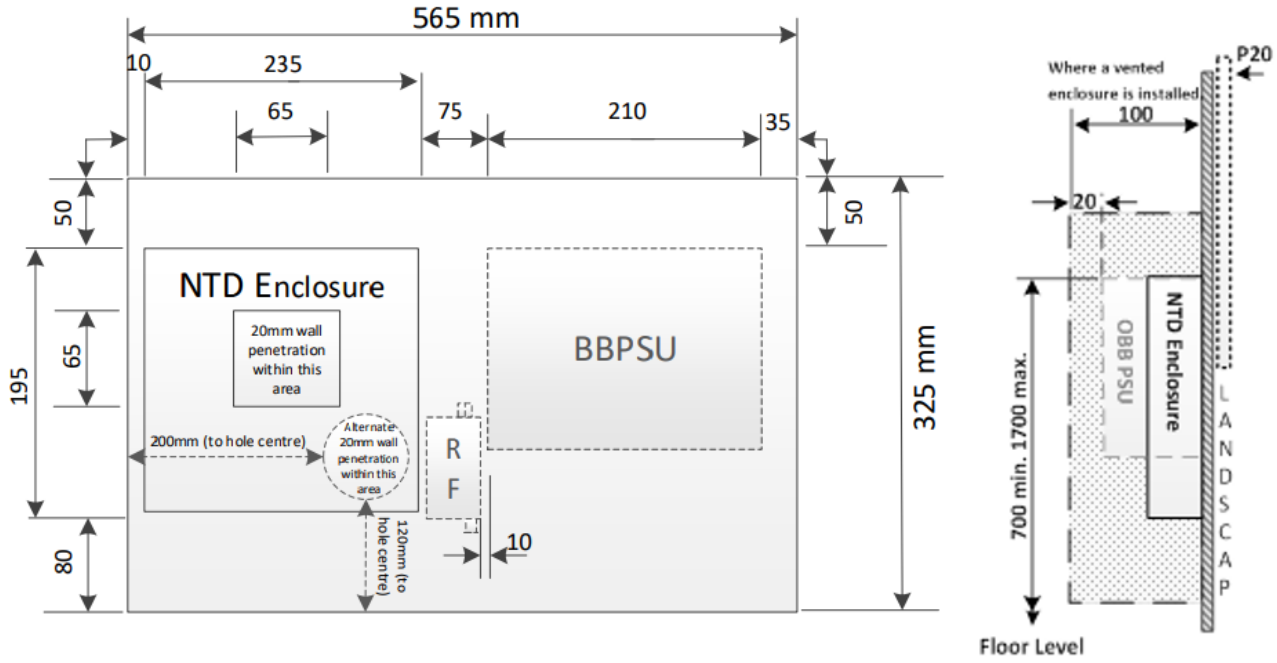


Figure 40. NTD enclosure landscape orientation

Mounting surface template for a portrait orientation

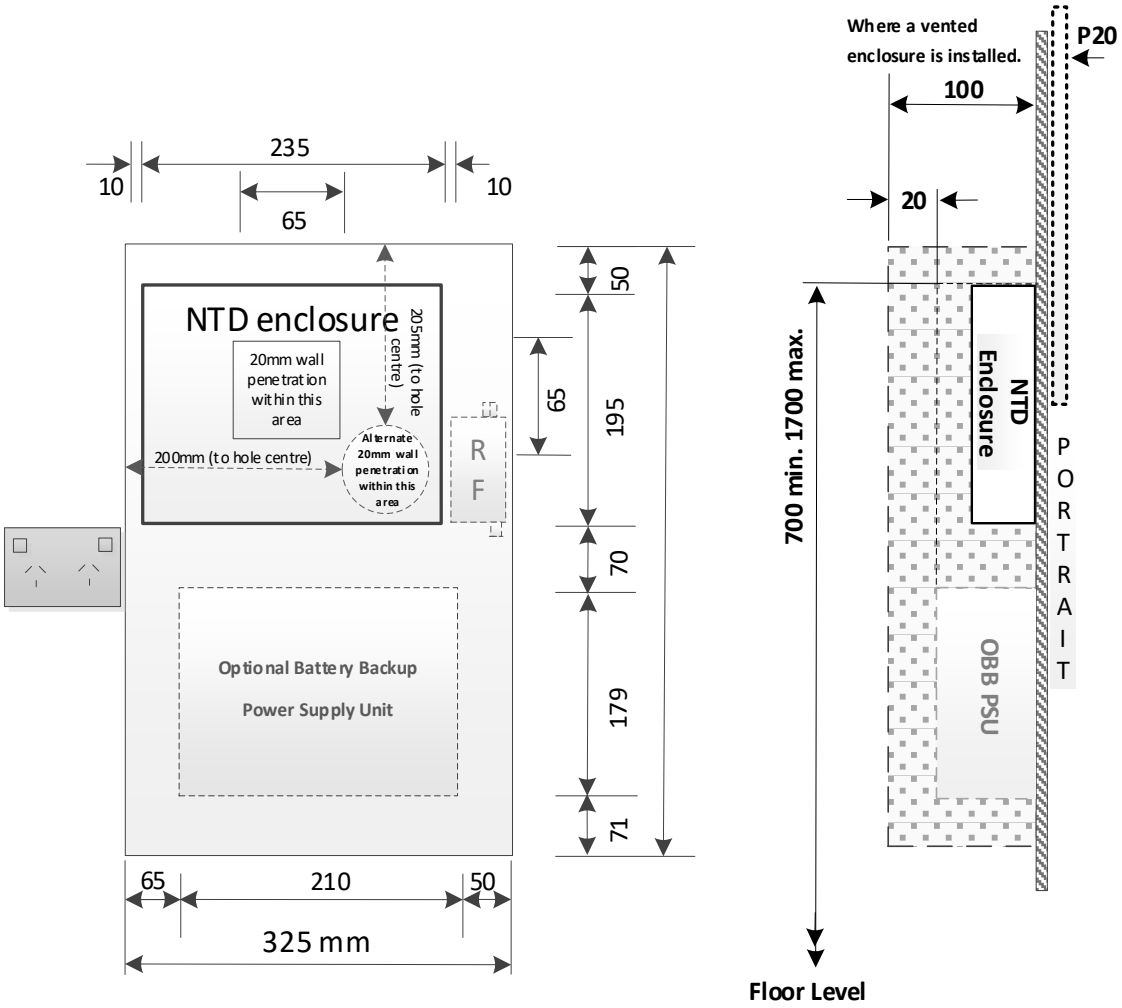


Figure 41. NTD enclosure portrait orientation

7.1.2 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 the GPO is positioned up to 200 mm from the **nbn**™ equipment template.

> The provision of a double GPO is recommended, so that one (1) 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.

7.1.3 Installation specifications and rules for NTDs and PSUs

The indoor NTD and its PSU are suitable for installation in standard circumstances.

All of the following checks shall be true for an installation to be categorised as 'standard circumstances':

- 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.

This means 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.

- The NTD and PSU:
  - **are** installed inside the same building as each other
  - **are not** installed on the external surface of an external wall
  - **are not** installed in an enclosure situated on or embedded into the external surface of an external wall of the building.

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 or 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 described later in this list.

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

- 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 S009:2013 Installation requirements for customer cabling (Wiring rules)*.
- Cables and equipment shall be installed in accordance with local OH&S regulations and requirements. It is beyond the scope of this document to specify values.

- If a battery backup PSU is deployed, it is mounted and semi-permanently secured to a wall or permanent fixed enclosure.
- Neither the NTD nor PSU are installed in a situation where they might be reasonably expected to experience damp, moist or excessively humid conditions.
- Neither the NTD nor the PSU are installed within a roof cavity.
- Neither the NTD nor the PSU are installed below a floor outside the normal living, working or occupancy areas of the building.

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

- Neither the NTD nor the PSU are installed in a cupboard, enclosure, home distributor or in a confined space where:
  - it might reasonably be expected that linen, clothing or towels might be stored in direct contact with the NTD or PSU
  - it might be reasonably presumed that items could be stored that restrict free airflow around the NTD or PSU
  - gases may be trapped due to limited or no ventilation, or because the design or situation of the enclosure or home distributor is such that there is potential for ventilation to be inhibited.

VRLA batteries, of the kind used in the battery backup PSU, may emit hydrogen and oxygen gas under some circumstances, such as battery overcharging. VRLA batteries may be installed into office or end user enclosures if the space provides for an exchange of air with the ambient atmosphere, as described in Section 2.4 of *AS/NZS 4029.2:2000 Stationary batteries - Lead-acid*. While not strictly applicable to **nbn**'s application, Sections 2.6 and 2.7 of *AS 4086.2-1997 Secondary batteries for use with stand-alone power systems* provide cogent recommendations.

- Neither the NTD nor the PSU are installed:
  - 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
  - on a surface where the temperature might routinely exceed +40°C or fall below 0°C.

- This means that neither the NTD nor the PSU may be installed directly onto a northern or western facing masonry wall where:
  - 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
  - the NTD or PSU will be 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 provided the cavity is fitted with R1.5 or higher rated insulation batts
- Also note that if a wall would be subjected to solar loading except for a tree that is currently providing shade, the installer should assess future circumstances whereby the tree may be removed.

- Neither the NTD nor the PSU are installed in a location where the power or end user cabling might:
  - be a tripping or strangulation hazard
  - be accidently wrenched or damaged by tripping, passers-by or another inadvertent disturbance.

- 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 S009:2013 Installation requirements for customer cabling (Wiring rules)*.
- Cables and equipment shall be installed in accordance with local OH&S regulations and requirements. It is beyond the scope of this document to specify values.

- Neither the NTD nor the PSU are installed:
  - onto an accessible conductive/metallic surface
  - encompassing a GPO, unless all accessible conductive surfaces and parts have been protectively earthed in accordance with *AS/NZS 3000:2007 Wiring Rules* and *AS/CA S009:2013 Installation requirements for customer cabling (Wiring rules)*.

This addresses potential breaches of primary insulation, an inadvertent detachment of live conductors coming into contact with exposed metallic parts, and other similar risks in situations where conductors carrying mains potential are routed into conductive/metallic enclosures. Refer to Section 8.4 of *AS/CA S009:2013 Installation requirements for customer cabling (Wiring rules)* (Section 8.4 Earthing of cable support systems and cable enclosures states that 'An electrically conductive support system may be connected to protective earth in accordance with Clause 20.19').

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

7.2 Indoor NTD mounting surface templates

Figure 42 shows the requirements for NTD landscape and portrait indoor mounting surface templates. Space should be available for a 230V AC power outlet adjacent to the mounting surface template. The 230V AC 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.

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

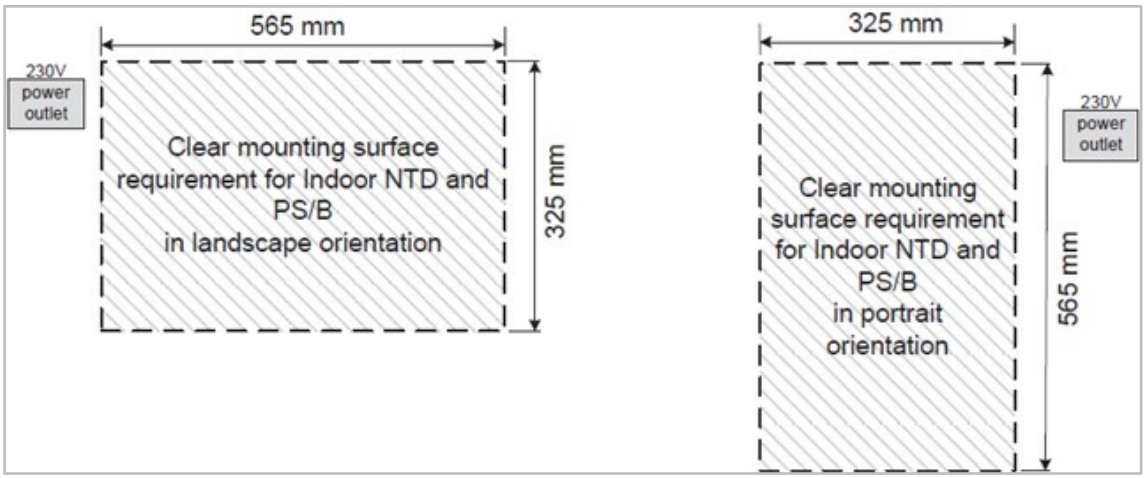


Figure 42. Indoor NTD mounting surface templates

7.3 Mounting locations

Builders and building owners shall make one (1) of the following types of locations available for the installation of **nbn**™ equipment.

nbn distinguishes between three (3) types of mounting locations, where NTD equipment may be mounted within the confines of a mounting surface template. Table 5 summarises the types of mounting locations.

