LBNCo Pty Ltd

Detailed Specifications, Requirements and Guidelines for Builders and Cabling Providers

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Issue 1

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Issue #	Issue Date	Revision	Revision Date	Comments	Prepared By	Authorised By
1	30/09/15	0		Document created for builders and owners	Tim O'Dea	Ben Seaman

Distribution List

Document Approval

Name	Association	Signature	Date
Tim O'Dea	Document creator		
Lachlan Delaney	Field Support Manager		
Terry Limnidis	Connections Manager		
Ben Seaman	Chief Technical Officer		
Stephen Picton	Chief Executive Officer		

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PURPOSE

The purpose of this document is to provide detailed technical guidance and information to developers, builders, electrical contractors, telecommunications cabling providers *'cablers'* and end-users about connection of premises to the LBNCo Fibre to the Premises (FttP) network.

This document is referenced by other summary documents which are specifically aimed at Builders and Premises (Home) Owners.

SCOPE

Applies to connecting any building constructed for use as a dwelling or small business within greenfields broadacre real estate developments where LBNCo has been selected as the FttP provider.

It applies to detached buildings (single dwellings) and semi-detached buildings such as town houses, duplexes, triplexes etc.

It also applies to group and strata housing on 'Super Lots' although special arrangements would have to be made to accommodate these.

It is specifically for the end-user end of the network from the LBNCo Service Drop Pit in the street reserve and for FttP connections where the Network Termination Device (NTD) is installed internally within the premises.

GLOSSARY and DEFINITIONS

Builder	Contracted by the Owner to build the premises.
Developer	The seller of the Lot of land. Builds and provides infrastructure in the estate.
Finished Ground Level (FGL)	This is the level of the ground external to the home after the Lot is Levelled
Fibre-to-the-Premises (FttP)	Telecommunication Network using an optical fibre to each of the premises
Fibre Wall Outlet (FWO)	Fibre Wall Outlet - termination point of the fibre from PCD to NTD
General Power Outlet (GPO)	General Power Outlet - switched electrical power socket used in premises
Electricity Connection Pillar	Owned by the electricity supplier and connects the underground electricity network to the premises. In the form of an above ground green dome or box.
Home Distributor (HD)	Equipment from which telecommunications and TV cabling is distributed to outlets throughout the premises. Is usually housed within and enclosure or cabinet and can also be described as a Smart Wiring Hub or Distribution Hub. Can also house LBNCo's NTD equipment.
Internal Conduit	Conduit inside the premises that carriers the optic fibre cable from the PCD to the NTD
LBNCo	Licenced carrier building and operating the FttP network. Wholesale Service Provider.

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Lot	The parcel of land purchased by the landowner from the Developer. Sometimes known as the house lot or block.
Network Termination Device (NTD)	The device where the optical fibre terminates at the premises and converts electronic signals to and from light signals. It provides the interface with customer wiring.
Occupant	The occupier of the premises once built. Can be the Owner or Tennant
Optical Network Unit (ONU)	LBNCo term for the NTD, also known as ONT Optical Network Transceiver
Owner	The purchaser of the Lot of land and owner of premises to be built
Premises Termination Device (PCD)	The device where the lead-in fibre terminates and is connected to the Internal Fibre between the PCD and the NTD. Can be referred to as the Utility Box.
Pit	Plastic communications enclosure part buried in the ground that contains the network distribution equipment
Uninterruptable Power Supply (UPS)	Battery back-up power supply
Utility Box	Another description of the PCD
Radio Frequency (RF)	Radio Frequency signal
Retail Service Provider (RSP)	Retail Service Provider - provides the services to the end-user
Service Drop	'Lead-in' - The connection from the Pit to the PCD
Service Drop Conduit	The conduit from the Pit to the PCD that carries the Optical Fibre lead-in fibre cable
Starter Conduit	Conduit from the Pit that is joined to the Service Drop Conduit and carries the lead-in fibre
User Network Interface Data (UNI-D)	User Network Interface – Data (RJ45 Ethernet data port)
User Network Interface Voice (UNI-V)	User Network Interface – Voice (RJ11 telephone port)

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RESPONSIBILITIES

The following table shows who is responsible for what components in the installation and connection process.

Developer	Ensures that the land purchaser and potential building owner are aware of the requirements for the premises to be connected to the LBNCo FttP network as laid out in this document including the consequences of not complying.
	Provides the land purchaser with access to documents or websites laying out the requirements during the planning, design and building stages, including this document.
	Note: The land purchaser can be an owner who engages a builder to plan and construct the premises or could be a developer/ builder who offers the land as part of a house and land package.
Land Purchaser /Premises Owner	Ensures that the Builder has access to this and other relevant documents prior to finalising plans for the building.

	Discusses the requirements and reaches agreement with the builder about:
	• Telecommunications services required and where
	• Entertainment services required and where (Free-to-air TV, pay TV, Subscription TV etc)
	• Location and placement of the LBNCo fibre equipment
	• Internal customer cabling
	• Compliance with these guidelines
	  ○ Space and pathway requirements
	  ○ Equipment specifications (conduits etc)

	Note: Where the premises are to be rented/leased after completion, ***the premises owner ensures that the premises are suitably prepared during the building stage*** *prior to tenanting to allow for LBNCo equipment to be installed when the tenant applies for services from a Retail Service Provider. In particular pre-installation of Service Drop and Internal Conduits, allocation of space for the Premises Connection Device (PCD) and NTD and provision of a General Power Outlet (GPO) at the NTD location is essential.*

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Builder (including sub-contractors such as electricians and cabling providers)	Installs the facilities required to connect the LBNCo fibre network to the premises including: • Service Drop (Lead-in) Conduit with draw rope • Internal conduit from the PCD location to the NTD location with draw rope • GPO at the NTD location
	Internal customer cabling and outlets to the Building owners requirements including for: • Telephone • Data • Security • Home care and safety • Entertainment • Home automation • Routing, patching and splitting • Power circuits Installs the Home Distributor (HD) as required by the Owner
	Connects internal cabling to the Network Boundary at the NTD
LBNCo	Provides and operates the FttP infrastructure to which the premises are to be connected to enable provision of services by the Retail Service Provider (RSP)
	Provides the Street Pit and Starter Conduit

	Supply and install
	• PCD (Utility box)
	• NTD including
	  ○ NTD device (ONU)
	  ○ Fibre Wall Outlet (FWO)
	  ○ Power supply
	• Service Drop *'Lead-in'* fibre optic cable
	• Internal *'PCD to NTD'* fibre optic cable

Occupant (including tenants)	Contacts and applies to the RSP of their choice for provision of services
Retail Service Provider (RSP)	Provides Services via the Network Boundary Ports at the NTD including: • Superfast Broadband • Telephone • Entertainment
	Initiates the installation and activation of the LBNCo equipment at the premises

