New Property Technical Requirements – General Fibre Network (Volume 1)

Network Deployment Standard

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1. Introduction

1.1.1. Objectives of Manual

The objective of this Manual is to provide the design and deployment standards for developers for new property developments or subdivisions within Chorus' UFB areas and areas with existing Chorus fibre or copper infrastructure. This document is separated into four volumes which covers different topics of the network.

1.1.1.1. Volume 1 – General Fibre Network Guidelines

Topics covered under Volume 1 includes:

The selection criteria for the type of network to be deployed (fibre or copper)

- Overview of the Chorus UFB network
- The lead-in infrastructure from the boundary to the premises
- Infrastructure compliance for separation of utilities
- Overview of installation of the copper network where applicable

***Note**: Property refurbishment is not covered in this document. Developers or property owners undergoing building refurbishment must contact their respective ISP for fibre cabling from the boundary to the premises.*

1.1.1.2. Volume 2 - SDU and ROW Greenfield Development

Topics covered under Volume 2 includes:

- Single Dwelling Unit (SDU) and Rights of Way (ROW) infrastructure deployment
- The pathway from the lead-in External Termination Point (ETP) to the Home Distributor Hub

1.1.1.3. Volume 3 - MDU Fibre In-Building Distribution Network Design and Installation

Topics covered under Volume 3 includes:

- Multi Dwelling Unit (MDU) In-Building Distribution Network design
- MDU fibre network cable and terminal description
- MDU fibre network deployment scope of responsibility

1.1.1.4. Volume 4 - Premises Wiring Minimum Requirement Recommendation

Topics covered under Volume 4 includes:

- The recommended minimum requirement for general premises internal cabling from the Home Distributor Hub to all outlets.

1.1.2. Artefact Constraints

This Process and Procedure is constrained by the Design Rules OR Deployment Standard in the following Chorus internal artefacts. These documents will not be publicly available and only to be referenced by Chorus personnel and their contracted partners.

Document No.	Document Title
ND0545	UFB Network Design Rules
ND0574	UFB MDU Design and Installation
ND0563	NGA Provisioning and Assure Task Handbook
ND0625	UFB Fixed Fibre Aerial Design Guide
ND0635	UFB MDU Cable and Terminals Installation Handbook
ND0588	UFB Premise Boundary Deployment Standards
ND13006	UFB Aerial Road Crossing, RoW and Infill Technical Guide
ND13159	Network Depth and Separations
ND13161	Electric Lines Safety

1.1.3. Intended Audience

The intended audience of this document are Chorus, service companies' personnel, service providers, builders, property developers and their contractors involved with the design and installation of optical fibre networks in new properties or property subdivision. Where developer is listed, this can mean their agents e.g. builder, electrician or anyone acting on their behalf.

1.1.4. Chorus Network Specified Product (CNSP)

CNSP is an assessment and approval pathway for particular types of product and test equipment to ensure that a product meets criteria for:

- Whole of life performance
- Longevity, and
- Durability

Where a product is listed within the CNSP process, Chorus service companies must use that product from the approved supplier.

1.1.5. Contractual Reference

This document may be provided to Chorus partners, service companies, Chorus customers and 3rd party service providers for use alongside the relevant contracts for service or the relevant Standard Terms Determination.

Throughout this document, Chorus New Zealand is referred to as Chorus.

This document does not, in any way, vary the terms of the main contract between Chorus and the service company. If there is any conflict between the relevant contract and statements made in this document, the terms of the relevant contract shall prevail.

This document does not, in any way, vary the terms of the main contract between Chorus and the Service Company, developers or any other parties.

1.2. Related Reference Material

It is the responsibility of the contractor to research, understand and abide by the relevant national or local compliance standard as applicable to the location and tasks. The table below lists the national and international standards that may be associated or referenced within this standard. This list is not exhaustive and is not in place of the Building Code Compliance.

Document No.	Document Title
AS/NZS 1367	Coaxial cable and optical fibre systems or the RF distribution of analogue and digital television and sound signals in single and multiple dwelling installations
AS/NZS 3000	Electrical Installations
AS/NZS 11801.1:2019	Information technology - Generic cabling for customer premises Part 1: General requirements (ISO/IEC 11801-1:2017, MOD)
ANZS3084-2003	Telecommunications Installations standard
AS/NZS 3085	Telecommunications installations - Basic requirements
AS/NZS 3086	Telecommunications installations – Integrated telecommunications cabling systems for small office/home office premises
AS/NZS 3808	Insulating and Sheathing Materials for Electric Cables
AS/NZS 3112	Approval and test specification - Plugs and socket-outlets
AS/NZS ISO / IEC 15018	Information technology - Generic cabling for homes
AS/NZS ISCO / IEC 24702	Telecommunications installations - Generic cabling - Industrial premises
IEEE 802.3 2012	Power over Ethernet
ECP 34	Electrical Code of Practice for Electrical Safe Distances (ECP 34:2001)
	TCF Premises Wiring Guide – tcf.org.nz
ND13148	Chorus As Built Requirements
ND13005	Chorus Service Provider Health & Safety Plan