Table 5. Mounting locations

Location type	Description
open wall areas	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.
open enclosures	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.
confined areas	A cabinet or cupboard (including a home distributor or utilities enclosure) dedicated to communications equipment. Confined areas require ventilation to be added to the design to improve the air circulation.

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

7.3.1 Confined area Built in arrangement

The Internal NTD can be placed within a dedicated built out shelf within individual units cabinetry either Landscaper or portrait mounting layout templates can be used.

Face plates for GPO and data cabling shall be located outside the mounting surface layouts as shown in Figure 42. Indoor NTD mounting surface templates when placed with a cabinet or cupboard.

Figure 43. Typical Built out shelf

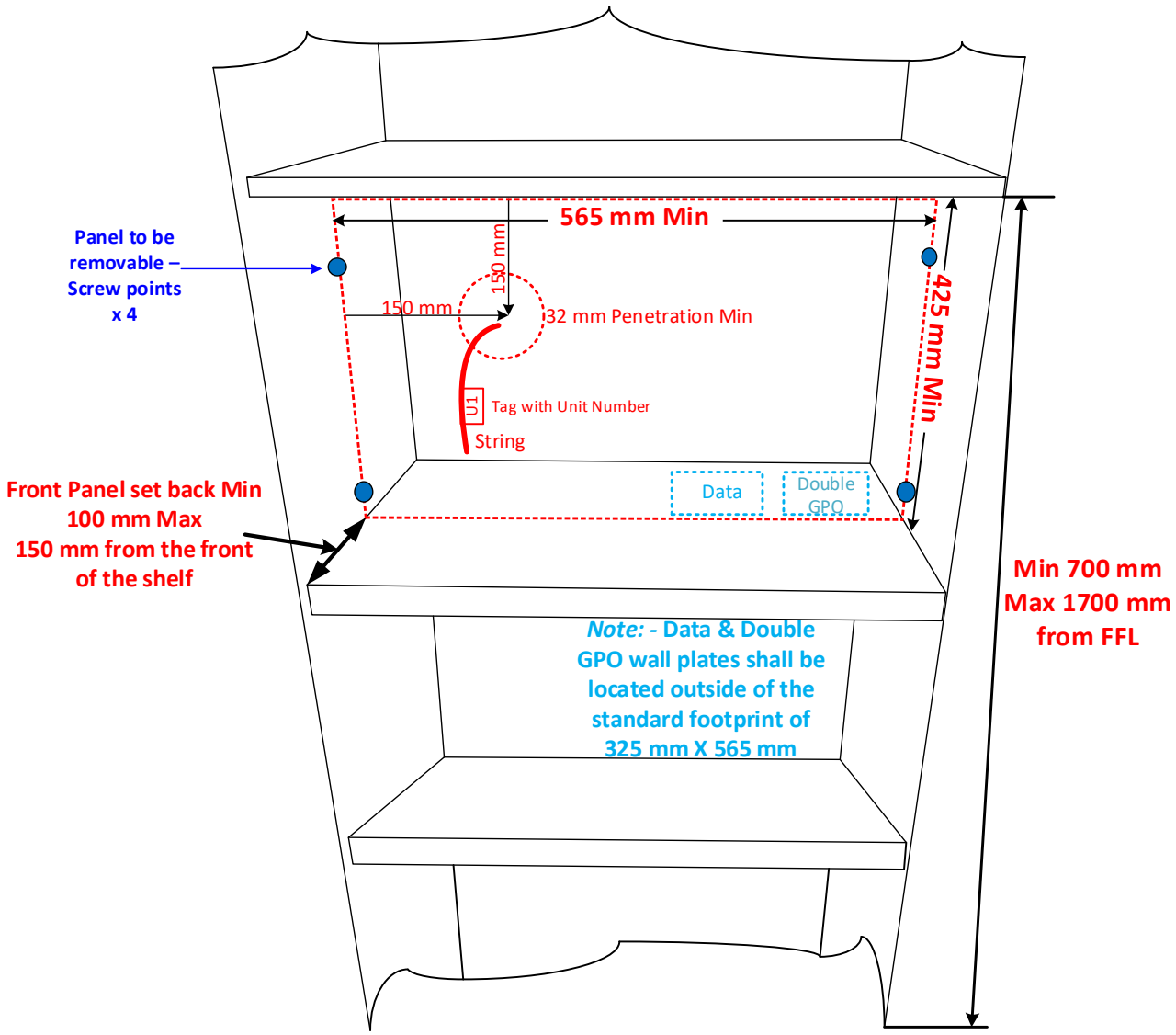


Figure 44. Built out shelf landscape

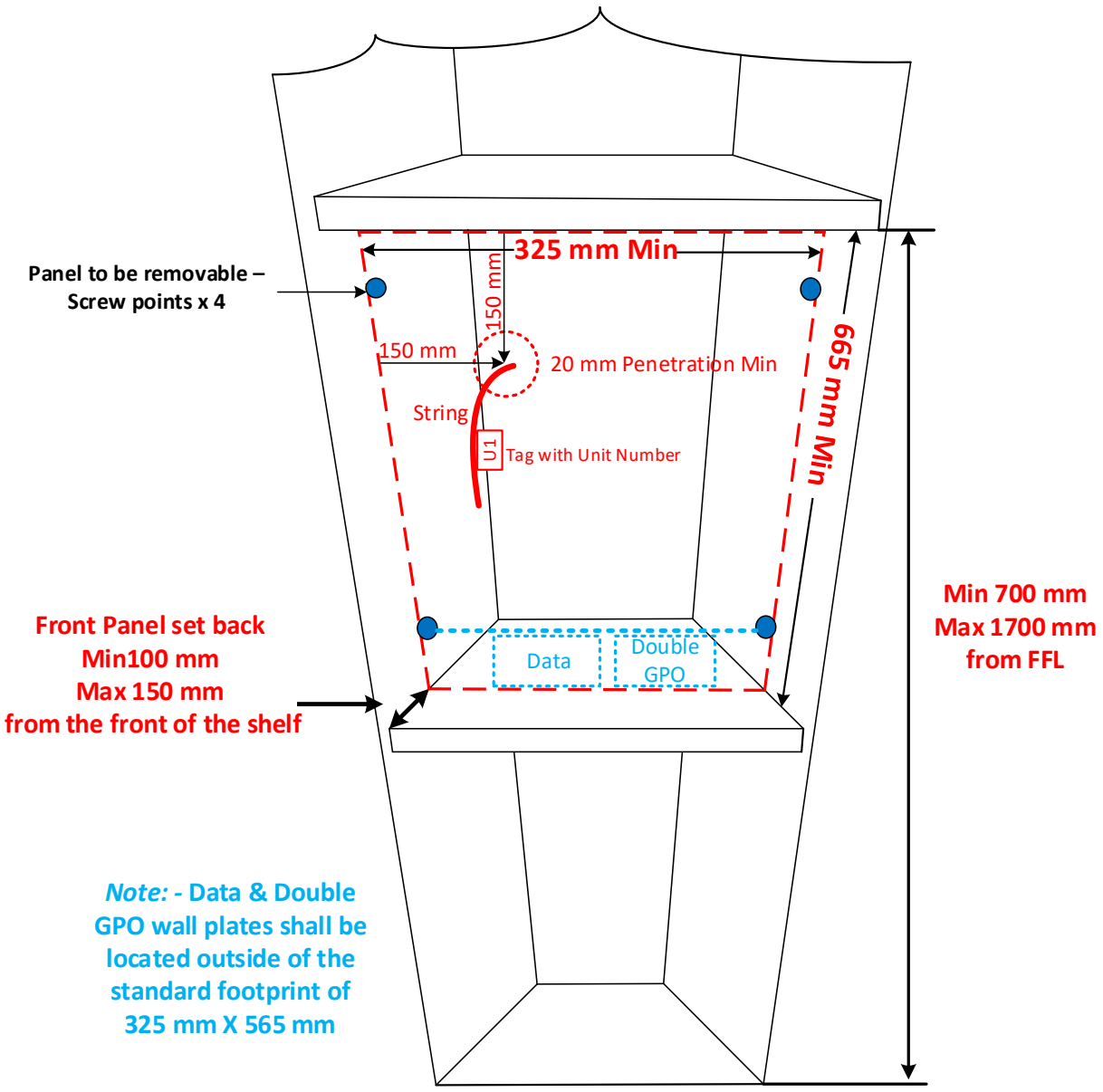


Figure 45. Built out shelf portrait

Drawing shows the laying of the NTD within the living unit.

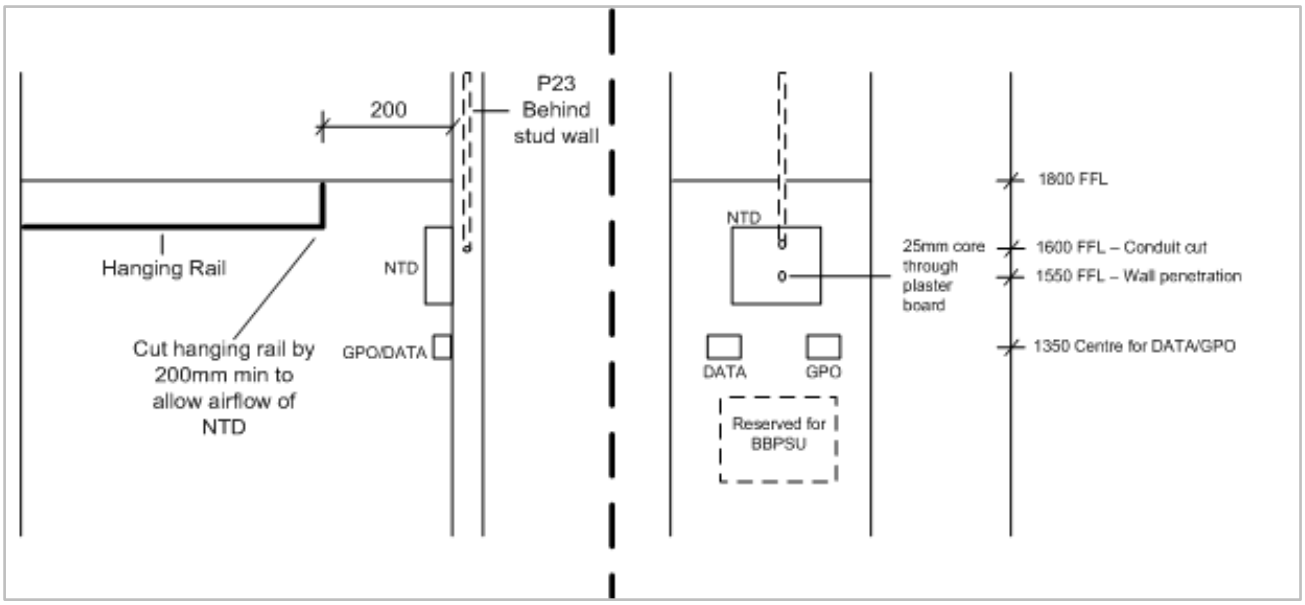


Figure 46. NTD Typical side and front view with living unit

7.3.2 Centrally located NTDs

nbn outdoor NTD Equipment can be centrally located within communications rooms when supporting essentials services such a lifts and Fire Panels.