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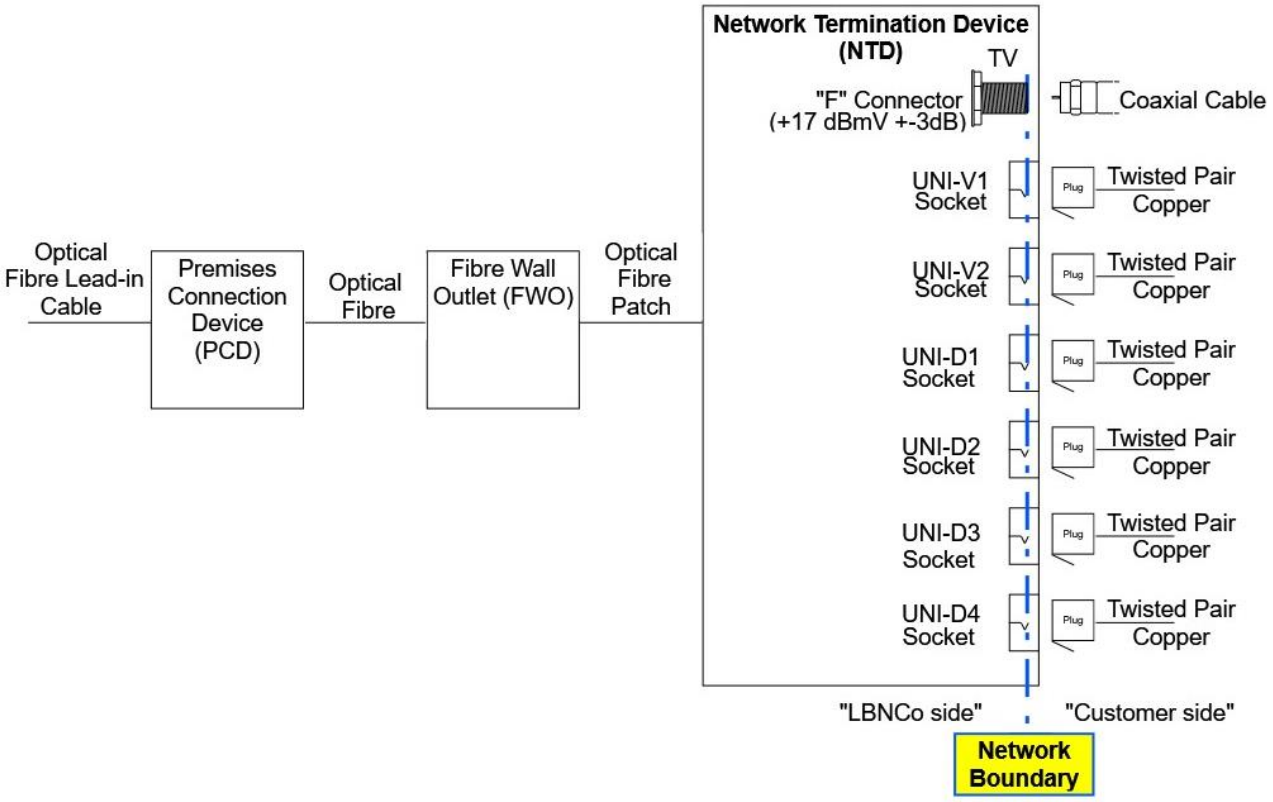
IMPORTANT INFORMATION – **READ BEFORE YOU START**

Network Boundary Point

The network boundary in the LBNCo FttP network is at the Service Ports of the NTD as shown here:



LBNCo FttP Network Boundary Definition

ACMA Wiring Rules

All cabling work performed on the customer side of the Network Boundary Point is subject to the Australian Communications and Media Authority (ACMA) administered *Telecommunications Cabling Provider Rules 2014 (CPRs)* and must be cabled according to the standard *AS CA S009-2013 Installation requirements for customer cabling (Wiring Rules)*.

Cabling work includes the connection, installation or maintenance (repair) of Customer cabling.

Cabling work must be carried out by installers registered to install customer premises cabling.

Cabling on the LBNCo side of the Network Boundary, up to and including the Network Boundary, is not covered by these ACMA rules.

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Building Project Timeline

The following is provided to assist with determining who needs to do what and when, and what to expect during the lifecycle of the building project with reference to the LBNCo installation and connection. There will be variations with different types of developments, buildings, customers, builders, connections and RSPs, however this is typical of a home building project in a greenfields broadacre development.

Project Stage	What	Who
Prior to building commencement	FttP network installed • Pipe and pit installed • Service Drop **Starter** Conduit installed • FttP fibre network installed and commissioned	LBNCo
Prior to building commencement (pre-start)	Plan and design telecommunications and entertainment requirements for the building including: • Location of PCD • Location of NTD • Internal cabling	Owner and Builder
From building commencement and prior to driveways and landscaping – at the same time as the power lead-in conduit is installed	Install Service Drop Conduit including connection to the Starter Conduit and installing the Draw Rope	Builder
Before plate height (before roof completed) when electrical conduits and wiring is installed	Install Internal Conduit including Draw Rope	Builder
	Provide for installation of GPO at NTD location	Builder
After lock-up (final fit-off)	Install GPO faceplate at NTD location	Builder
Prior to handover	Contact RSP of choice and apply for services	Owner
At completion of building can be prior to or after handover (requires power connection)	Install and commission LBNCo equipment	LBNCo (initiated by the RSP)
After installation of LBNCo equipment	Connect Customer Cabling to LBNCo NTD at the Network Boundary	RSP, Builder, Owner
	Activate services	RSP and Owner

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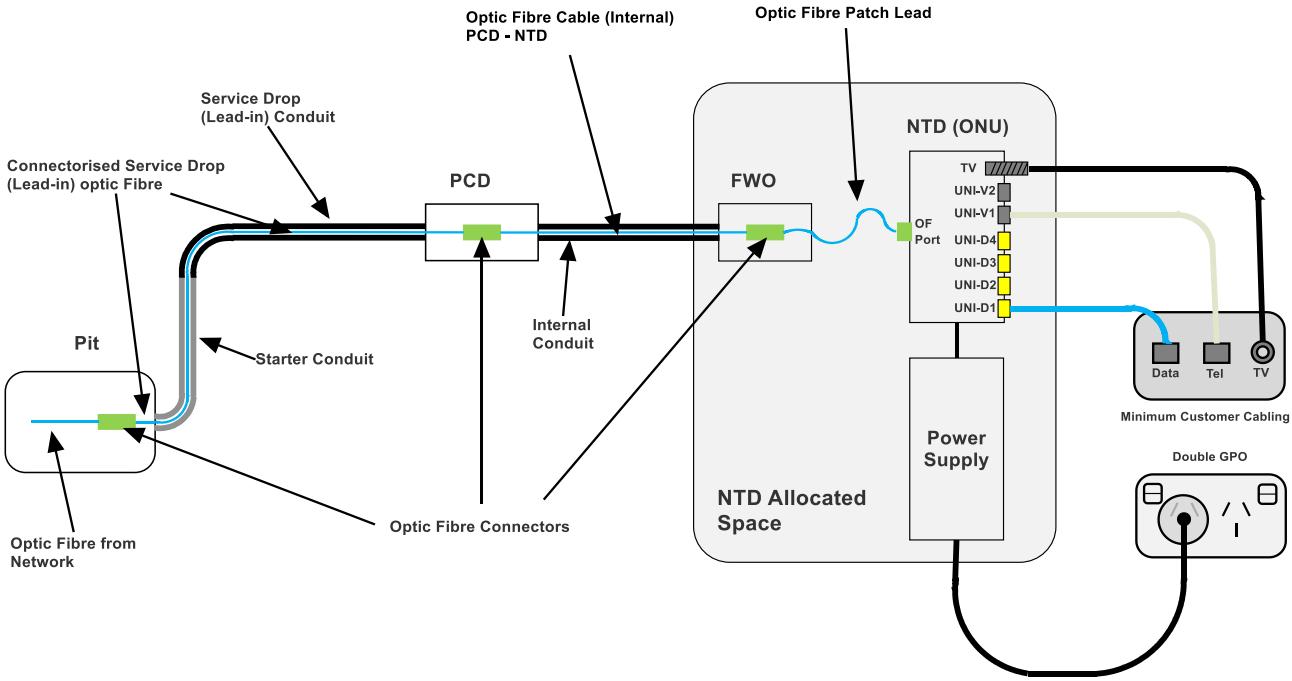
OVERALL DESCRIPTION AND SPECIFICATIONS