1.3. Glossary of Terms Used

The following list describes some of the terms used in this document:

Term	Description
ABF	**Air Blown Fibre** Refers to an installation method where a fibre cable is blown into a microduct
ABFFP	**Air Blown Fibre Flexibility Point** An enclosure which is installed in an underground pit. The enclosure houses an optical fibre splitter which acts as a flexible fibre network connectivity point.
ABFU	**Air Blown Fibre Unit** A small bundle of fibre that is installed through a 5/3.5mm microduct by using the air blown method. Chorus deploys a 2-fibre and a 12-fibre ABFU in the fibre network.
ATA	**Analog Telephone Adapter** A device that connects regular telephones to a broadband network for voice over IP (VoIP) service. The ATA delivers dial-tone, manages the call setup and provides the conversion between voice signals from an analogue telephone and IP packets.
BDD	**Buried Distribution System** An oval underground pit which provides a storage and connectivity point for microducts or FATs
BUDI I-FFP	**Building Distribution Internal Fibre Flexibility Point** A wall-mounted enclosure which houses optical fibre splitters which acts as a flexible fibre network connectivity point. Typically used for MDU with up to 48 premises.
CCA	**Copper Clad Aluminium** A type of sub-standard wire used in Ethernet cable that is **NOT** recommended by Chorus. Such cable type will not achieve the performance requirements for high speed broadband.
CNSP	**Chorus Network Specified Product** A list of products which are technically approved by Chorus to ensure network compatibility and reliability.
CO	**Central Office** An exchange building which houses Chorus transmission equipment
Drop Cable	A 2 fibre (2F) cable installed from the FFP or FAT in the Chorus distribution network. This is typically also referred to as the Service Lead.
Ducting	The green PVC pipe we use to get a route from A to B. It can be called duct, pipe, or conduit. It comes in a range of sizes, most commonly 20mm, 50mm, 100mm or microduct.
ETP	**External Termination Point** An outdoor enclosure mounted on the side of a premise which provides a point of connectivity from the service lead cable and the premises cable. This unit stops water ingress into the building and allows Chorus access for maintenance.
FAT	**Fibre Access Terminal** An enclosure which provides breakout access of Chorus' cables to the lead-in cables into premises.
FFP	**Fibre Flexibility Point** An enclosure which provides a connectivity point between the feeder fibres from the CO to the distribution fibre to premises.
FTTP	**Fibre To The Premise** Optical fibre network constructed pursuant to the UFB Initiative
GPON	**Gigabit Passive Optical Network** A type of telecommunications network that uses a point-to-multipoint FTTP which uses unpowered optical splitters to enable a single feeder optical fibre to serve multiple premises.
GPX I-FFP	**GPX Internal Fibre Flexibility Point** A wall-mounted enclosure which houses optical fibre splitters which acts as a flexible fibre network connectivity point. Typically used for MDU with more than 48 premises.
Hand hole	A small pit that is installed at the premises boundary as the location where the lead-in pipe into the premises is terminated. It is also used as a location to join microducts.
Home Distributor Hub	An in-wall networking cabinet that houses Chorus, ISP and home owner devices for connecting the incoming signal from the broadband provider to the internal network. This is usually where the ONT is installed, and needs to be non-metallic for modem transmission.