Figure 47. Centrally located Outdoor NTDs for essential services.

End-users NTDs can only be centrally located within large commercial developments, within riser or communications rooms / cupboards only when it is possible to individually secure each NTD within a separate enclosure accessible only to the individual End-user.

The enclosures shall be sized to allow the standard indoor layouts as detailed in section 7.1.1 Indoor Composite layouts and have meet the ventilation requirements required in **Error! Reference source not found.Error! Reference source not found.Error! Reference source not found.**.

Figure 48. Centrally located NTDs for commercial developments.

Figure 49. Centrally located NTDs with standard portrait layout within commercial developments

7.3.3 Ventilation requirements

nbn requires that enclosures for **nbn**™ equipment only, satisfy the following thermal ventilation requirements:

Table 6. Ventilation requirements

Volume of open enclosure or home distributor	Required ventilation area (for each of the upper and the lower ventilation region)
20 L (minimum volume requirement)	60 cm^2
1. between 20 L and 60 L	60 cm^2, *plus* an additional 1.5 square centimetres per litre of volume over 20 L
2. between 20 L and 60 L	120 cm^2, *plus* an additional 0.1 square centimetres per litre of volume over 60 L
3. greater than 60 L	120 cm^2, *plus* an additional 0.1 square centimetres per litre of volume over 60 L

7.3.3.1 Calculating ventilation area

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

- use the following formula to calculate the volume:

  $$volume = \left(\frac{W \times H \times D}{1000}\right)$$

  - where:
    - *W*, *H* and *D* are the internal width, height and depth of the enclosure (in centimetres)
    - *volume* is expressed in litres
- based on the volume you calculated in the previous step, determine the required ventilation area (in square centimetres).
  - for volumes between 20 L and 60 L:

    $$ventilation\ area = 60 + [\ (volume - 20) \times 1.5]$$

  - for volumes greater than 60 L:

    $$ventilation\ area = 120 + [\ (volume - 60) \times 0.1]$$

Example:

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

$$volume = \left(\frac{38 \times 65 \times 13}{1000}\right) = 32.13\ \text{L}$$

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

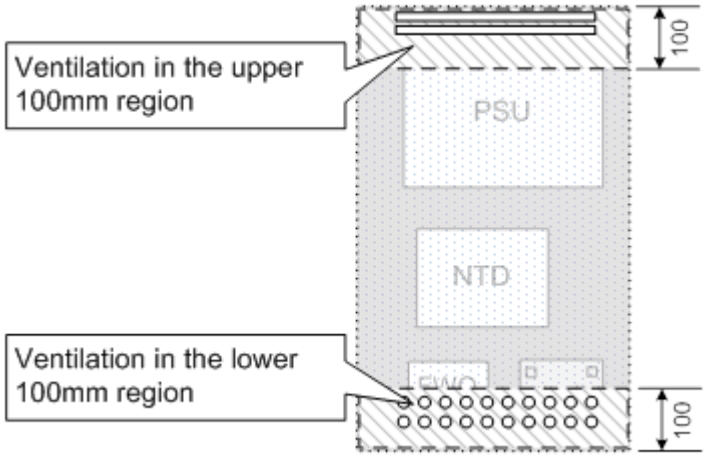
$$ventilation\ area = 60 + \left[\left(\frac{38\ \times 65\ \times 13}{1000} - 20\right) \times 1.5\right] = 78.2\ cm^2$$

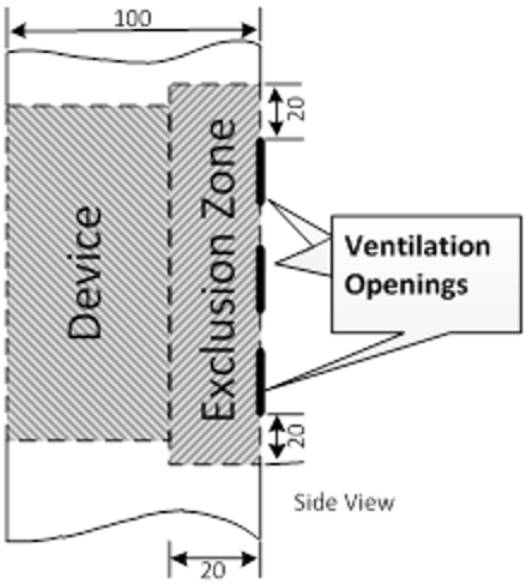
7.3.3.2 Additional requirements

Table 7. Additional ventilation requirements

Rule	Notes
doors or covers shall not obstruct ventilation	An open enclosure or home distributor design shall not rely on a cover or doors being opened to meet the thermal ventilation requirements.
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 shall 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 8. Ventilation requirements

Ventilation to dissipate gases released during battery charging	a. Ventilation shall be provided in an 'upper ventilation region' no further than 100 mm from the top surface of the open enclosure area or home distributor. b. Ventilation shall be provided in a 'lower ventilation region' no further than 100 mm from the bottom surface of the open enclosure area or home distributor. c. The combined cross-sectional ventilation area in the upper ventilation region shall be at least 5 cm^2 unimpeded. d. The combined cross-sectional ventilation area in the lower ventilation region shall be at least 5 cm^2 unimpeded.  **Figure 50. Ventilation upper/lower** This ventilation shall exit towards the top/bottom, sides or front of the open enclosure area or home distributor and shall not exit into a wall cavity. 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.
	'Unimpeded' is also intended to mean 'unobstructed' and refers to the minimum effective cross-sectional area of airways intended for ventilation. The requirements for separate upper and lower ventilation areas may be met with: • upper and lower circular holes each of at least 25 mm diameter • multiple circular holes with areas that sum to at least 5 cm^2 in each of the upper and lower enclosure spaces

	• one (1) or more ventilation slots in each of the upper and lower enclosure spaces with cross-sectional areas that sum to at least 5 cm^2 each.
Arrangement of enclosure/home distributor ventilation openings	Where feasible, ventilation openings should be arranged in accordance with the recommendations in *AS 4086.2-1997 Secondary batteries for use with stand-alone power systems*. 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
	AS 4086.2-1997 Secondary batteries for use with stand-alone power systems covers 'secondary batteries for use with standalone 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™** battery backup PSU, we have referenced sections of *AS 4086.2-1997 Secondary batteries for use with stand-alone power systems*, which are arguably agnostic to the source of power and provide relevant guidance regarding ventilation.
Proximity of a ventilation opening to the face of a device	The perimeter of the inner opening of a ventilation opening shall be at least 20 mm from any of the six (6) faces of an active or passive device.  **Figure 51. Ventilation openings**
	This is equivalent to saying that a device may not be mounted within 20 mm of a ventilation hole, either in the two dimensions of the mounting surface or in the third dimension above the mounting surface.

Cable ingress/egress and ventilation	Ventilation openings shall not be used or intended to be used for cable ingress/egress.
	This requirement is to ensure that cables cannot obstruct or reduce the free flow of air into and out of the open enclosure or home distributor, thereby compromising the ventilation.
Doors or covers may not obstruct ventilation	An open enclosure or home distributor design shall not rely on a cover or doors being open to meet any of the ventilation requirements.
Compliance with standards governing safe location of VRLA batteries and battery backup PSUs	Battery backup PSUs shall 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.
	Batteries should not be situated in areas where gas emission, however minor, could give rise to a safety risk. Installing the battery backup PSU in an open enclosure or home distributor that is itself in such an area will not mitigate the latent safety risk, so the battery backup PSU should not be installed in such locations.

7.4 Essential services

Outdoor ONT device is nearing end of life and being discontinued by vendor. It's not mandatory to use Outdoor ONT for Essential Services (such as lift phones, managed alarms and fire alarms) and is the least preferred choice. A range of alternate options are available which can provide benefit of reduced spatial requirements.

Options available:

- Wireless 3G/4G connection
    - Recommend dual sim with two different mobile carriers for redundancy.
- RSP voice service (SIP)
    - Indoor NTD with **nbn** data service (UNI-D).
    - RSP provide voice services and required hardware (ATA).
- Indoor NTD with **nbn** voice service (UNI-V)
    - Enhanced over voltage protection must be used on UNI-V port (refer AS/CA S009 Section 10).

- Outdoor NTD with **nbn** voice service (UNI-V)
    - This option is not recommended.

Indoor NTD’s shall not be installed in the following locations:

- Basements
- Damp and dust areas

- Lift or Plant rooms due to excessive heat

The UNI-V ports on the Indoor NTD have basic over voltage protected and the developer must provide suitable protection (ITU-T K.21 Enhanced protection, refer AS/CA S009 Section 10) should it be used to provide lift (elevator) telephone services, building emergency panel communications services, or other specialised PSTN applications where the cabling may conduct induced electrical impulses. It's recommended that all equipment (ATA's, routers etc) directly connected to fire/lift/alarm panels also have over voltage protection.

Resilient power must be provided to all devices required to provide Essential Service phone services. A range of options are available:

1. UPS
2. 3rd party battery backup solution (**nbn** BBU solution is not recommended)
3. Alternate building power feeds

For power and installation requirements refer to AS 16703.3-2018 "Fire detection, warning, control and intercom systems - System design, installation and commissioning."

If using an **nbn** voice service (UNI-V) for monitored fire alarms or lift emergency phones it must be added to register https://www.nbnco.com.au/learn/device-compatibility/fire-alarms/registration-form.

Please discuss with your lift and fire panel suppliers options for connections to the nbn network.

The outdoor NTD, unlike the indoor NTD, has specific earthing requirements as described below.

- The CET earth shall be provided by a licensed electrician engaged by the developer or construction contractor.
- Whilst the NTD being used for essential services is generally called an 'outdoor NTD', this will always be used/located indoors for new development MDU areas (typically in a communications cupboard or room).

The outdoor NTD specific earthing requirements are:

- 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 shall be connected to the electrode by a separate earthing clip. The connection shall be labelled ' Communication Earth Terminal' so that is clearly identified in accordance with the requirements of *AS/NZS 3000:2018 Wiring Rules*.
- Provide a 6 mm² green/yellow equipotential bonding conductor between the earthing bar in the electrical switchboard and a 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 3000:2018 Wiring Rules*).
- 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.