Overall System Diagram



LBNCo Fibre-to-the Premises (FttP) Customer End Installation

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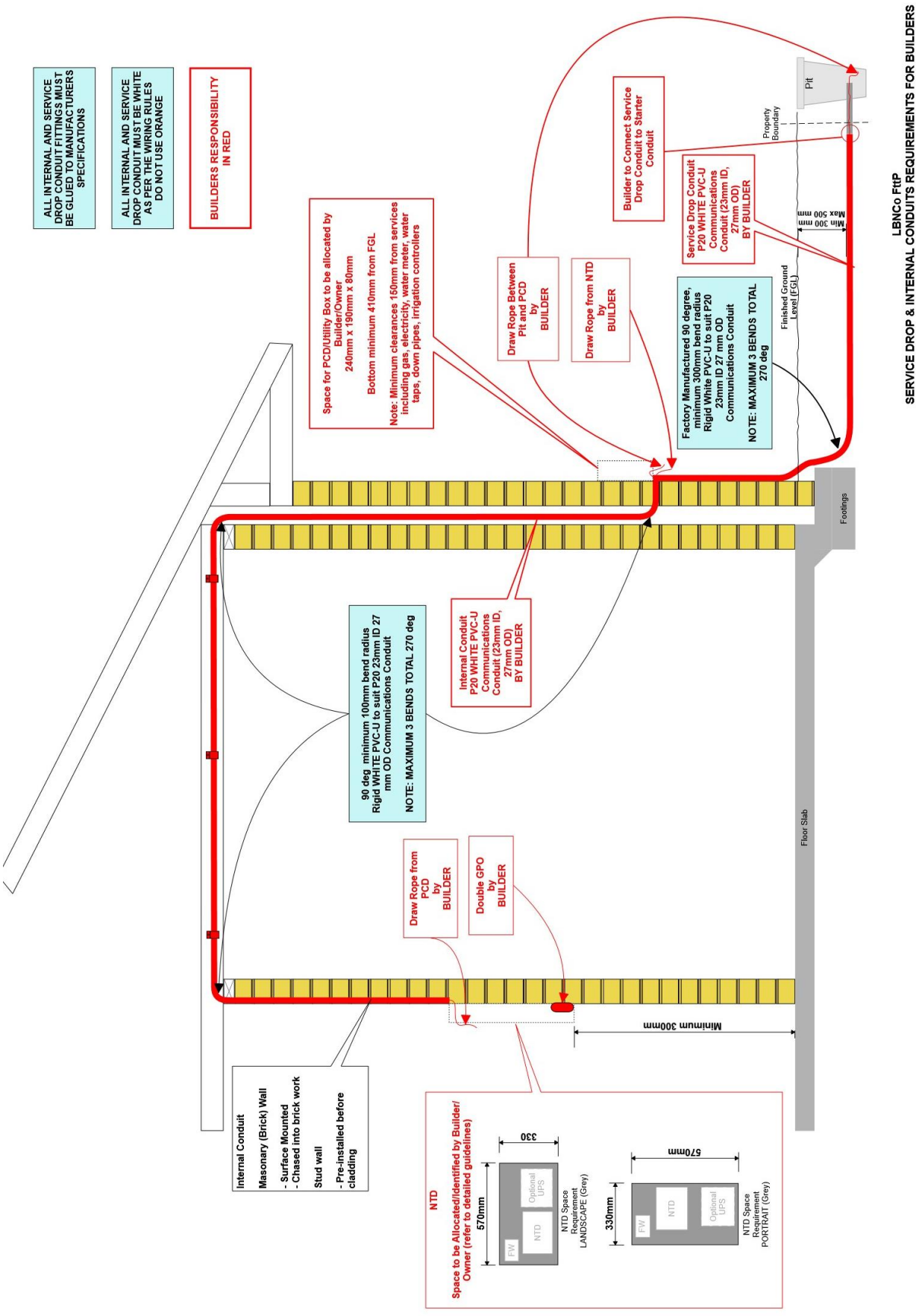
Owner/Builder Requirement Diagram



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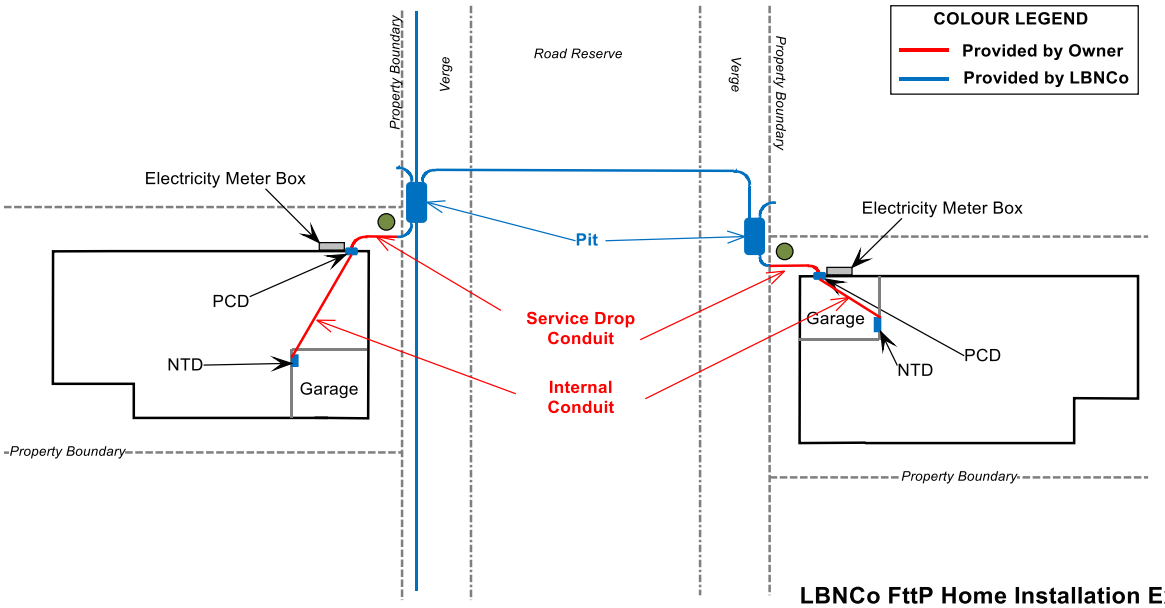
System Components

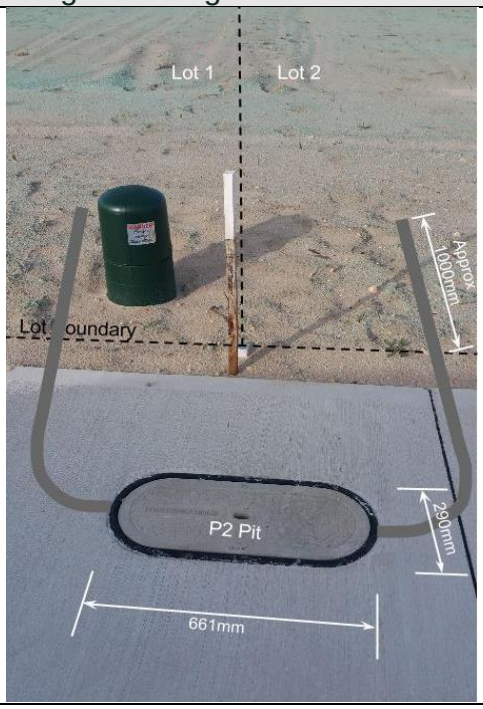
PIT

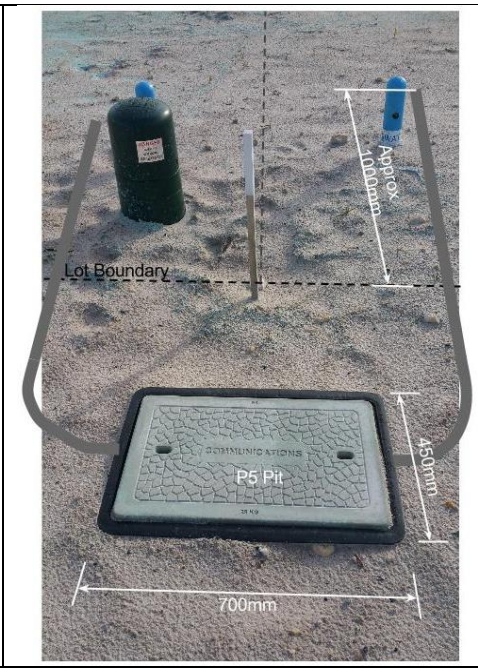
- ***Provided and installed by LBNCo***
- Located, usually for a standard front loaded Lot, in the street verge near to the front boundary at the junction with one of the side boundaries of the Lot.