Term	Description
IBDN	**In Building Distribution Network** The optical fibre distribution network within a building premise.
ID	Internal Diameter
I-FFP	**Internal Fibre Flexibility Point** An FFP which is installed indoors, typically in a TER
IFDB	**Internal Fibre Distribution Box**, a fibre management access terminal used by Chorus to connect between 2 and 6 customers down a RoW. It is housed in a light green rectangular pillar adjacent to the communal driveway.
Infill	A new property where the address is created after UFB roll-out in the street and requires a new connection e.g. 1 existing lot subdivided into 2.
Internal Cables	All cables installed by the developer from the Home Distributor Hub, Comms Room, or similar, within a premises. These must be Low Smoke Zero Halogen (LSZH) and are not suitable for use outside.
ISAM	**Intelligent Services Access Manager** A node equipment that provides access services such as DSL and GPON.
ISP	**Internet Service Provider** Communication companies who use Chorus' optical network to create retail services which are sold to residents, businesses, schools and health premises.
ITP	**Internal Termination Point** An indoor enclosure installed in the HDH or on a wall which provides a point of connectivity from the service lead fibre to the ONT.
Lead-in Pipe	A dedicated green service lead-in pipe from the premises boundary to the dwelling. Specifically, when a 20mm internal diameter green lead-in pipe is used, it is for a single lead-in to an SDU, not for multiple connection lead-ins.
LFC	**Local Fibre Company** The operator of the local optical fibre network
LSZH	**Low Smoke Zero Halogen** A type of plastic used in cable jacketing. This material produces minimal smoke and has low toxicity when exposed to fire, which is suitable for installation inside buildings.
MDCC	**Microduct Clamp Closure** A type of closure that is used to drop off one or more 1-way ruggedized microduct service lead from a microduct bundle
MDU	**Multi Dwelling Unit** A building which has two or more premises such as an apartment building. This can be horizontal or vertical and generally has one lead-in which then feeds the various tenancies
Microduct	A small specially manufactured tube that is used for fibre installation through the blowing technique.
Micronet	A Hexatronic System consisting of microducts and cables used by Chorus for the optical fibre distribution network.
NPD	New Property Development also known as Greenfield or subdivision
NZCCPTS	New Zealand Committee for the Co-ordination of Power and Telecommunication Systems
OD	Outer Diameter
OFDF	**Optical Fibre Distribution Frame** An optical fibre distribution frame installed in the CO to provide connectivity between the Chorus active transmission equipment to the outside network.
OLT	**Optical Line Terminal** A GPON Access Node installed in Chorus' CO that provides for the delivery of UFB services. The GPON OLT is installed in Chorus exchange buildings
ONT	**Optical Network Terminal** A GPON network equipment installed in the customer premise that provides for the delivery of UFB services.
PE	Poly Ethylene
RLG	**R.L. Grant**, a Post Office engineer who designed the telecoms copper distribution network
RGW	**Residential Gateway** Equipment installed in the premise connected to the ONT which is used to centralise communications.
RoW	**Rights of Way**

Term	Description
	More than one premises with separate ownership sharing a common access to the public roads.
Ribbonet	A Hexatronic System consisting of microducts and cables used by Chorus for the optical fibre distribution network.
SDU	**Single Dwelling Unit** A premises which has a single customer connection. This can include a single, or multiple detached or attached dwelling(s)
Service Lead	A Service Lead is a cable that connects from the Chorus distribution network to the ETP/ITP.
TER	**Telecoms Equipment Room** (also known as Comms Room / Utilities Room) A location in an MDU where the lead-in cable terminates into an I-FFP and where the IBDN converges.
TV	Television
UFB	**Ultra-Fast Broadband** FTTP broadband service providing high speed internet connectivity.
UPS	**Uninterrupted Power Supply** Battery pack which provides backup power supply to keep critical devices powered in the event of a power outage.
UTP	**Unshielded Twisted Pair** A type of twisted pair copper cabling used for carrying transmission signals
VOD	**Video On Demand** Video service where the end user is able to order videos on demand.
VoIP	**Voice Over IP** A methodology for the delivery of voice communication over IP network such as the internet.

2. General Information for Chorus Network Installation

2.1. Chorus Network Overview

The Chorus network can be based on a pit and pipe system, a microduct system or a combination of both. The material to be installed can be a combination of the following:

- Chorus branded Green PVC ducting (20mm 50mm and 100mm internal diameters)
- Microducts of various sizes for air blown optical fibre cables and ABFU
- Aluminium joint pits with one, two or four lids
- Plastic joint pits, Channell manufactured
- Hand holes for service lead connections (usually sited on alternate boundaries with the power service box or pits

  ***NOTE**: see Section 6 for copper cable installations*

The material used for the Chorus network must be approved under the Chorus Network Specified Product (CNSP) to ensure compliance, compatibility and performance. The table below shows some of the network components.

<table>
<tr><th>Network Element</th><th>Description</th><th>Example Photos</th></tr>
<tr><td>Green ducting</td><td>Green 20mm, 50mm and 100mm internal diameter pipes used in the Chorus network for external use only
Note: The green ducting used must be a Chorus Network Specified Product supplied by Chorus and/or Chorus' approved distributors/manufacturers
<table>
<tr><th rowspan="2">Pipe Type</th><th colspan="2">Nominal Sizes (mm)</th></tr>
<tr><th>OD</th><th>ID</th></tr>
<tr><td>100mm Green pipe</td><td>110.2</td><td>103.0</td></tr>
<tr><td>50mm Green pipe</td><td>60.3</td><td>55.1</td></tr>
<tr><td>20mm Green pipe</td><td>26.7</td><td>22.5</td></tr>
</table></td><td>  </td></tr>
<tr><td>Microducts</td><td>Microducts with green Chorus marked outer sheath. Microducts consists of a bundle of tubes that are used for blowing optical fibre cable and ABFU through to premises.</td><td>  </td></tr>
<tr><td>Plastic pit</td><td>Plastic pits that are manufactured by Channell. Pits come in three different sizes which are:

Bulk 2 – L559mm x W324mm x D476mm
Used as in-line cable hauling point or as distribution pits in ROWs with 4 or more premises.
Bulk 3 – L762 x W432 x D609mm
Used as turning pit and for FFP or FAT installation
Bulk 4 – L914 x W609 x D609mm
In situations where a larger than Bulk 3 is required
Note: This is a Class B pit and is only suitable for installation in footpaths and is not roadway rated.</td><td>  </td></tr>
<tr><td>Hand holes</td><td>Access pits usually installed at premises boundaries for service lead connections.
Note: This MUST NOT be installed in a location where vehicular traffic is expected.</td><td>  </td></tr>
</table>

Network Element	Description	Example Photos
Mini Marker Post	Mini marker post to be installed at the premises boundary to indicate the location of service leads buried underground. **Note:** Only to be installed in soft surfaces for premises with pre-built fibre	
Large Marker Post	Large marker post to be installed at the premises boundary to indicate the location of service leads buried underground. **Note:** Only to be installed in soft surfaces for premises without pre-built fibre	
Internal Fibre Flexibility Point (I-FFP)	Wall-mounted termination box or cabinet that is usually installed in a comms room in a medium to large Multi Dwelling Unit (MDU). The I-FFP acts as the central point where the optical fibre lead-in cable and distribution cables are terminated.	
Fibre Access Terminal (FAT)	A FAT functions as a distribution point to branch off optical fibres from distribution cables to multiple drop cables to separate premises. For outdoor installation, the FAT can be installed underground in a pit, in a pedestal, wall-mounted or on a pole. Specific FATs are used in different install scenarios. For indoor installation, the FAT is installed as wall-mounted box usually in the comms room or in risers.	   
External Termination Pont (ETP)	A termination box that is usually wall-mounted on the external wall. It functions as a termination point to connect an external lead-in cable to the internal cabling.	
Composite Cable	A 6mm diameter composite two fibre and a four pair Cat5e cable.	
Internal 2F Flat White Cable	A two-fibre cable that is installed internally to connect the ETP or FAT to the ONT.	
Optical Network Terminal (ONT)	A wall-mounted equipment at the end of the Chorus network where the optical fibre is terminated. This is usually installed in the home distributor hub or in the lounge by the TV location. This unit is modem capable and needs to be installed in a non-metal box. This equipment needs to be powered by a 230V AC power source.	

Network Element	Description	Example Photos
Residential Gateway (RGW)	Depending on the Internet Service Provider (ISP), an RGW is provided to be connected to the Chorus ONT to provide broadband service and Wi-Fi.	
Internal Termination Point (ITP)	An indoor enclosure installed in the Home Distributor Hub or on a wall which provides a point of connectivity from the service lead fibre to the ONT.	

Table 1. Examples of Chorus Network Components

2.2. Minimum Cover for Buried Network

The following rules apply to all new installations and maintenance of ducts, microducts for both fibre optic and copper cables where those cables or ducts are to be installed below ground level.

2.2.1. Minimum Cover

The minimum ground cover for all new Chorus network (ducts, microducts and cables) is:

Situation – Network Plant outside of private property	**Minimum Cover**
Existing ducts	450mm
All buried plant alongside non kerbed roads (i.e. where there is a possibility of road reforming or grading of the road edge)	600mm
All buried plant in stable well-formed suburban areas when the lay is between the kerb and the boundary	450mm
All buried plant in suburban roadways	600mm
All buried plant in state highways	1000mm

Table 2. Minimum Cover Network Plant

Statutory compliance must be sought and confirmed at time of design Situation: Chorus Lead-in and Customer Service Lead on private property	**Minimum Cover**
20mm green Lead-in pipe and direct buried copper service lead	450mm
20mm green lead-in pipe and direct buried copper cable under permanent material such as concrete driveway	200mm
Duct other than 20mm green lead-in pipe	450mm
Microduct assemblies other than ruggedised single way	450mm
Ruggedised single way Microduct	Preferably 450mm No less than 200mm
Ruggedised Fixed Fibre service lead	

Table 3. Minimum Cover Lead-in and Service Lead (on private property)

2.2.2. Maximum Cover

Maximum cover for Chorus plant that requires physical access is 1.5m.