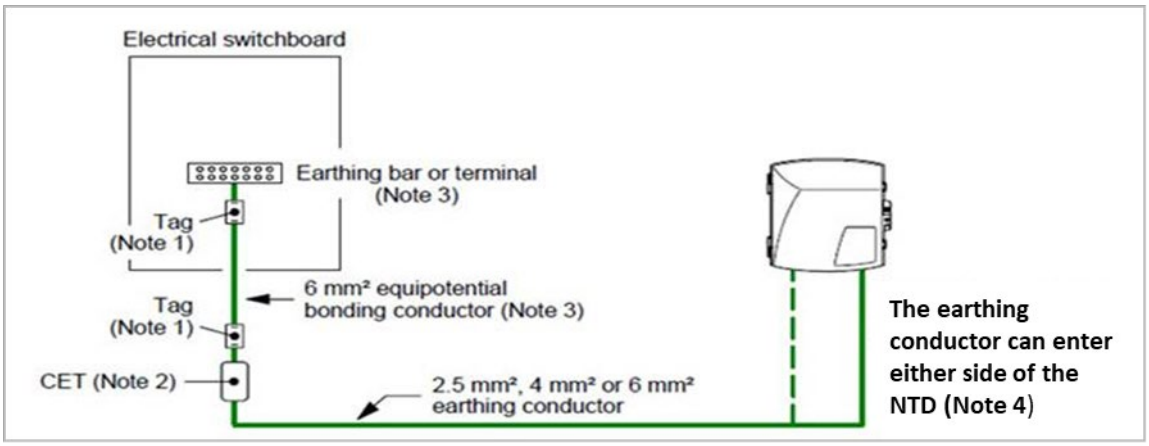


Figure 52. Earthing requirements

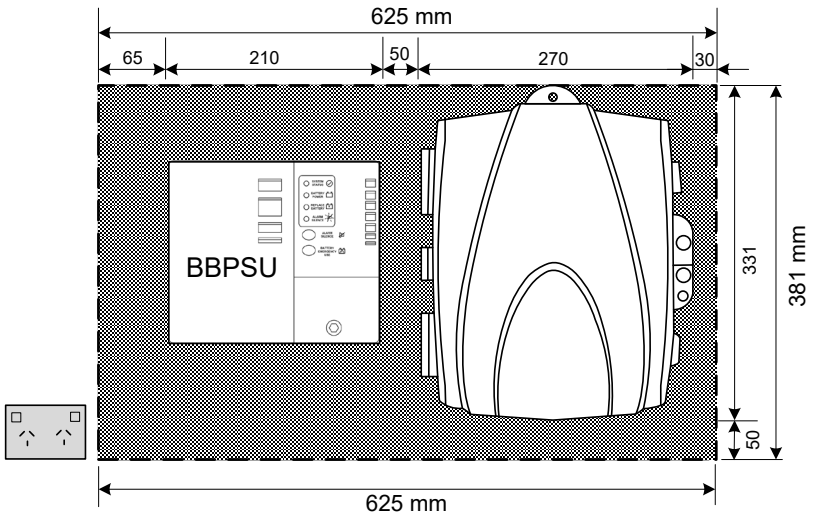
The following notes relate to Figure 52. Earthing requirements:

1. The bonding conductor shall be labelled 'Telecommunications Bonding Conductor' at the switchboard end and also at the CET end if the CET is not within sight of the switchboard.
2. The CET shall be located within one (1) m of the essential services outdoor NTD.
3. A licensed electrician shall make the bonding conductor connection inside the electrical switchboard.
4. The earthing conductor shall be connected to the outdoor NTD by the **nbn** installer.

7.5 Outdoor NTD Mounting template

- A General Power Outlet (GPO) shall be provided by the end user outside the area assigned for the installation of **nbn**™ equipment.
- The position of the GPO in these diagrams is 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, Radio Frequency (RF) and fibre in the same vertical corridor.

Table 9. Outdoor NTD mounting template

Parameter	Mounting surface template for outdoor NTD
A landscape layout of the outdoor NTD	 **Figure 53. Outdoor NTD composite layout (landscape)**
	Additional area shall be provided if the open enclosure/home distributor is designed for non **nbn**™ cable patching, devices or equipment.

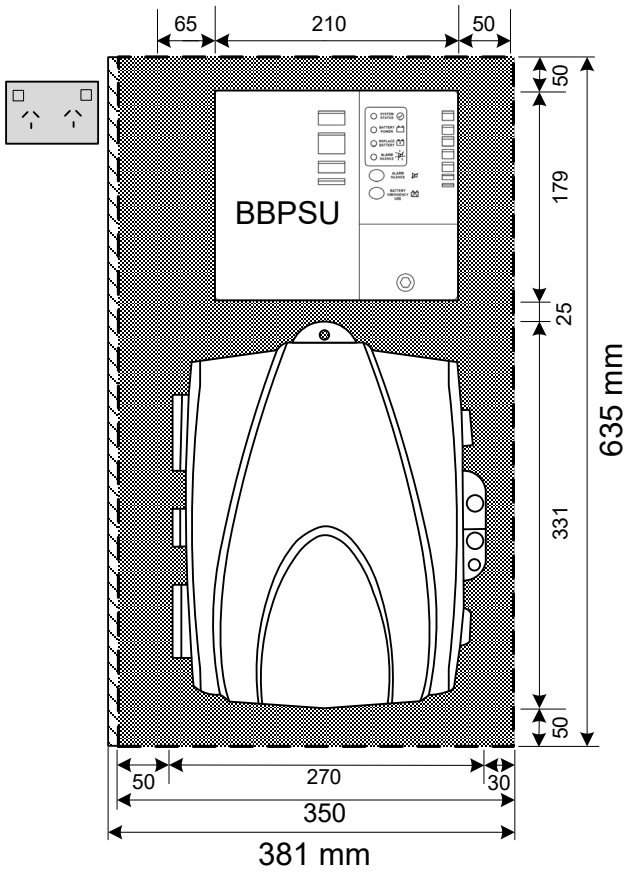
Parameter	Mounting surface template for outdoor NTD
A portrait layout of the outdoor NTD	

Figure 54. Outdoor NTD composite layout (portrait)

7.6 External enclosures for Building fibre devices

Enclosures shall only be used on extra small and small MDUs, **nbn** Passive fibre devices can be installed within an external enclosure where there is no common area available for a communications room or cupboard within the basement and or ground level of the development, the enclosure and must be used for ascetical and security applications externally on the building. Note: - This is the least proffered method recognised by **nbn**™.

7.6.1 Enclosure purpose

The enclosure should be used for the following purpose:

- to house the PCD / BUDI / SDTs passive fibre devices in extra small and small MDUs
- suitable lead-in conduit transition point, e.g. P50 to P20
- to act as the building entry point for **nbn**'s lead-in cable
- to provide additional security of **nbn** passive fibre products
- to allow for a more visually appealing cabinet, that can colour match the premises.

7.6.2 Enclosure location

The enclosure shall be installed on an external wall, 'in a safe and readily accessible location. The enclosure can be recessed within a cavity wall.

Enclosure location shall be set back from trafficable areas and shall not block building walkways or encroach exit pathways, parking spaces or driveways

The cabinet shall be positioned on the wall at a maximum height of 1800mm from finished floor level to the top of enclosure and shall be a minimum 400 mm from ground level, with clearances as shown in **Error! Reference source not found.**

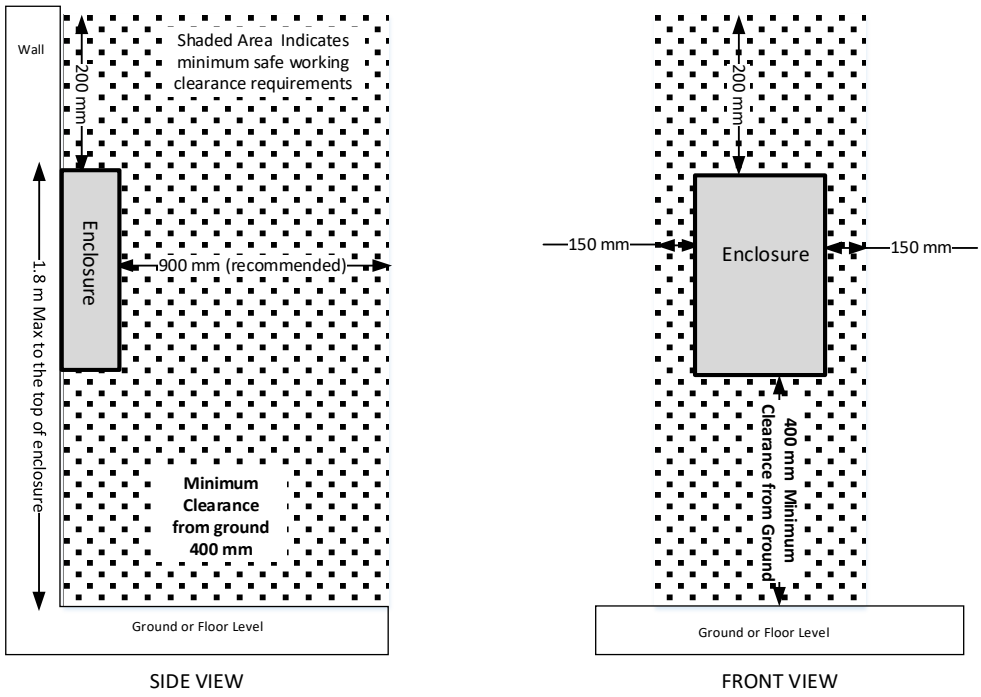


Figure 55. Enclosure clearances

7.6.3 Enclosure dimensions and selection

- For a development of 1 – 4 SLs deployment, the minimum external cabinet size of 600mm (h) x 600mm (w) x 300mm (d) can be utilised to manage a PCD and a single SDT if required,
- For developments greater than 4 will need to accommodate a Budi Building fibre device and max two SDTs, the minimum cabinet size of 800mm (h) x 800mm (w) x 300mm (d) can be utilised.

  Minimum internal mounting requirements of 760 mm (h) x 760 mm (w) x 250 mm (d)

Devices within the enclosure require a minimum side and top clearance of 50mm from enclosure walls and other devices

Clearance from bottom of devices 250 mm for cables entry

PCD the door must open a minimum of 120 degrees, to allow clear access to the splice trays

Larger or multiple Enclosures can be utilised as required to meet the number of devices to be installed and clearance requirements.

7.6.4 Enclosure conduits

All conduit entry points into the enclosure shall be adequately sealed as to mitigate against ingress of vermin and weather elements and maintain IP55 Rating.

Cable entry holes shall be free of sharp edges or burr's or have a grommet of insulating material fitted.

Conduits entering the enclosure shall be secured to the building.

No more than 30mm of conduit shall protrude into the enclosure internal space.

All conduits leaving the enclosure shall not be installed in shared or dedicated underground trenches. Conduits can be surfaced mounted - installed unbroken in a cavity via common area to the NTD location and or cast in a concrete slab.

7.6.5 Enclosure labelling

The front enclosure door shall be identified as **NBN**, with a permanent fixed label.

8 Fibre TV

Where an agreement for **nbn** Fibre TV has been entered into with **nbn**, please contact your Content Service Provider for their requirements.

9 Glossary

Term	Description
AC	Alternating Current
ACMA	Australian Communications and Media Authority
BCA	Building Code of Australia
BFD	Building Fibre Device
BUDI	Building Distribution Enclosure
CET	Communications Earth Terminal
CPE	Customer Premises Equipment
CSD	Compact Sealed DSLAM
CTL	Cable Transition Location
DP	Delivery Partner
FCD	Fibre Collector Distributor
FDT	Fibre Distribution Terminal
FIP	Fire Indicator Panel
FTTP	Fibre To The Premises
FTTx	Fibre To The ‘x’ (building, curb, node, premises)
GNAF	Geo-coded National Address File
GPO	General Power Outlet
HS&E	Health, Safety & Environment
LIC	Lead-In Conduit
living unit	A valid physical address in the Geo-coded National Address File (GNAF) provided by PSMA Australia Ltd.
LSZH	Low-Smoke Zero-Halogen
MDF	Main Distribution Frame
MDU	Multi Dwelling Unit
MPS	Multi Premises Site

Term	Description
nbn	National Broadband Network
NBP	Network Boundary Point
NTD	Network Termination Device
PCD	Premise Connection Device
PDH	Premise Distribution Hub
PSU	Power Supply Unit
RF	Radio Frequency
SDT	Splitter Distribution Terminal
SWMS	Safe Work Method Statement
TO	Telecommunications Outlet
WHS	Workplace Health & Safety

Appendix A ADT Drafting Tool

This section aims to provide developers with:

- Key **nbn** drafting requirements.
- A description of the ADT and AutoCAD Template to be used when creating and submitting New Development MDU Pathway Designs for comment by nbn in accordance with the applicable developer agreement.

Developer agreement requirements

This document does not affect Developer's obligations under their Developer Agreement or other agreement with **nbn**.

For example, while under the Developer Agreement, the Developer must submit the pathway design for comment by **nbn** and the design remains the responsibility of the Developer, regardless of any review or commenting by **nbn** on the pathway design.