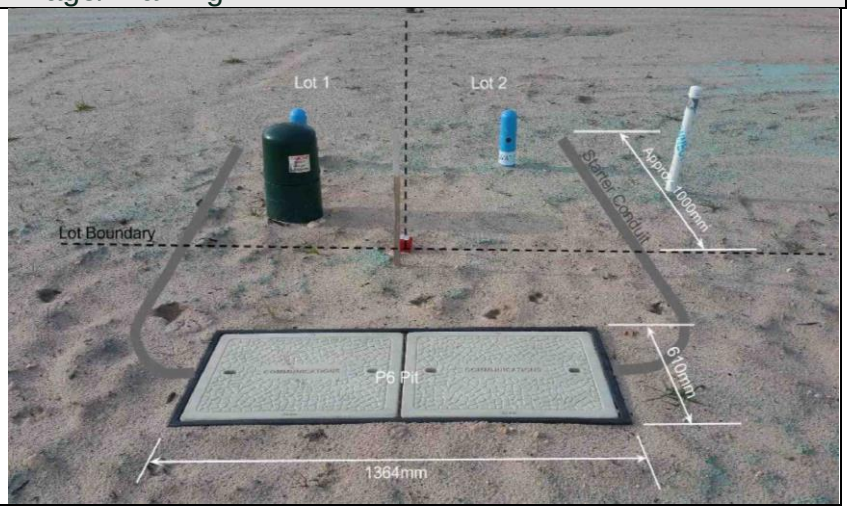


LBNCo FttP Home Installation Example

The following is a table showing the Pit types used by LBNCo and the most common location for those pits and Starter Conduits in relation to the Lot boundaries. This is to assist builders in locating the Starter Conduit.

Type	Image/Drawing
P2	

P5	

Type	Image/Drawing
P6	

- The Pit is usually shared with at least one other lot
- Preferred location is outside the Lot boundary, next to where the Electricity Connection Pillar (Green Dome) is located inside the Lot boundary. There are rare exceptions to this due to logistics where the power is on one side boundary and the LBNCo Pit is on the other.
- The Pit is *not* located where the Developer has indicated a driveway or crossover is likely to be located
- The Pit, located in the Street Reserve, ***MUST NOT be covered*** by a driveway, crossover, lawn or landscaping.
- Other locations are possible depending on the type of Lot:
    - Corner Lot
        - The Pit can be located in the truncation in the Street reserve

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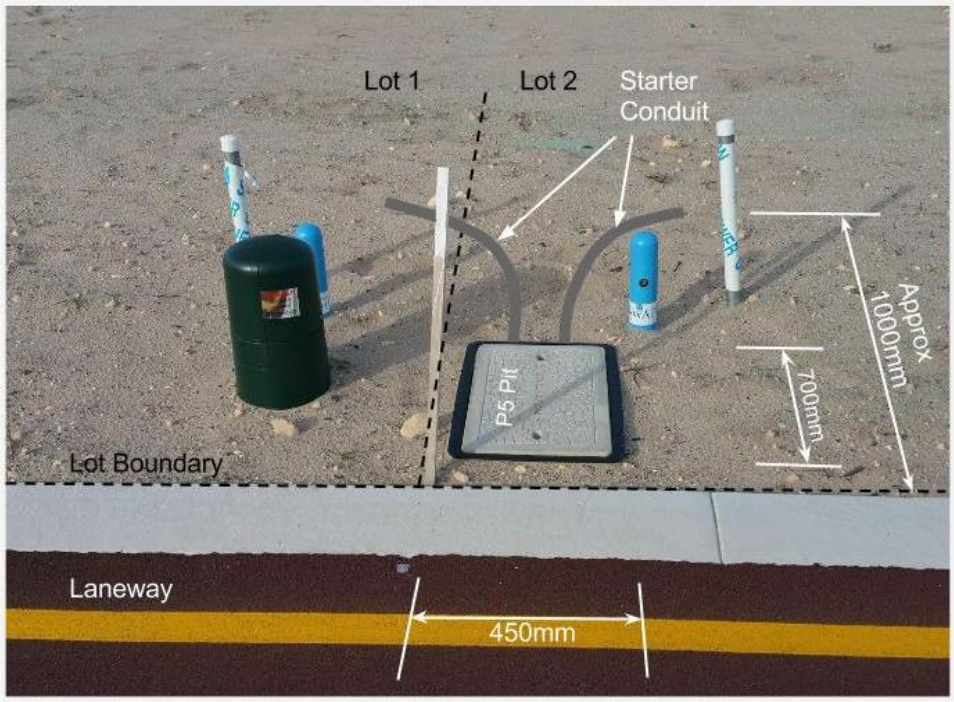
- The Pit can be located at the rear of the Lot because that boundary is on the narrow side of the Lot

- Front loaded Lot
  - Retaining Wall – the pit will be located in the street reserve on the junction of the Front Boundary (which is usually the front surface of the wall) and a side boundary. Refer to the Starter Conduit Special Case – Retaining Wall below.
- Rear Loaded Lot (Rear Laneway)

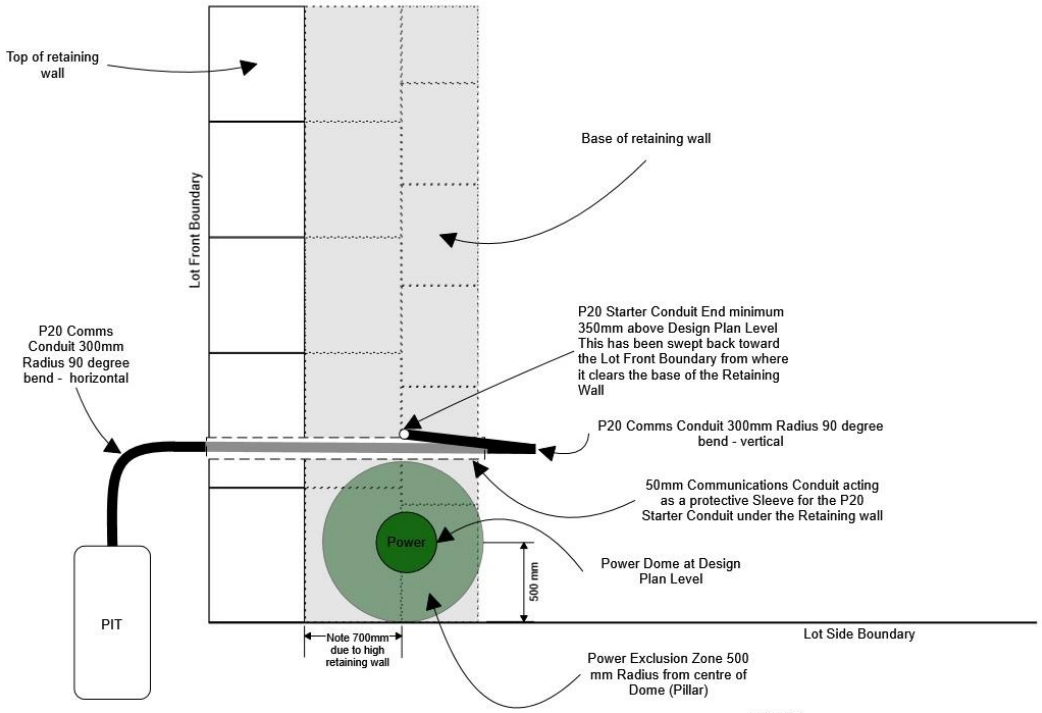


- Power and Communications provided from a Laneway at the rear of the Lot
- Not usually located in the roadway
- An easement is usually provided by the Developer on a common boundary with another Lot (this is NOT the Power Exclusion Zone for the Electricity Power Pillar (Green Dome))
- The future location of garages, carports and associated driveways and crossovers are taken into account by the Developer in siting these pits and other utilities