Work in any pit, shaft, trench or other excavation in which any person is required to work in a space more than 1.5m deep and having a depth greater than the horizontal width at the top is notifiable hazardous work under regulation 24 of the Health and Safety in Employment Regulations 1995.

2.3. Chorus Network Installation Inside the Development

A Chorus representative will supervise the installation of our network, as required. Any instruction given by that representative, either in the first instance or to correct a problem, must be followed.

Chorus prefers the telecoms service point to utilise the same trench as power services, however it is dependent on the final positions that will be confirmed in the final design specification. For more information on the telecoms service point, please refer to Volumes 2 & 3.

Road reserve: The installation will involve laying of the Chorus network in the main trench in the road reserve area and lateral ducting to Chorus pit positions near the section boundary line. Wherever possible, the telecommunication ducting needs to be laid furthest from the boundary in the road to be vested to the Council.

2.4. Chorus Network Installation Outside the Development

When a trench is to be provided (typically open cut) by the developers contractor on Council or Waka Kotahi NZTA land, the appropriate written permission from the Council or Waka Kotahi NZTA via a CAR (Corridor Access Request) must be obtained by the developers contractor prior to the commencement of any works. Chorus network must not be installed prior to this permission being viewed by the Chorus Service Company Representative.

Developers will not carry out simple single isolated road thrusts for Chorus network in rural situations - this work will be carried out by the Chorus Service Company.

Traffic Management Plans must be submitted by the developers contractor and approved by the Local Roading Authority before any Chorus network is installed.

The developer's contractor is responsible to ensure that all other existing services (including Chorus') are located prior to excavation. The cost of repair to any service will be the responsibility of the developer or their sub-contractor. To arrange location of existing Chorus services phone 0800 248 344 or see the website https://www.chorus.co.nz/our-network/before-you-dig

3. General Infrastructure Compliance

3.1. Overview

It is very important that telecommunications infrastructure is sufficiently protected and maintains a minimum separation from other utilities such as power, gas, water, storm water and sewage.

This is to ensure the health & safety of the installer and Chorus network, as well as prevent accidental damage to any other utility infrastructure.

This is based on the New Zealand Committee for the Co-ordination of Power and Telecommunication Systems (NZCCPTS) Cable Separation Guide.

3.2. Power Network Clearance

A guideline on the minimum separation between the Chorus network and a power network is as outlined. Refer to the NZCCPTS Cable Separation Guide for more details.

Power Cable Voltage	Power Cable Type	With Mechanical Protection Installed	Minimum Separation
Low voltage – Exceeding 50v AC or 120v ripple free DC but not exceeding 1000v AC or 1500v DC	Neutral screened or armoured	No	150mm crossing 300mm parallel
		Yes	50mm
	Other than neutral screened or armoured	No	450mm
		Yes	50mm Crossing 450mm parallel
High voltage – Any voltage exceeding 1000v AC or 1500v DC	Single core or Multi core	No	450mm
		Yes	150mm crossing 450mm parallel (2.4km maximum parallel length)

Table 4. Clearances between Power and Telecommunication

Mechanical protection is generally installed to give protection to the power cable from any future digging activity. Examples of such mechanical protection are concrete slabs, PE mag slabs or ground contact treated timber. Refer to the AS/NZS 3000 standard for more information.

- Concrete slab: Minimum 50mm thickness
- Ground contact treated timber: Minimum 25mm thickness
- Tough plastic slab minimum dimension: 10mm thick x 150mm wide x 750mm long

3.2.1. Cable Crossing Separation

Following are diagrams showing cable separation between the different utilities to the ground level. Some examples of special protection are timber or mag slabs.