As part of its agreement with **nbn**, the Developer warrants that the pathway design for the MDU will:

a. Comply with all **nbn** specifications as required by the developer agreement.

b. Be fit for the purpose of constructing the Pathway Works, including as reasonably ascertainable from – **nbn**'s specifications.

nbn may make comments on, or have additional requirements for, your pathway design even after you submit it and you need to take those comments into account (whether covered in this document or otherwise) to modify your pathway design accordingly and resubmit it to **nbn**.

The Developer must not commence building until **nbn** has confirmed it has no additional comments on the design, or nbn has not provided any comments on the design within 20 business days of it being submitted (or if submitted before the developer agreement is signed, 20 business days from the developer agreement being signed).

Resources available on the **nbn**™ website:

http://www.nbnco.com.au/develop-or-plan-with-the-nbn/new-developments/builders-contractors/builders-contractors-guidelines.html

ZIP file

The zip file contains:

a. ADT (assisted drafting tool) file ADT.VLX

b. Documents

c. Templates

d. NBN-TE-CTO-284 - Multi Dwelling Unit (MDU) building engineering and design standard - new development (this document).

e. SAMPLE .dwf (can be viewed with 'Autodesk Design Review', free download software).

f. New_Development_template_2017.dwt (AutoCAD template) AutoCAD template

AutoCAD software requirements

External plant drafting will be done using industry standard AutoCAD software and the fundamental 'Model Space' and 'Paper Space' CAD drafting approach.

It is assumed that users undertaking CAD drafting for nbn are conversant with use of 'Model Space' and 'Paper Space' in an AutoCAD environment.

The current minimum version of AutoCAD is AutoCAD 2013-R18.

Note: all submissions need to be in .DWG format, saved as a minimum 2013 version and also required in PDF format.

Design settings

The AutoCAD Template includes symbols, blocks, layers and title blocks. They are explained in detail in this document and intended to assist Developers in adhering to **nbn**'s CAD standards.

The sections below outline the drawing setup required.

Layers

There are many layers included within the template.

The names are specific to nbn systems and are to be used as presented, to load data into nbn's database.

To assist with the design of MDU Pathways, a filter group called NEW DEVELOPMENT is created and all layers required are added to the filter group.

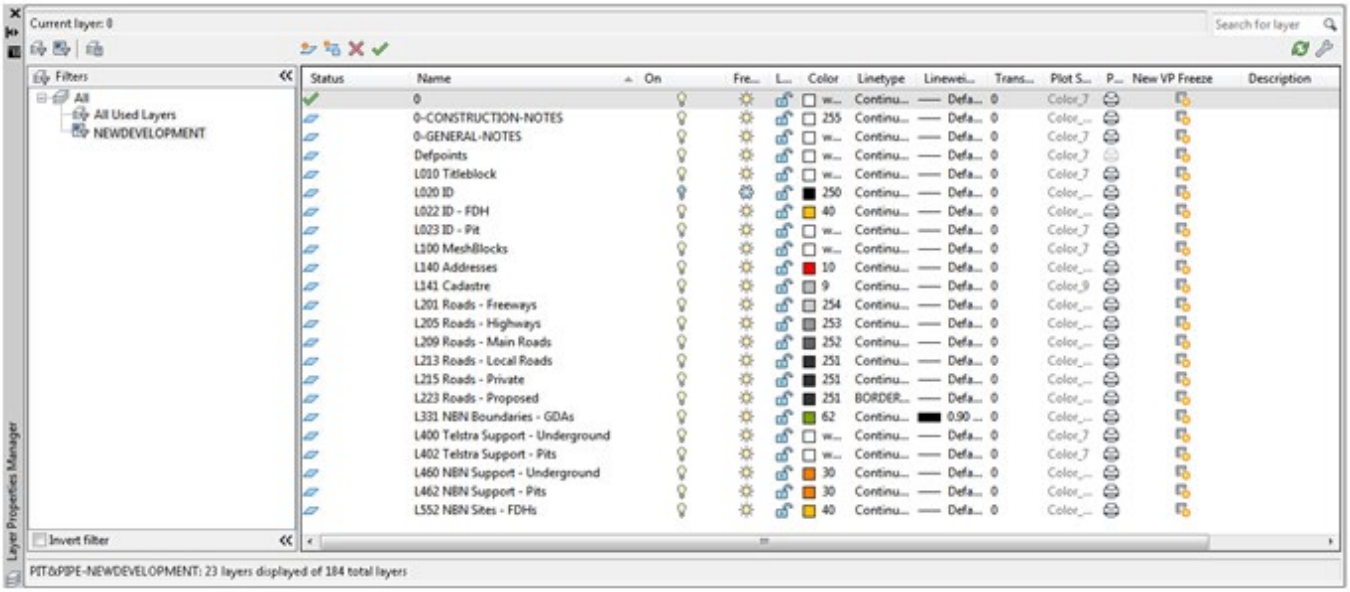


Figure 56. Layers from the NEW DEVELOPMENT filter group

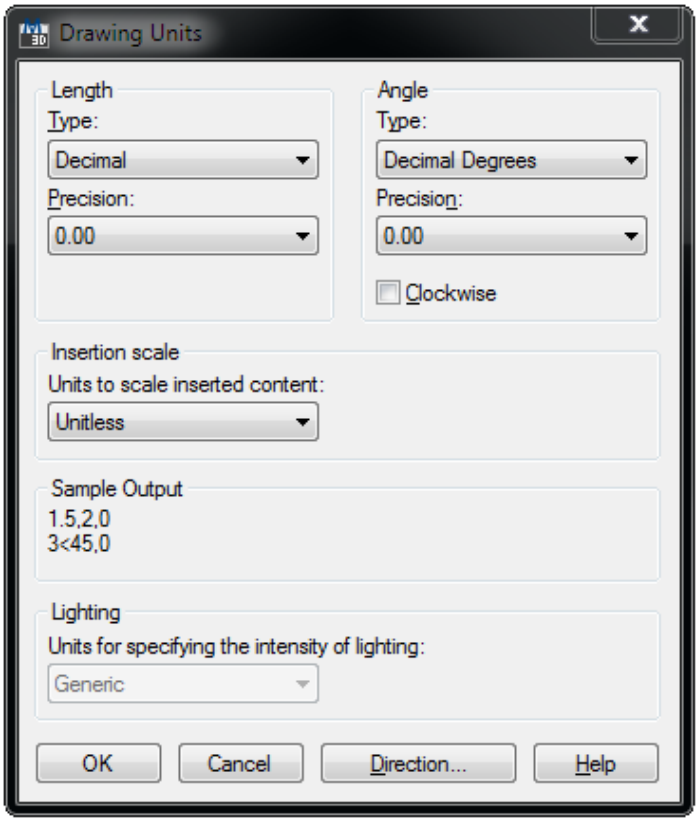
Note: Developers can add their own layers to this list, but the MDU Pathway and Equipment needs to be captured on the specified layers.

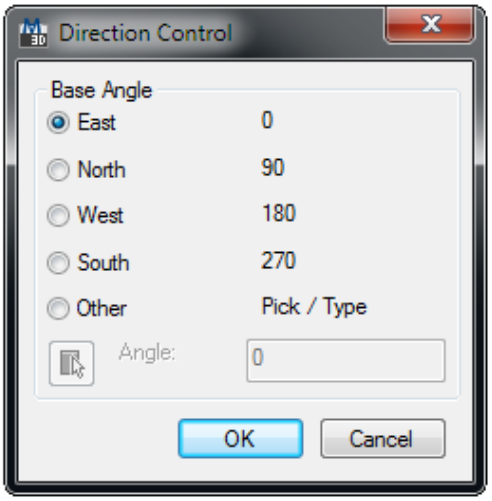
Drawing units

Drawing units must be set up as per the table below:

Table 10. AutoCAD drawing set-up

Drawing Units	Field	Value
Length	Type	Decimal
	Precision	0.00
Angle	Type	Decimal Degrees
	Precision	0.00
	Clockwise	Unticked
Insertion scale	Units to scale inserted content	Unitless
Direction Control - Base Angle	East	0





Font style

Font style must be adjusted as per the table below:

Table 11. AutoCAD font style set-up

Unit	Value
Style in use	Standard
Font Style	Regular
Width Factor	0.8
Font name	ISOCPEUR
Height	2.0
Oblique Angle	0.0

Blocks

The table below shows the blocks from the template that must be present in your drawing for the ADT to function properly.

Table 12. Required blocks

Block	Description
NBN_PIT	**nbn** Pit
NBN_TRENCH_ANNO_TYPE	Duct Type Annotation (P100, P50, etc.)
NBN_TRENCH_ANNO_LEN	Duct Length Annotation (in metres)
NBN_A1	Title Block
NBN_CAP	End Cap
NBN_TPT	Telstra Pit
NBN_FIX	QA Issue Tracker (a tag which the QA command attaches to a wrongly design pathway)
NBN_MDU_NDI	Development information
NBN_ADDRESS	Lot / Unit / Apartment / Tenancy Number

Scaling

Despite the fact that scale is set to **UNITLESS**, you must draw property boundary lines on a 1:1 scale using **METRES**. This ensures that segments of network are drawn accurately using the nominated blocks.

Base data

Property survey data should be brought into the **L141 Cadastre** layer of the drawing.

Street names must be placed in **L140 Addresses** layer.

Street numbers inside the development boundary are to be created with the **ADD** command and also placed in the **L140 Addresses** layer.

Any other base data can be presented in the layers not designated for exclusive use by the ADT commands. The designated layers are mentioned later in this document.

Title Block

When preparing a drawing, the **Title Block** and **View Ports** must be placed on the correct layer, as per the table below:

Table 13. Title block and view ports

Item	Layer
Title Block	L010 Title block
View Ports	DefPoints

Projection

All designs must be geographically oriented to the GDA 94 or GDA 2020 datum with the correct MGA projection for the area of the country you are working in. The country is divided into 8 zones for each 6 degrees of longitude.

For example, all towns East of Longitude 150 use MGA Zone 56 (GDA94).

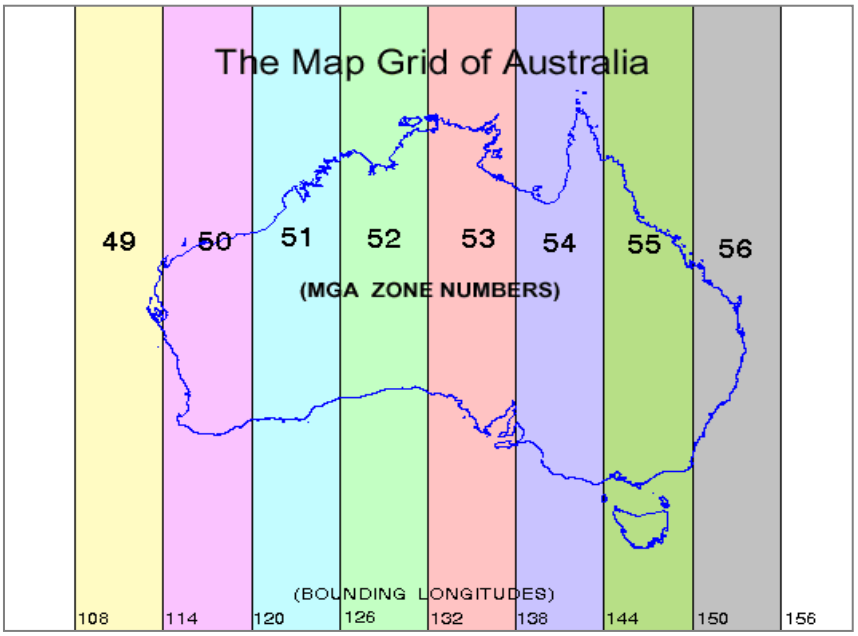


Figure 57. Map grid of Australia

Use the above map as a guide to determine the correct MGA Zone for the file you are preparing.