STARTER CONDUIT

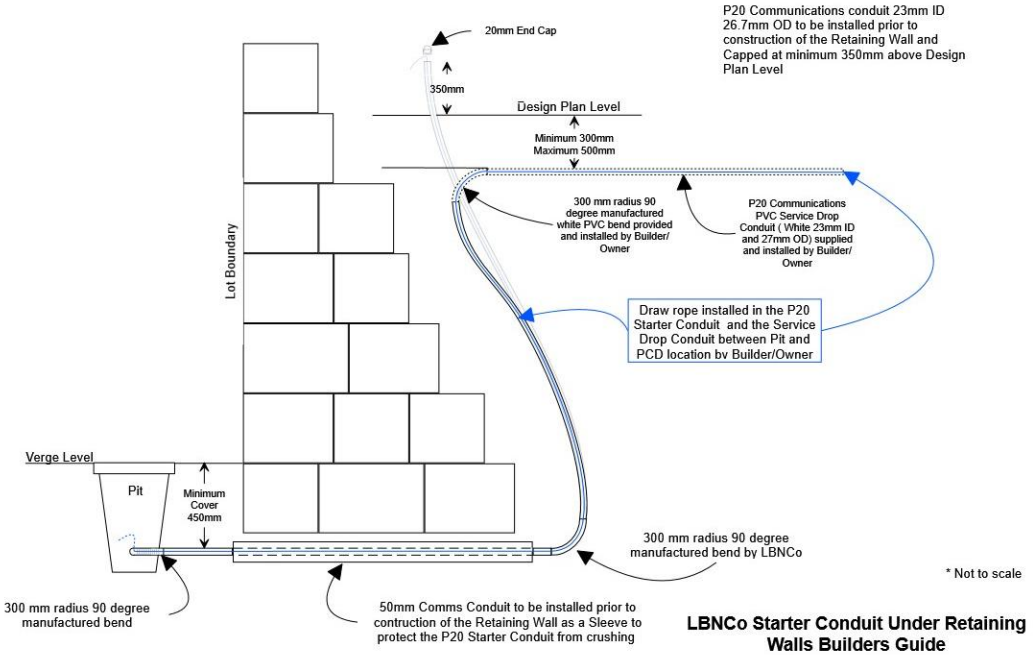
- ***Provided by LBNCo***
- Connected to the Pit
- The building end is located approximately 1,000mm (1metre) inside the front boundary between 300mm and 500mm below the FGL (see the pictures in the table above)
- Special case – Retaining Wall
  - The Pit is in the street reserve.
  - The Starter Conduit passes under the Retaining Wall in a 50mm sleeve conduit to protect it against crushing.
  - The Stater Conduit rises vertically within the Lot and is swept back toward the Retaining Wall so that its end is as close to the wall as possible.

- The Starter Conduit capped end is approximately 350mm above the Finished Ground Level (FGL).



LBNCo
Plan of Retaining Wall Starter Conduit Location

- The connection of the Service Drop Conduit to the Starter Conduit must be done 300mm – 500mm below FGL with a 90º bend so that the Starter Conduit is not bent and distorted thus restricting the path of the Service Drop (lead-in) fibre cable being pulled through it.



LBNCo Starter Conduit Under Retaining Walls Builders Guide

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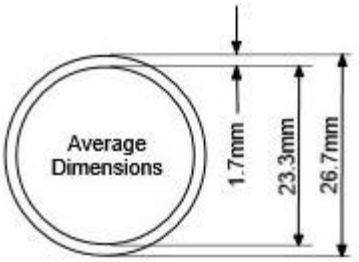
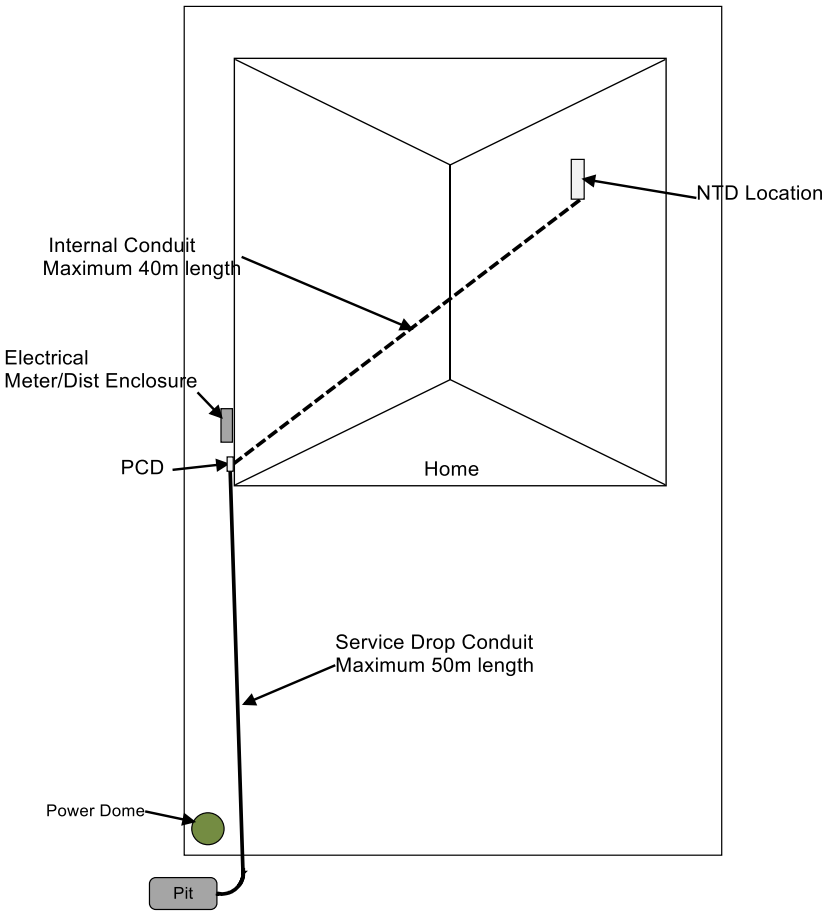
SERVICE DROP (LEAD-IN) CONDUIT

- ***Supplied and installed by the Builder***
- Includes connection to the starter conduit already provided by LBNCo
- Includes a draw rope installed within the conduit from the pit to the end at the PCD location on the building
- Conduit Specification: P20 White PVC-U Telecommunications Conduit with nominal Inside (ID) 23mm and nominal Outside Diameter (OD) 27mm. The conduit will carry the markings Communications, Telecommunications, Telstra.



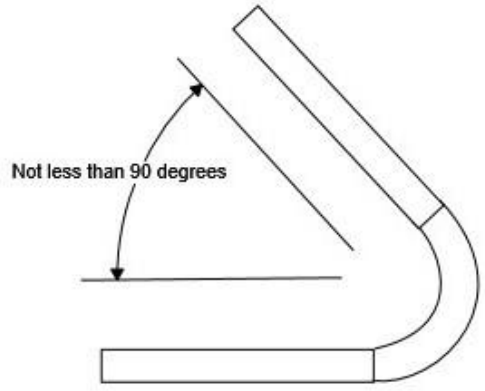
P20 Communications Conduits Dimensions

- Coverage (depth below finished ground level):
  - Minimum 300mm
  - Maximum 500mm
  - Under driveways etc recommended minimum is 450mm
- The maximum length of the Service Drop Conduit between access points (Pit, PCD or intermediate pulling point such as an additional pit within the Lot) is 50 metres. Where an intermediate access (pulling point) is required, LBNCo must be advised prior to LBNCo installers attending site to install the LBNCo equipment because the length of the Service Drop Conduit from Pit to PCD determines the length of the Service Drop Fibre (Cable).