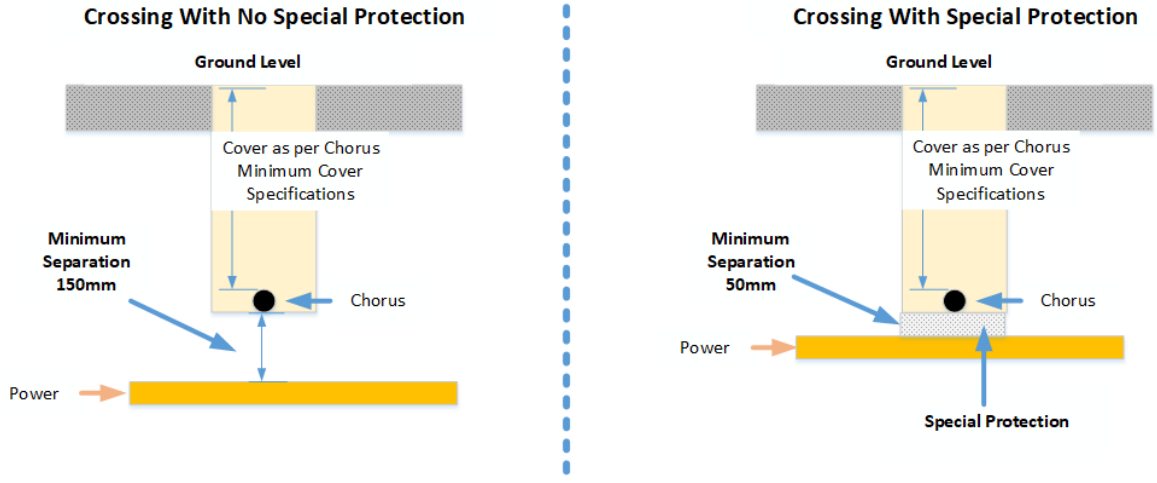


Figure 1. Crossing Separation – LV Neutral Screened or Armoured

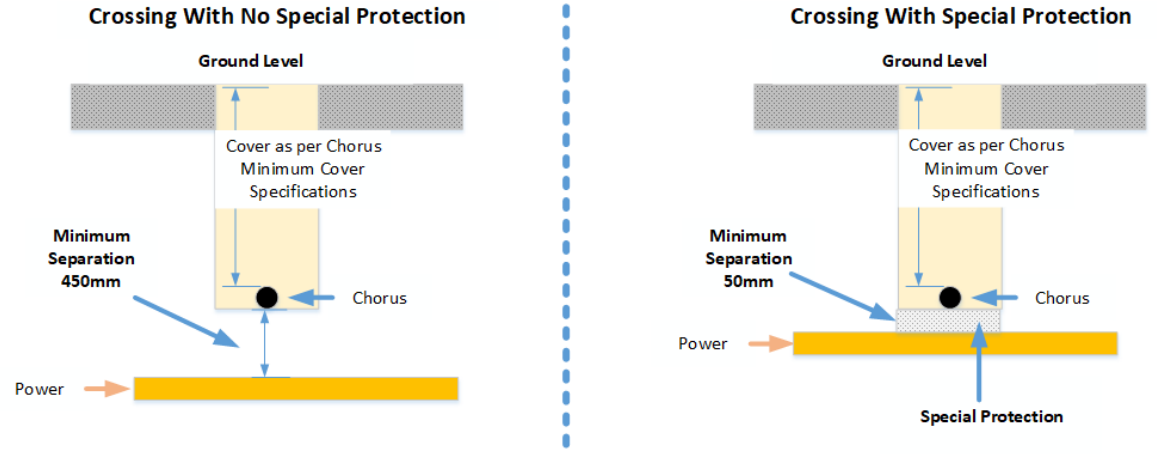


Figure 2. Crossing Separation – LV Non-Screened or Un-Armoured

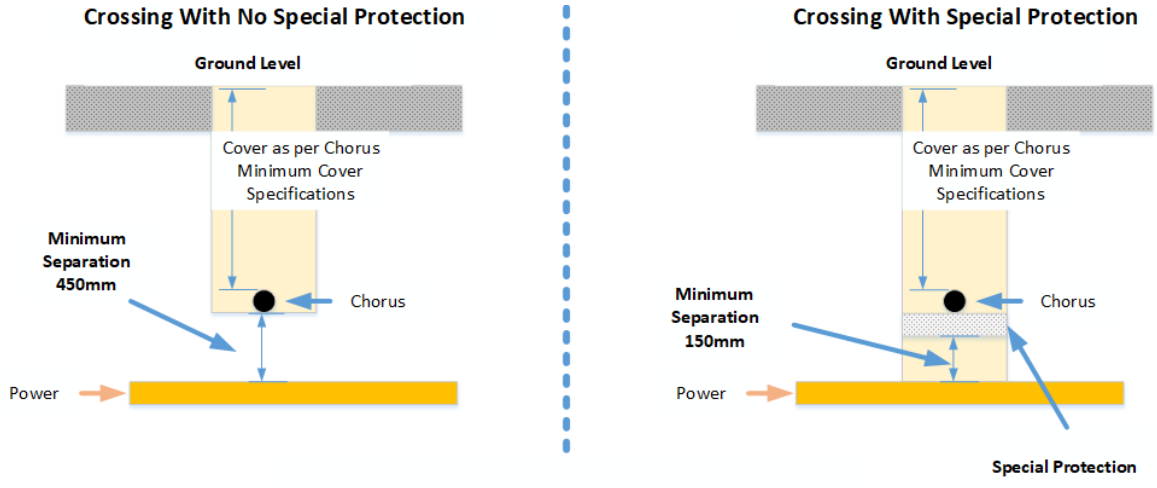
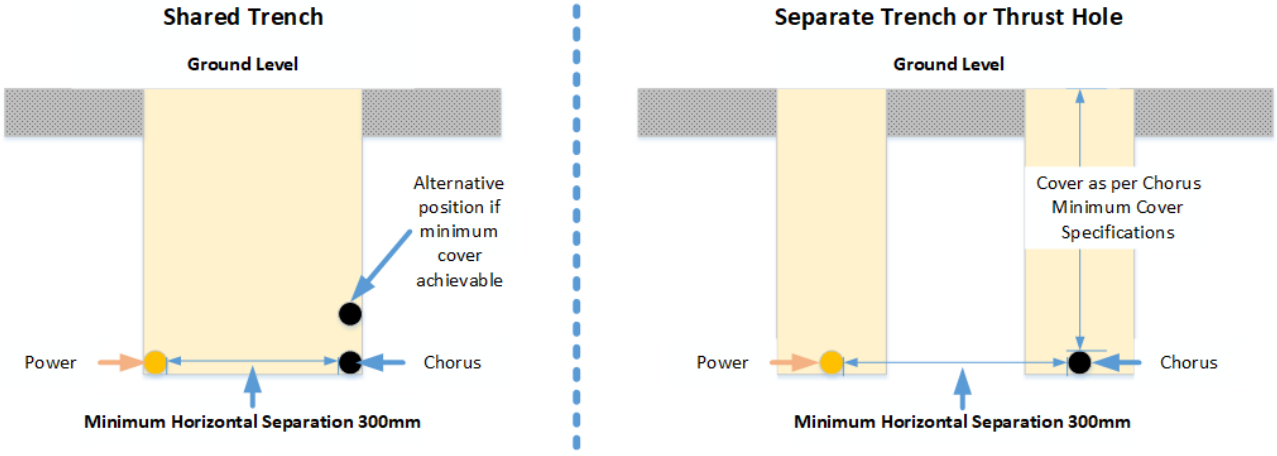