More information can be found at: https://www.icsm.gov.au/datum/geocentric-datum-australia-1994-gda94.

Important Note: The first item checked on designs submitted to **nbn** is the MGA zone. If designs are submitted with **incorrect Projection** and/or **incorrect MGA Zone Eastings and Northings -, nbn** will request you correct and resubmit the design.

XData (extended entity data)

XData is attached to CAD entities as a necessary requirement for the translation of attribute data between the AutoCAD dwg file and **nbn's** Physical Network Inventory database.

This is in addition to the standard object data attributes that are used purely for visual representation.

ADT creates XData where necessary during its use. XData should not be edited directly. Objects containing XData should not be copied or moved around, as XData reflects the topology of the network.

Assisted Drafting Tool (ADT)

The ADT is provided in the zip file to assist in capturing the **nbn™** MDU pathways and equipment locations, this will assist in auditing the design for compatibility with **nbn's** CAD requirements and database compatibility.

Please note the following when using the ADT:

1. The tool is designed to automate the process of MDU Pathway drafting and its use is **Mandatory**.

- In order to exit any command, you MUST press <**Enter**>, NOT <**Esc**> (pressing <**Esc**> breaks the loop and also breaks the program).

The **nbn™** approved template has been provided as a starting point for you to complete with details of your design and also to assist you in providing a design that is consistent with **nbn's** CAD standards for elements. The template includes all required Symbols, Blocks, Layers and settings.

Installation instructions

Download the zip file containing the tool from the **nbn™** website.

Load the tool into the drawing:

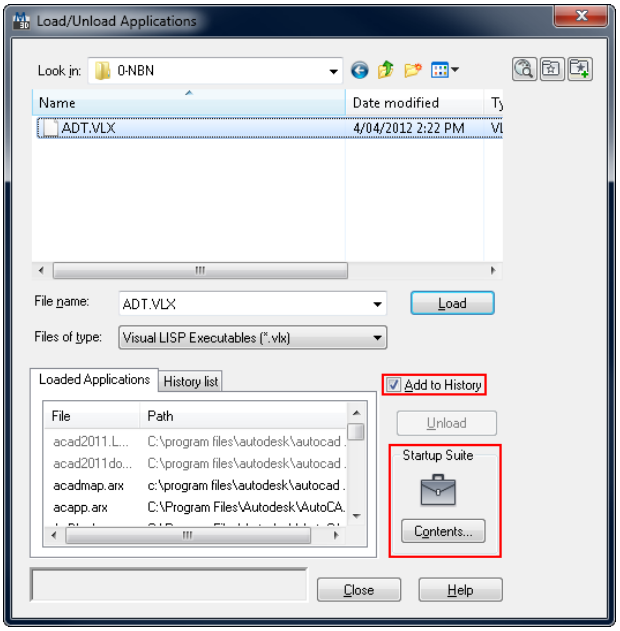
2. Save the **ADT.VLX** file or its updated version to your computer.

- Open the **nbn™** AutoCAD Template.

  Note: ADT does not work with other templates.

- Type **appload** in the command line.

  The *Load/Unload Applications* screen will display prompting you to browse for the file you want to load:



Note: if the file is not added to history and start-up suite, it will need to be loaded every time you open up a drawing.

Drafting guidelines

This section describes the methods of data capture to assist Developers in complying with nbn CAD and database compatibility standards.

Cadastre layer fix

Before you begin, ensure the cadastre (or property survey data) is in the **L141 Cadastre** layer.

> **Note**: the **PIT** command will not work if the cadastre layer is not set to **L141 Cadastre**.

Please keep the cadastre layer as simple as possible.

nbn's internal drawing Quality Audit/Conversion tool creates a polygon out of any line work that looks like a polygon visually, because polygons are expected to be lot boundaries primarily.

Unnecessary cadastre layer imagery (i.e. other utilities and services, excessive detail) will slow the processing of your drawing considerably, causing a queue to form. This will result in a delay in the review of your and other people's drawings.

The Cadastre layer must contain only the line work helpful with pathways and equipment placement when using ADT commands and must also provide sufficient visual reference for easy drawing review by nbn Planning (i.e. Address, Street name/s, unit or apartment numbers, equipment location/s, like floors, risers, communications room or cupboard).

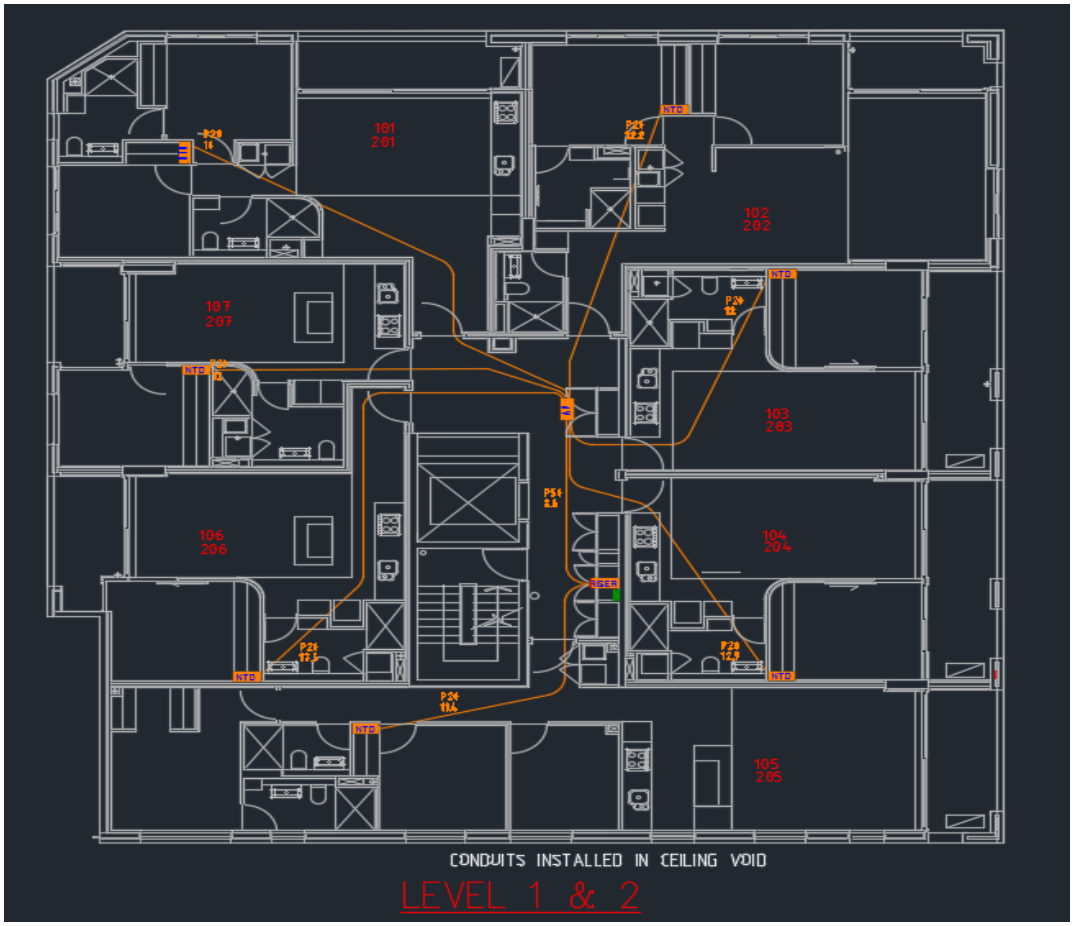


Figure 58. Good cadastre layer example

Current development stage boundary

The Current Development Boundary goes around the MDU development drafting area, the drafting area is inclusive of all street facing premises, pit and pipe connectivity of these premises shall link to the internal pit and pipe of the development. The ADT tool works inside the boundary. The boundary must consist of one closed polyline. It must be in the **L331 NBN Boundaries - GDAs** layer. The boundary colour must be **ByLayer**.

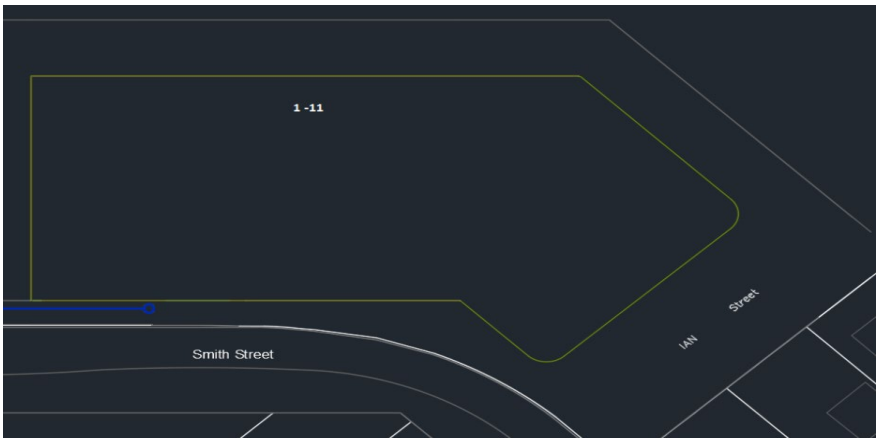


Figure 59. Current development stage boundary

Development information

Development information must be present in the drawing.

Note: All fields in the development information block (**NBN_MDU_NDI**) should be populated. The **NBN_MDU_NDI** block should be in **0-GENERAL-NOTES** layer.

Table 14. Development attributes

Attributes	Description
DEV_NAME	Development Name
DEV_COMP	Development Company
DEV_ADD	Development Address
DEV_NBNREF	**nbn** Reference Number for Development
DEV_STG	Development Stage
DEV_REP	Development Authorised Representative
DEV_MOB	Authorised Representative's Phone number
DEV_EML	Authorised Representative's email
DEV_LEVEL	Number of Levels
DEV_PREM	Number of Premises
DEV_FLOOR	Number of Like Floor Layouts
DEV_REV	Design Revision

ADT command for the Development Block

- Enter **NBN_MDU_NDI** in the command line.
- The program will ask you to pick an insertion point.
- The program will then ask you to populate the following criteria, press enter to move to the next item: -
- Development name.
- Development Company.
- Development Address.
- **nbn** Reference Number for Development (This is the ID **nbn** provided to the developer).
- Development Stage.
- Development Authorised Representative.

- Authorised Representative Phone Number.
- Authorised Representative email.
- Number of levels.
- Number of Premises.
- Number of like floor layouts.
- Design revision.

  Note: do not press Esc as it cancels the command.

Refer to the table below for **NBN_ADDRESS** block attributes.

Table 15. Address block attributes

Attribute	Prompt	Explanation
STREET_NUMBER	Enter the street number for this building.	This is the lot number of the current stage.
ID	Enter the GNAF ID of this address.	This attribute is used for data translations and should be left empty.
STREET_NAME	Enter the street name.	This is the street name for the current stage. It contains both the street name and street type e.g. MARBLE LANE.

Important Note:

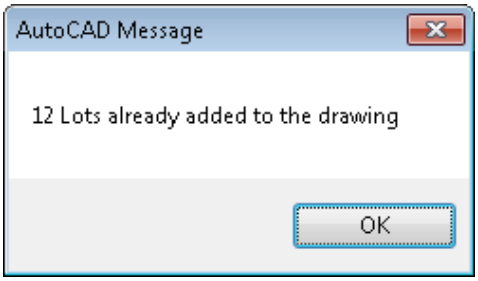
The combination of the **STREET_NUMBER** and **STREET_NAME** attribute values must be unique i.e. each street address text has to be unique. You may use the street number prefix or suffix, such as 1A, if necessary.