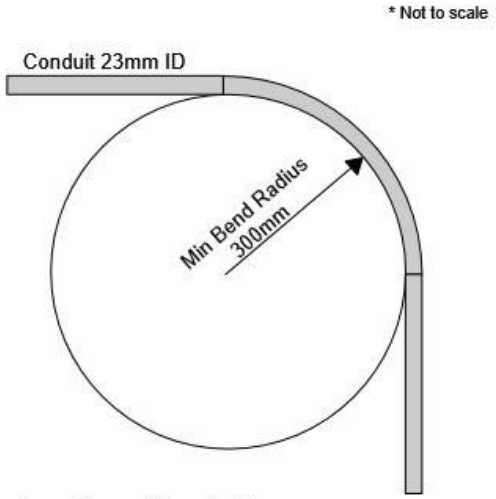
Conduit Paths with Pit at Same Corner of Lot as PCD

- Where practical it is recommended that a trench be shared with the electrical power lead-in cabling/conduit because, normally, both go to common locations at either end (**the PCD should be located near the power meter/distribution box**).
    - Communications conduit should be at a higher level in the trench than power:
        - Power minimum cover is 500mm
        - Communications minimum cover is 300mm
    - Because the communications conduit carries no metallic cables there is no strict requirement for separation from the power conduit
- All bends and fittings will suit this conduit and will be rigid. Flexible or corrugated conduit, fittings and bends are not acceptable. These must be factory fabricated.
- All joints will be glued to the manufacturer's specification for water proofing and to prevent the conduit and fittings from separating due to external pressure or during the pulling of cable through the conduit
- Bends:
    - All bends must be factory fabricated.
    - The use of bends manufactured from conduit using heat is *not accepted* because distortion of the conduit will impede pulling of the connectorised service drop fibre through it.
    - Tight bending of conduit which results in distortion of the conduit is also not acceptable.
    - The inside bend angle is to be minimum 90º.



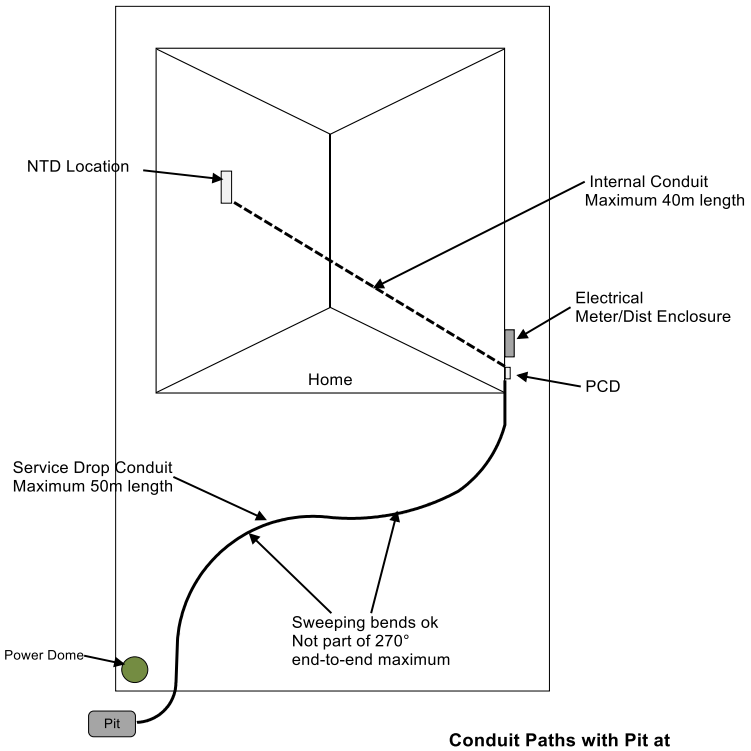
Inside Bend Angle

    - Minimum Bend Radius 300mm (note: pre-fabricated bends are usually specified at 305mm bend radius)



Service Drop Conduit Bend Radius

- Maximum number of 90º bends is three (3)
- Maximum total angle of all bends is 270º including part bends such as 45º
- Sweep bending of lengths of the conduit is permitted provided the profile or circularity of the conduit is not compromised. This is NOT included as part of the 270º total.



Conduit Paths with Pit at Opposite Corner of Lot to PCD

- Building entry (the PCD end)
  - Location
    - Minimum 300mm from corner of the external wall
    - End at the bottom of the allocated PCD location
    - Separated laterally from the Internal Conduit by minimum 80mm
  - Bends
    - Part of the overall Service Drop Conduit so must be taken into account in the total number of 90º bends and the over total 270º limit
    - Below Finished Ground Level minimum 300mm bend radius
    - Above Finished Ground Level 100mm or 300mm minimum bend radius as required

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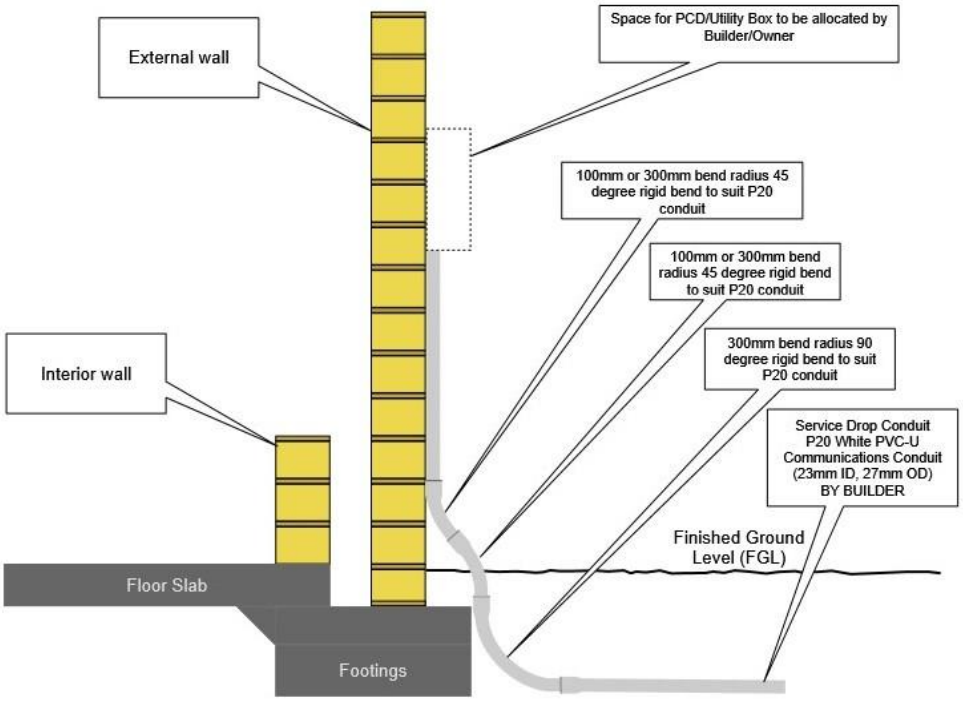
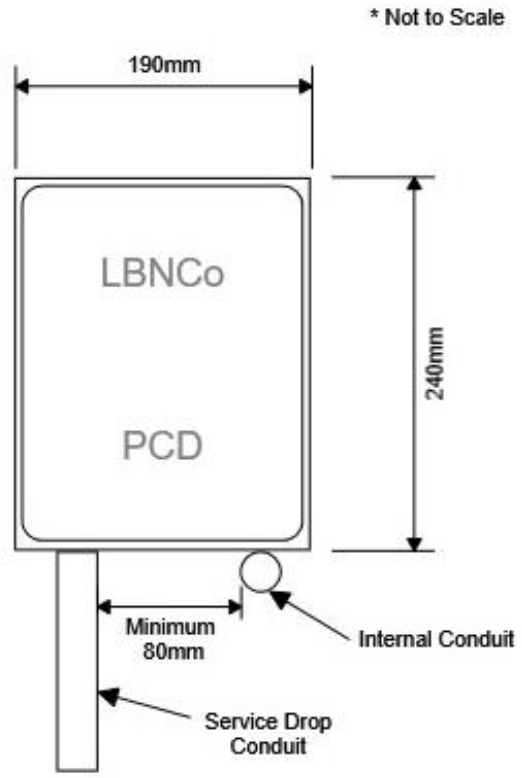