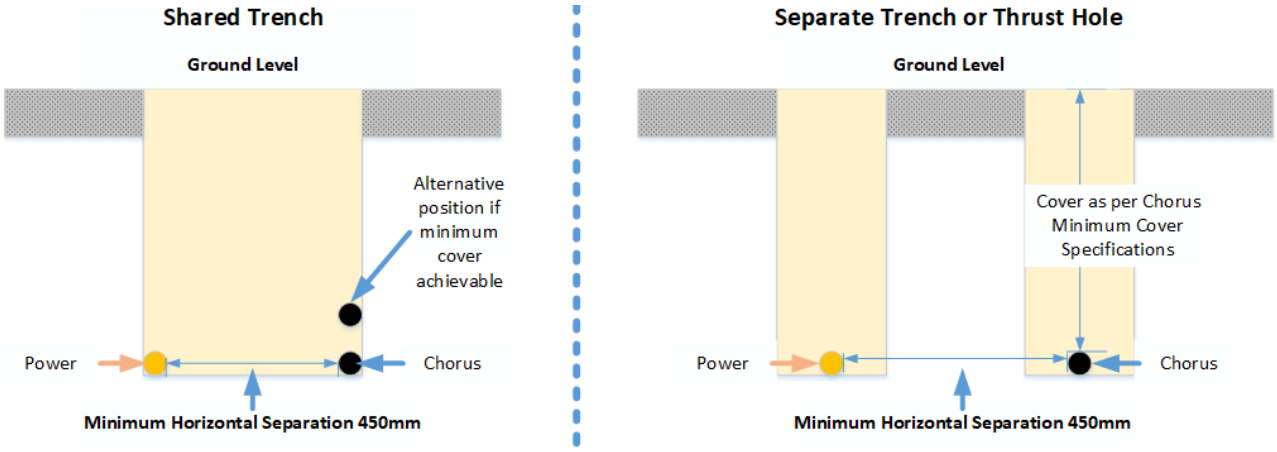
Figure 3. Crossing Separation – HV Single or Multicore