Assisted drafting tool (Address)

After loading the ADT.VLX file into the drawing, perform the following steps to insert an address:

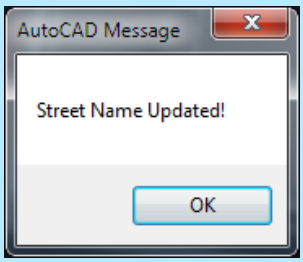
1. Enter **ADD** at command line then follow the prompts.

- The address command counts the existing addresses inside the development stage boundary.



- Click **OK** and follow the prompts:

Prompt	Explanation/Action
Please pick an insertion point:	Select the text representing the street name.

Prompt	Explanation/Action
	Note: This prompt is asking you to pick an insertion point for the address block. Yet, your very first insertion point should always be the street name along which you are going to create addresses. You must select a street name from the **L140 Addresses** layer. The **ADD** command does not work with other layers' street name texts.  Above is an example of the message displayed when the street name is first selected or changed.
Please pick an insertion point:	Lot number location has to be picked this time
Please enter lot number or press Enter for (x):	Enter the lot number with the desired prefix or suffix. **Note**: You can enter the lot number or press **Enter** or space bar to accept the default value (**x**) offered. If you choose to prefix or suffix lot numbers with letters (i.e. **1A**, **A1**) the tool is capable of automatically assigning prefix and suffix letters for you. Please refer to the tutorial for details. Please note, that neither suffix nor prefix get incremented automatically in alphabetic order when you click next insertion point. For example, instead of the 101A, 101B, 101C you might be expecting, the generated sequence will be 101A, 102A, 103A.
Please pick an insertion point:	You are in the loop of creating new addresses. From here on you can left-click at a new insertion point, then press **Enter** or **Space** to keep creating as many addresses as you need - if you are happy with the automatically generated lot number value. Other actions at this prompt: • Pick a different street name to start creating addresses along that street. • Press **Enter** or **Space** to finish the **ADD** command.
Please enter lot number or press **Enter** for (**xx**):	Lot number (**xx**) offered as a default will be the previous value incremented by one. The simplest response would be to accept it by pressing **Enter** or **Space**. Alternatively, you can edit the lot number as described above.

Assisted drafting tool MDU commands

Table 16. MDU ADT commands

MDU commands	Description
CTR	CableTray: Allows a cable tray to be inserted into the design cadastre layout.
COMM	Types of **nbn** communication equipment (PDH, CTL, FDT, CET) can be selected by using this command.
MDU_DCT	*1.* Duct Command for an MDU: Types of conduit (P100, P50, P20) can be selected by using this command. *Note: P50 can only be used for the truncation conduit on any level between risers and access panels.*
NTD	NTD Types [NTD, FIP, LIFT, SEC] can be selected by using this command
OBBU	Optional Battery Backup Unit, mandatory for essential service NTD's i.e. FIP, LIFT, SEC; optional for premises NTD's.
PET	Reflects the size (Inside Diameter) of a penetration provided i.e. between floors etc.
RISER	Represents the riser cupboard, on each level of the development.
MDU_QA	Performs the Quality Audit of the MDU pathway design.
AP	Represents the Access Panel: Where a combination of cable tray and conduit is utilised for cabling from the telecommunications riser/closet to the living unit, access panels shall be provided.

ADT command for a riser

- Enter **Riser** in the command line.

  The program will ask you to pick an insertion point.

  Note: do not press **Esc** as it cancels the command.

- Press **Enter** to finish.

ADT command for an Access Panel:

- Enter **AP** in the command line.

  The program will ask you to pick an insertion point

  Note: do not press **Esc** as it cancels the command.

- Press **Enter** to finish.

ADT command for an NTD:

- Enter **NTD** in the command line.

  The program will ask you to pick an insertion point

  The program will then ask you to: please select the **nbn** NTD type (NTD, FIP, LIFT, SEC)
- Select the NTD type

  Note: do not press **Esc** as it cancels the command.
- Press **Enter** to finish.

ADT command for a Penetration:

- Enter **PET** in the command line.

  The program will ask you to pick an insertion point

  Note: do not press **Esc** as it cancels the command.
- Press **Enter** to finish.

ADT command for an Optional Battery Backup Unit:

- Enter **OBBU** in the command line.

  The program will ask you to pick an insertion point

  Note: do not press **Esc** as it cancels the command.
- Press **Enter** to finish.

ADT command for a PDH:

- Enter **COMM** in the command line.

  The program will ask you to pick an insertion point.
- Choose **nbn** COMM Type.
- Select **PDH**.

  Note: do not press **Esc** as it cancels the command.
- Press **Enter** to finish.

ADT command for a CTL:

- Enter **COMM** in the command line.

  The program will ask you to pick an insertion point.
- Choose **nbn** COMM Type.
- Select **CTL**.

  Note: do not press **Esc** as it cancels the command.

- Press **Enter** to finish.

ADT command for a FDT:

- Enter **COMM** in the command line.

  The program will ask you to pick an insertion point.
- Choose **nbn** COMM Type.
- Select **FDT**.

  Note: do not press **Esc** as it cancels the command.
- Press **Enter** to finish.

ADT command for a CET:

- Enter **COMM** in the command line.

  The program will ask you to pick an insertion point.
- Choose **nbn** COMM Type.
- Select CET.

  Note: do not press **Esc** as it cancels the command.
- Press **Enter** to finish.

ADT for the MDU Cable Tray:

- Enter **CTR** in the command line.

  The program will ask to specify the start point of the cable tray and continue your cable tray line to the next riser, access panel or penetration.

  Note: do not press **Esc** as it cancels the command.
- Press **Enter** when you finish drawing the cable tray.

  The program draws a Polyline representing a cable tray.
- Please enter the cable tray length or press enter for the calculated length.

ADT for the MDU Truncation or Pathway Conduit:

- Enter **MDU_DCT** in the command line.

  The program will ask to specify the start point of the conduit.
- Draw the duct and press **Enter** to finish.

  Note: do not press **Esc** as it cancels the command.
- Please enter the conduit type or press **Enter** for the default (P100).
- Please enter conduit length or press **Enter** for (Calculated length).

- Please select an insertion point for the duct attributes.

> **Note**:
>
> You have the option of entering conduit length or using the calculated length.

Assisted drafting tool (Duct Update Command)

Edit a conduit

- Enter **DCTUPD** in the command line.
- Select duct type annotation if you have to edit duct type.

  The program will ask you to select the line the annotation is related to.

  The program will ask you to enter the desired type.
- Enter the duct type (P50).

  Note: The conduit type will be updated in both the annotation and the line XData.
- Similar steps are applicable if you choose to update duct length.

Lead-ins

When no **NBN_PIT** is chosen as the duct end, the **DCT** command will create a Lead-In in with **NBN_CAP** block as its endpoint. The **NBN_CAP** will be placed in the duct layer **L460 NBN Support – Underground**.

> **Note**:
>
> The **nbn** preferred lead-in location at the property boundary should be confirmed with the **nbn** deployment specialist.

Refer to the table below for **NBN_CAP** attributes.

Table 17. NBN_CAP block attributes

Attribute	M/O	Prompt	Explanation
ID	M	Enter a Unique ID within this drawing for this null node.	This is the **nbn** identifier for the end cap and has the format **NEC-XXX**. **XXX** is a 3 digit number starting from 001 and incrementing sequentially.
TYPE	M	Enter the type for this null node.	ENDCAP

Telstra Pit

To capture Telstra pit located outside of the development to support the lead-in location, use the **TPT** command. This will place a **NBN_TPT** block in the **L402 Telstra Support – Pits** layer. Linetype and Lineweight properties are set to **ByLayer**.

Refer to the table below**Error! Reference source not found.** for **NBN_TPT** block attribute description:

Table 18. NBN_TPT block attribute

Attribute	M/O	Prompt	Explanation
SIZE	M	Size	The size of the Telstra Pit

Assisted drafting tool (TPT)

- Enter **TPT** in the command line.
- At the prompt **PLEASE PICK AN INSERTION POINT OR PRESS Enter TO FINISH**, select the place for the Telstra pit.
- At this prompt **PLEASE ENTER TELSTRA PIT TYPE, (M) for MANHOLE, Enter FOR (5),** either press **Enter** to accept **5**, or type a different number or **M** and press **Enter**.

To exit the loop of Telstra Pit creation, press <**Enter**> when asked to pick an insertion point again.

Quality audit for MDU pathway design

The MDU_QA command helps developers to audit their designs before submitting them to **nbn**.

Refer to the table below for the QA tests:

Table 19. MDU_QA command

Item	Description
Development Information	Checks if: • Development Information block is inserted • All fields are populated
Boundary Check	Checks if: • One (and only one) current development stage boundary, drawn with AutoCAD polyline, is present in **L331 NBN Boundaries – GDAs** layer. • There are no AutoCAD lines in the **L331 NBN Boundaries – GDAs** layer.
Special cases (QA run against an unfinished design by mistake)	Checks if: • There are no duct or cable trays inside the development stage boundary. • There are any risers, penetrations, access panels, NTD's etc. not connected to any duct or cable tray.
Pit Check	Checks if: • All **nbn™** pits are set to the right layer and right colour. • All **nbn™** pits are the right type (2, 5, 6, 8, 9, Manhole). • No active pits are outside the development boundary. **Note**: previous stage pits connected to the current stage must be coloured Yellow (2) —the new tool drags pits back into L462 automatically.

Item	Description
	Performs the following correction: • Renumbers pits sequentially starting from one.
Duct Check	Checks if: • All ducts have XData attached. • All ducts have correctly snapped start and end points (to pits/endcaps).

Assisted drafting tool (MDU_QA)

Enter MDU_**QA** in the command line.

The MDU_QA command will run, and you must fix faulty items if any are found.

Note: the MDU_QA command works in steps. Upon the completion of one step it moves to the next step, so it is extremely important to follow through with the MDU_QA command and fix all issues.

If the MDU_QA command finds faulty items that need manual correction, it inserts an **NBN_FIX** block with commentary text.

Refer to the table below for an explanation of NBN_FIX errors.

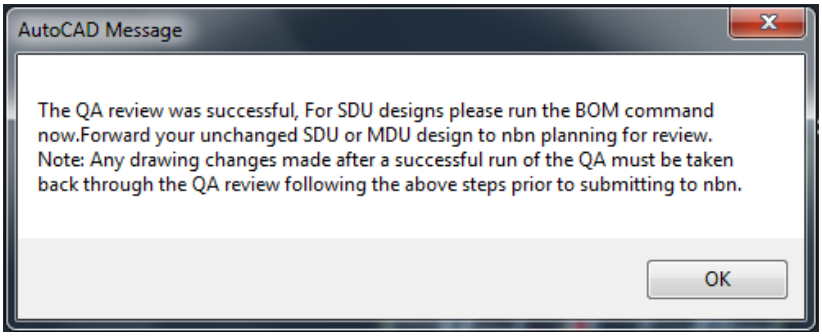
Table 20. NBN_FIX text description

Error text	Explanation	Required action
Errors tagged with **NBN**_FIX block (yellow circle with a short error message)		
TYPE	Pit type is not 2, 5, 6, 8, or 9	Manual editing of the pit type attribute of **NBN_PIT** block is allowed.
NO XDATA	Duct Polyline with no XData attached. This error usually means that a problem with one of the ducts was found, like polyline not created with the MDU_DCT command.	Delete the Duct and rebuild it with the MDU_DCT command.
NO CONNECTION	Orphan pit, risers, access panels, NTD's etc. or a pit not properly snapped to the duct end, or a duct without a pit/end cap at its start or end.	Make sure there are no orphan pits risers, access panels, NTD's etc. or unattached duct ends.
SHORT DUCT	Duct polyline length is 2.5 m or less.	You are allowed to draw ducts longer than you need, but the desired length can be entered at DCT command prompt. That value will be shown in the annotation.
Layer	NTD/RISER/OBBU/AP/COMM	Incorrect Layer, move the item to the correct layer.