LBNCo FttP
Service Drop Conduit Building Entry

PREMISES CONNECTION DEVICE (PCD)

- Location
  - ***Allocated by the Builder/Owner*** based on the following requirements:
    - Near to the Electrical Meter/Distribution Enclosure
    - Footprint - the space required for the equipment is:
      W 190mm x H 240mm x D 80mm plus clearances (see exclusion zone below)



PCD Space Allocation and Conduit Location

- The height from Finished Ground Level to bottom side of PCD equipment is minimum 410mm to maximum 1500mm.

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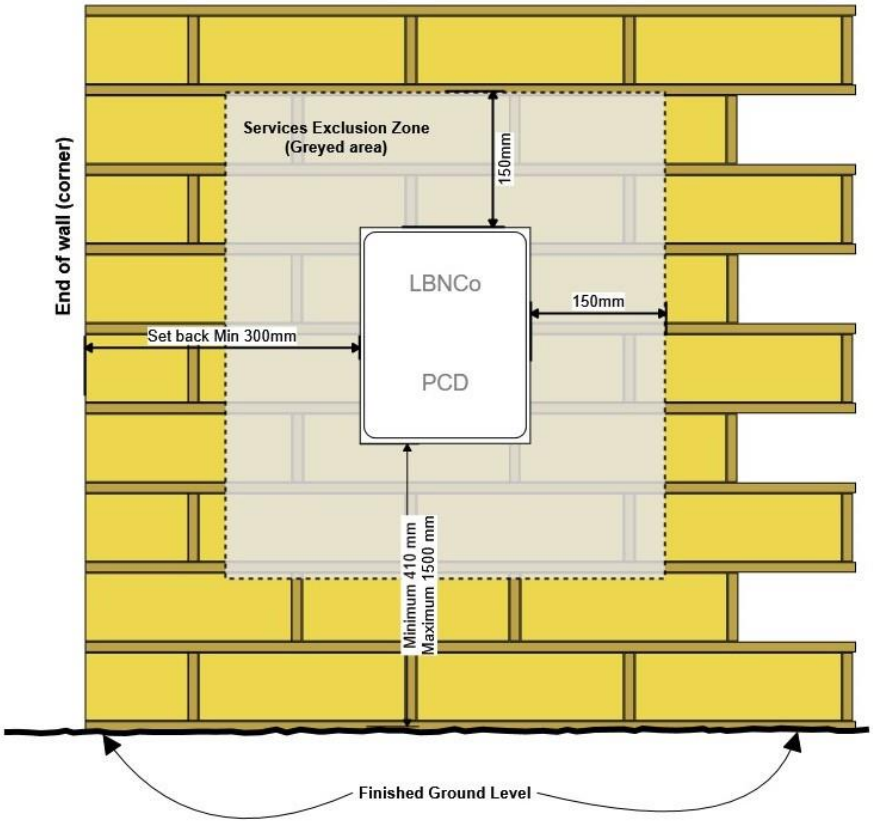
- Exclusion zone: To maintain the correct clearances from utilities, building features and other services there is a 150mm exclusion zone around all outer edges of the PCD equipment as illustrated below.



* Not to scale

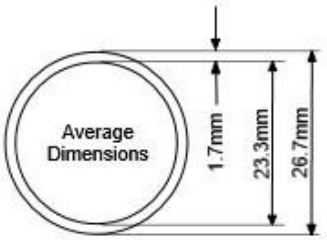
PCD Set Backs and Exclusion Zone

- Additionally a clearance of 250mm (100mm extra to the 150mm exclusion zone) on the left side of the PCD to allow for opening of the cover/door.
- 300mm minimum set back from the vertical edge of the end of the wall on which the PCD is to be located. For example from a corner as illustrated above.
- The Exclusion Zone provides required clearances from the PCD to:
  - Gas meters, enclosures and pipes
  - Electricity meter and distribution enclosures and external GPOs
  - Water meters and pipes
  - Downpipes, taps, drainage, irrigation controllers and other building services
  - Windows, doors, walls, fencing and other building features
- Note: The pathways for the Service Drop and Internal Conduits need to be considered when locating the PCD. Obstructions within the wall cavity, such as plumbing, for the Internal Conduit or obstructions of the Service Drop Conduit below the ground, such as drainage and plumbing, may affect the location of the PCD.

- PCD Equipment
  - ***Supplied and installed by LBNCo***

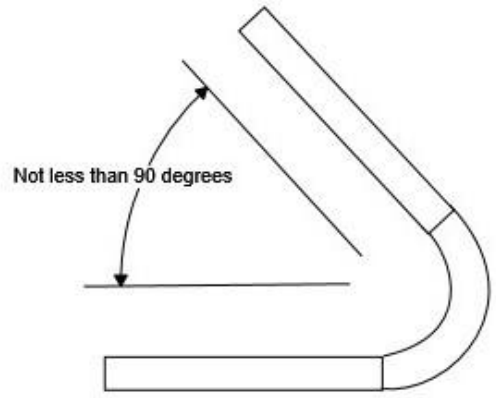
INTERNAL CONDUIT

- ***Supplied and installed by Builder***
- The Internal Conduit will be installed according to the requirements and specifications of the *AS/CA S009:2013 Installation requirements for customer cabling (Wiring rules)* for internal telecommunications conduits and fittings
- The Internal Conduit includes a draw rope installed within the conduit from the PCD to the end at the NTD location within the building
- Conduit Specification: P20 White PVC-U (ID) Telecommunications Conduit with nominal Inside Diameter 23mm and nominal Outside Diameter (OD) 27mm. The conduit will carry the markings Communications, Telecommunications, Telstra.



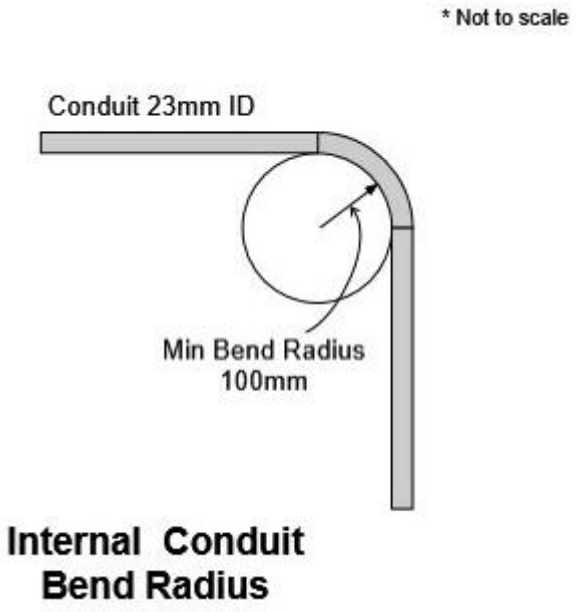
P20 Communications Conduits Dimensions

- All bends and fittings will suit this conduit and will be rigid. Flexible or corrugated conduit, fittings and bends are not acceptable. Must be factory fabricated.
- All joints will be glued to the manufacturer's specification for water proofing and to prevent the conduit and fittings from separating due to external pressure or during the pulling of cable through the conduit.
- Bends:
  - All bends must be factory fabricated.
  - The use of bends manufactured from conduit using heat is not accepted because distortion of the conduit will impede pulling of the connectorised optic fibre lead between the PCD and NTD.
  - Tight bending of conduit which results in distortion of the conduit is also not acceptable.
  - The inside bend angle to be minimum 90º.



Inside Bend Angle

- Minimum Bend Radius 100mm (note: pre-fabricated bends are usually specified at 105mm bend radius)



Internal Conduit Bend Radius

- Maximum number of 90º bends in the end-to-end Internal Conduit is three (3)
- Maximum total of all bends is 270º including part bends such as 45º
- Sweep bending of lengths of the conduit is permitted provided the profile or circularity of the conduit is not compromised. This is NOT included as part of the 270º total.

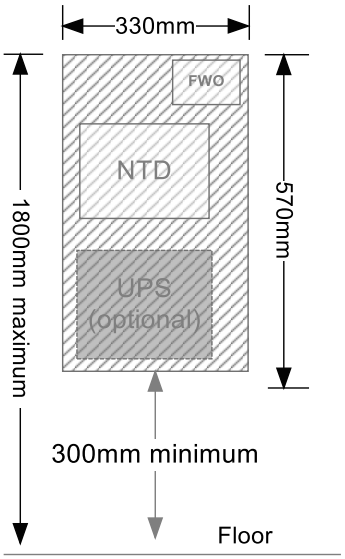
NETWORK TERMINATION DEVICE (NTD)

- The ***location*** of the NTD and associated equipment needs to be included as part of the planning and design for the premises ***by the Owner and Builder*** based on the following requirements and parameters.

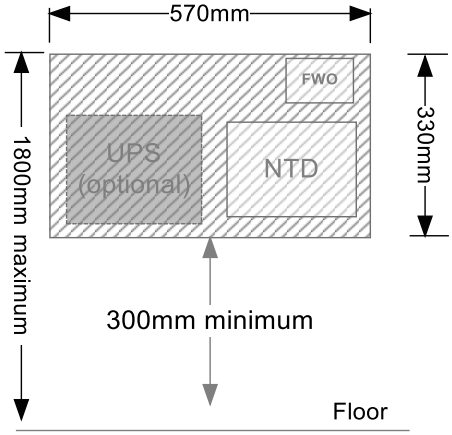
  Overall telecommunications and electronic entertainment requirements need to be considered during this planning and design process. The complexity relates more to the internal cabling of the premises which connects to the LBNCo equipment. This has a bearing on the location and housing of the LBNCo equipment. For instance an HD enclosure may be required to house the customer distribution equipment and this can also house the LBNCo NTD equipment.

  The following are the minimum requirements and specifications for the installation of LBNCo NTD equipment that form the pre-requisite for connection to the LBNCo FttP Network:

- Space requirement
  - Flat surface

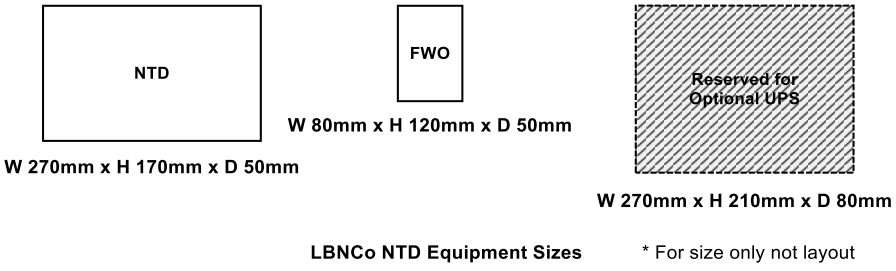


NTD Space Allocation
PORTRAIT (Hatched)



NTD Space Allocation
LANDSCAPE (Hatched)

  - In customer's HD enclosure
    - Sufficient space to accommodate the three LBNCo components as per below as well as the customer distribution equipment and cabling.



LBNCo NTD Equipment Sizes * For size only not layout

    - Minimum surface area 0.25m²
    - Minimum depth 100mm
    - Sufficient clearance needs to be allowed around the devices to accommodate access by cables and fibre optic leads.
    - The GPO can be located within the enclosure provided it is accessible.
    - The optional Uninterruptable Power Supply (UPS) can be mounted outside the enclosure provided space is allocated and a path for a cable from the UPS to the NTD is provided.
    - Note that the ventilation requirements below.

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- Location
  - General requirements
    - Ventilation; the equipment generates heat and the space surrounding the equipment must be sufficient to allow for air circulation through the equipment's vents and for the heated air to dissipate.
      - Open wall mounted equipment in a room or garage with no obstructions, 200mm clearance to all equipment surfaces, near the equipment; the volume of the space should be sufficient.
      - Open wall mounted within a cupboard, storeroom or wardrobe with no obstructions near the equipment (refer to "clearance" below) the volume of the space should be greater than 1.0 m^3 (1,000 lt) or the space must be ventilated.
      - Mounted within an HD enclosure
        - The enclosure must have built in ventilation openings (vents) that allow circulation of air through the equipment
        - There must be sufficient space surrounding the enclosure to dissipate the heated air from the enclosure
          - Such an enclosure can be used within a large room or garage
          - Where mounted within a cupboard, storeroom or wardrobe the volume of the space must be greater than 1.0 m^3 (1,000 lt)
    - Ambient temperature; the equipment must not be exposed to consistent ambient temperatures above 40º Celsius or below 0º Celsius.
    - Exposure; the location must be fully enclosed (internal to the building) and must not be on the outside of external walls of the building.
    - Safety; the location must not present potential trip, choking, electrical shock, exposure to laser light or physical injury hazards from the equipment, including cables, when installed.
    - Clearance; there must be no objects which will come into direct contact with, block ventilation for or prevent access to the equipment installed; minimum 200mm clearance to all equipment surfaces (top, bottom, sides and front).
    - Appliances and plant; the NTD equipment ***MUST NOT*** be mounted near to or within the same space as gas appliances, hot water systems, SPA's or pools.

  - Permitted locations
    - Enclosed garage under the main roof (LBNCo preferred location).
    - Storage room or cupboard of sufficient volume to accommodate the ventilation requirements and meets the clearance requirements.
    - Walk-in wardrobe of sufficient volume to accommodate the ventilation requirements and meets the clearance requirements.
    - Office or study.
    - Living room provided it meets safety requirements (should not be accessible by children).
    - Theatre/multimedia room.

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- Locations Not permitted for safety and environmental reasons:
  - Wet areas
    - Bathroom
    - Toilet
    - Laundry
    - Kitchen
  - Safety hazards
    - Children's bedroom
    - Play area
    - Anywhere cables could present a choke or trip hazard
  - Exposure
    - *Under* a window that opens to the outside
    - Carport
    - Patio
    - Veranda
    - Balcony
    - Anywhere not fully enclosed and internal to the building
  - Other technical
    - Standalone sheds
    - Standalone garage (not under main roof)
    - Coolroom, freezer
    - Sauna

- NTD Equipment Components

  All of the components listed below must be located together within one meter and within the same room or space:

  - GPO
    - ***Supplied and installed by Builder***
    - Recommended double GPO to allow for requirements for customer equipment
  - FWO
    - ***Supplied and installed by LBNCo***
  - NTD
    - ***Supplied and installed by LBNCo***
  - Power Supply
    - Standard
      - ***Supplied and installed by LBNCo***
    - UPS (Battery backup) – Optional
      - ***Supplied and installed by LBNCo***
  - Customer Cabling – to connect into the LBNCo equipment at the Network Boundary