Error text	Explanation	Required action
COLOUR	NTD/RISER/OBBU/AP/COMM	Incorrect Colour, change the item to the correct colour.
Risers should have both ends snapped to P50	Where a P50 is required to connect offset risers the P50 should have its ends snapped to risers.	Draw the P50 snapping one end to a riser and the other to the offset riser.
P20 should its ends snapped to AP/Riser or NTD	A P20 should only be drawn snapping the ends to a Riser, Access Panel or NTD. Or a Cable Tray where there is a suspended accessible ceiling for commercial or retail tenancies	Draw a P20 snapped to an AP, Riser, NTD or Cable Tray.
P50 should have its one end snapped to AP/Riser	A P50 truncation duct is drawn snapping between a Riser to Riser: Riser to Access panel: Access Panel to Access Panel. A P50 should not be used to connect between any **nbn** equipment.	Draw the P50 truncation duct snapping to Riser, Access Panel.
P20 should not snapped between ENDCAPS	A P20 should not be drawn snapping one end to an endcap, it must be snapped between two points; Access Panel, Riser, NTD or Cable Tray	Draw a P20 snapping to an AP, Riser, NTD, or Cable Tray
Overlapping ducts are not allowed	This error occurs when two or more ducts touch or cross each other.	Draw ducts maintaining separation.
Message: No section of conduit shall be longer than 50m between pull/draw points	A continuous duct should not exceed 50m between pull / draw points.	Draw the duct reflecting the correct distance.
Message: CTR length between access points should not be greater than 15m	A Cable Tray should be drawn no further than 15m between draw points i.e. Access Panel to Access Panel.	Draw the CTR reflecting the correct distance.
Message: Duct length between Access Panels should not be greater than 15m	A duct length should not exceed 15m between Access Panels	Draw the duct reflecting the correct distance.
Message: Start point is not selected	MDU_DCT was entered in the command and has not been drawn from a start point i.e. Riser, Access Panel	Enter MDU_DCT in the command line, select the start point, and draw the duct to the end point.

After identifying the issue, please take corrective actions to fix the faulty items.

If the Quality Audit is successful, the following message will display:



Note: The BOM command is for SDU designs only:

Notes:

- This message also advises you to never make changes between the last successful run of the QA command and actual emailing of your drawing to **nbn** for review.
- Developers should not simply rely on the ADT and must independently ensure that their design complies with all of the requirements of the Multi Dwelling Unit (MDU) building engineering and design standard - new developments (NBN-TE-CTO-284) and any other applicable -specifications or requirements under their agreement with **nbn**.

Checklists

The process for **nbn** commenting on multi dwelling unit designs and updating **nbn**'s systems and database requires Developers to use planning tools and methodologies consistent with **nbn**'s requirements.

An MDU design checklists have been created to assist you:

- Appendix B MPS/MDU pathway design checklist.

This checklist is designed to ensure that the system and database compatibility requirements have been met.

The checklist is available from the **nbn™** website in the Multi Dwelling Unit (MDU) building engineering and design standard - new developments Design zip file.

Contact us

Design submission and queries

For all multi dwelling unit design submissions please submit all MDU Designs via the link design upload tool.

new-developments/design-build-install/upload-designs

All design review and corrective actions queries should be sent to: NBNCoPlanning@nbnco.com.au

Assisted drafting tool (ADT) support

All ADT technical issues should be sent to: NBNADTQuestions@nbnco.com.au.

Appendix B MPS/MDU pathway design checklist

Table 21. Greenfield MPS/MDU pathway design checklist for FTTP

☐	1. All design drawings shall be submitted to scale in AutoCAD.dwg format (minimum version 2013) to scale 1:1. All .dwg format pathway design drawings shall be a single DWG/CAD, with all information built in the file (i.e. no attachments, binding or X-Refs). Minimum AutoCAD minimum version 2013. This design is also required in PDF format. All technical guidelines can be found at the **nbn** website at: http://www.nbn.com.au/develop-or-plan-with-the-nbn/new-developments/resources-guidelines.html#.VCD0CPmSxsM
☐	2. The latest version of the ADT (Assisted Drafting Tool) is being used in AutoCAD.
☐	3. The latest version **nbn** ADT Template has been applied and populated in the AutoCAD design reflected in the paper space.
☐	4. The ADT Development Information block is populated in the AutoCAD design (**NBN**_MDU_NDI).
☐	5. The Northing reference shall be shown in the design.
☐	6. Ensure a floor plan for each floor layout is supplied, depicting the communication pathway from riser cupboard to apartment (identical floors can be shown on the same floor plan). Unit/apartment/tenancy numbering shall be shown on all floor plans. All efforts should be made to ensure the pathways are supplied with minimal layers, sufficient to capture **nbn**'s requirements. No other utilities are to be reflected.
☐	7. Ensure the lead-in pathway is shown from the property boundary to the communications room (conduit, cable tray or a combination of both). Reflect the lead-in conduit size (i.e. P100 or P50).
☐	8. Street names shall be reflected in relation to the address and frontage of the MDU/MPS. The **nbn** preferred lead-in location at the property boundary should be confirmed with the **nbn** deployment specialist.
☐	9. Provide a front elevation of the riser cupboard layout, with appropriate space reserved for **nbn**™ equipment.

☐	10. For FTTP: ensure the communications room has the spatial requirements for NTD/PSUs to service lifts and the Fire Indicator Panel (FIP). Provide a front elevation of the communications room and/or cupboard layout, with appropriate space reserved for **nbn™** equipment (PDH and essential services Customer Premises Equipment [CPE]). ℹ • There is one (1) x NTD/PSU combination per lift and one (1) x NTD/PSU combination per FIP, including the CET. • NTD/PSU combinations for essential services can be placed in alternate locations after consultation with and agreement from your **nbn** account manager.
☐	11. Ensure the pathways from the communications room to each riser are shown (conduit, cable tray or a combination of both).
☐	12. Ensure the riser cupboard shows an FDT medium cabinet on each floor and the spatial dimensions of the riser cupboards are in accordance with **nbn** guidelines on a floor plan.
☐	13. Provide a schematic of the riser shaft depicting the distance between floors.
☐	14. 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 (3) bends.
☐	15. If the pathway from the riser cupboard to the apartment is a combination conduit/cable tray, then access panels shall be depicted in the designs at every change in 'cable tray' direction, as well as any point where the individual nominal P20 lead-ins meet the cable tray. Access panels shall be no more than 15 m apart.
☐	16. P20 conduits shall have no more than three (3) x preformed bends between the riser cupboard or the access panel to the unit/apartment/tenancy.
☐	17. The location and spatial separations for the **nbn™** CPE (NTD/PSU) shall be in accordance with **nbn** guidelines.
☐	18. Floor plans shall denote unit/apartment numbers.
☐	19. For horizontal or hybrid MDUs, the developer must submit a pit and conduit as-built design in AUTOCAD .dwg format (version 2010 only) to scale 1:1. The design shall be presented in the **nbn** template and reflect the correct symbols and version control. The design must adhere to the technical guidelines in ***NBN**-TE-CTO-194 New developments: deployment of the **nbn™** pit and conduit network* (including the as-built checklists) before **nbn** can deem it fit for purpose. (For hybrid MDUs, checkpoints 1-11 shall be verified as well). This design is also required in PDF format.

Refer to your **nbn** account manager for any clarification of the communications pathway designs.

Appendix C nbn™ FTTx pathways informal visual inspection checklist – MPS/MDU

This is not an **nbn certificate of practical completion**

DEVELOPMENT SITE	
PROJECT ID	
4. ADDRESS	
5. INSPECTION DATE	
6. INSPECTED FLOOR/S	
7. TECHNOLOGY	

Table 22. nbn™ FTTx pathways informal visual inspection checklist

Item	Description	Pass Y/N or N/A	Photo taken Y/N	Details
Lead-In Conduit (LIC) LIC is the conduit from the property boundary to within the communication room/cupboard.				
1	Lead in conduit is located at the property boundary edge within 2 m of an **nbn**™ pit (or Telstra manhole/pit where applicable) in road reserve or as close to 2 m as possible.			
2	The LIC is strung.			
3	The LIC is capped at the property boundary.			
4	The LIC is installed as per the design.			
Communications room The BFD and essential services shall be located in the communications room.				
1	Depending on the specific technology being delivered, there should be sufficient space for following items as per the guidelines: BFD large enclosure.			

Item	Description	Pass Y/N or N/A	Photo taken Y/N	Details
2	There is sufficient space for essential services.			
3	A location is reserved for essential service GPO sockets.			
4	CET 6 mm² earth cable is installed from the electrical switchboard.			
5	There is sufficient reserved space and cable tray for cable management requirements around **nbn**™ equipment.			
6	Pathway transition points are adequately supported (no fibre is to be self-supported over a maximum distance of 200 mm).			
7	The fibre route is not crossing other services.			
8	Cable tray or a minimum of nominal P50 has been used.			
9	Permanent lighting is available.			
10	A lockable door is present.			
11	The communications room is clean, tidy and dry.			
Trunk pathways Trunk pathways are the pathways from the communications room to the riser and from the riser to nominal P20 premises conduit.				
1	Cable tray or a minimum of nominal P50 has been used.			
2	All conduit is strung and labelled as required.			
3	The fibre route is not crossing other services.			
4	A minimum of 100 mm separation has been reserved within the cable tray from other services.			

Item	Description	Pass Y/N or N/A	Photo taken Y/N	Details
5	450 mm x 450 mm ceiling access panels are installed in locations were cable tray shall be enclosed. Small sections of perforated cable tray are installed at intersections of P50 and nominal P20 conduits to tie up transitioning premise cables.			
6	Ceiling access panels are no more than 15 m apart where cable tray is in use.			
7	No section of P50 conduit is longer than 50 m.			
8	Pre-formed 90 degree bends radius is used for all P50.			
9	Pathway transition points are adequately supported (no fibre is to be self-supported over a maximum distance of 200 mm).			
10	The conduit and cable tray are installed as per the design.			
Riser cupboards Riser cupboards are the cupboards where the FDT, SDTs shall be located.				
1	There is sufficient space for **nbn**™ equipment as per the guidelines.			
2	There is sufficient reserved space and cable tray for cable management requirements around **nbn**™ equipment.			
3	Wall mounted cable management is installed from riser hole to riser hole.			
4	A minimum of 100 mm separation has been reserved within the cable tray from other services.			
5	The fibre route is not crossing other services.			
6	The HFC cable is not crossing other services.			

Item	Description	Pass Y/N or N/A	Photo taken Y/N	Details
7	Pathway transition points are adequately supported (no fibre is to be self-supported over a maximum distance of 200 mm).			
8	Fire stopping arrangements have been discussed.			
For FTTPL premise conduit and the NTD location				
1	All premises conduit is rigid, white, nominal P20 telecommunications conduit.			
2	All conduit is strung.			
3	All conduit is labelled with the unit ID (on the string and conduit).			
4	There are no more than three (3) x 90 degree bends between drawer points.			
5	Pre-formed 90 degree bends are used: 300 mm for lateral pathways and 100 mm for the ceiling drop to the wall cavity. (There are no handmade bends.)			
6	No conduit section is longer than 50 m.			
7	The NTD/PSU spatial location is reserved as per **nbn** guideline templates.			
8	The NTD/PSU location has sufficient ventilation as per the **nbn** guidelines.			
9	All conduits are installed as per the design.			
10	Conduits finish a maximum of 100 mm from the location of the NTD enclosure.			
11	All conduits are glued.			
Miscellaneous				
1				

Provision of this document does not confirm that the developer shall achieve practical completion in relation to the pathway works or any other works. If the developer believes 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** shall

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 the developer or signed a separate letter of 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_____

Quality Assurance (QA) and Construction Supervisor_____

Photos of observations