3.2.2. Cable Parallel Separation



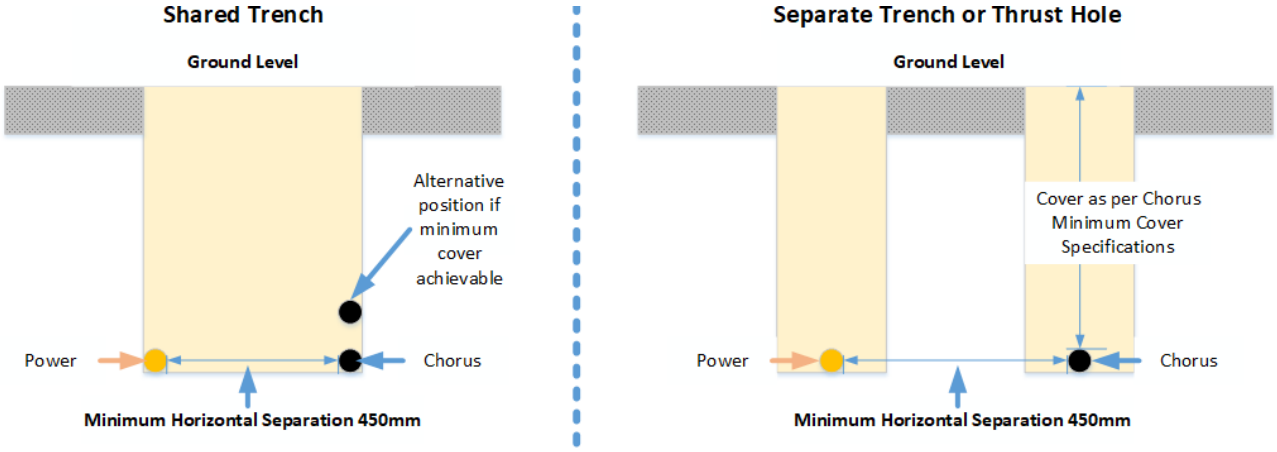
LV Power Neutral Screened or Armoured Cables

Figure 4. Parallel Separation – LV Neutral Screened or Armoured



LV Power Non-Screened or Un-Armoured Cables

Figure 5. Parallel Separation – LV Non-Screened or Un-Armoured



HV Power Single or Multicore Cables

Figure 6. Parallel Separation – HV Single or Multicore Cable

3.3. Gas Network Clearance

3.3.1. Natural Gas Pressures

Description of operating pressures:

Operating pressures	Pipeline pressures
Low pressure	Up to 7 kPa
Medium pressure	Greater than 7 kpa but not exceeding 420 kPa.
Intermediate pressure	Greater than 420 kPa but not exceeding 2000 kPa.
High pressure	Systems operating above 2000 kPa.

Table 5. Natural Gas Pipeline Operating Pressures

3.3.2. Separations

Separations from pipelines operating at pressures.

Operating Pressure	Situation	Minimum Separation
Low pressure	Crossing	150mm
Low pressure	Parallel	150mm
Medium pressure	Crossing	150mm
Medium pressure	Parallel	150mm
Intermediate pressure	Crossing	300mm
Intermediate pressure	Parallel	450mm minimum (measured horizontally) Horizontal separation is required in the case of parallel cable to guard against damage which could occur in the event of a blowout in the gas pipe.
High pressure	Crossing	600mm minimum (greater if specified by the Pipe Line Inspector.
High pressure	Parallel	Not permitted within the easement

Table 6. Gas Separations

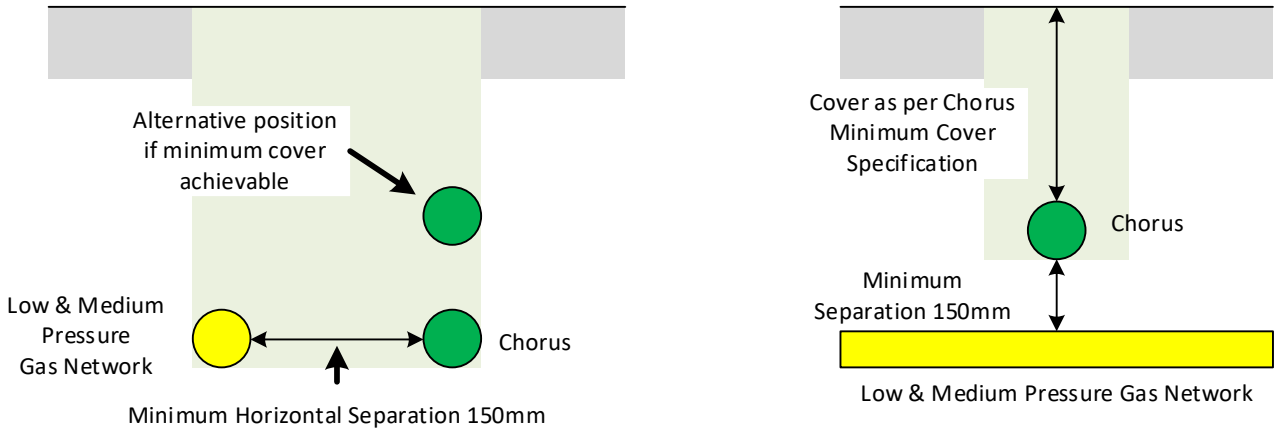


Figure 7. Parallel & Crossing Separation – Low & Medium Pressure Gas Pipe

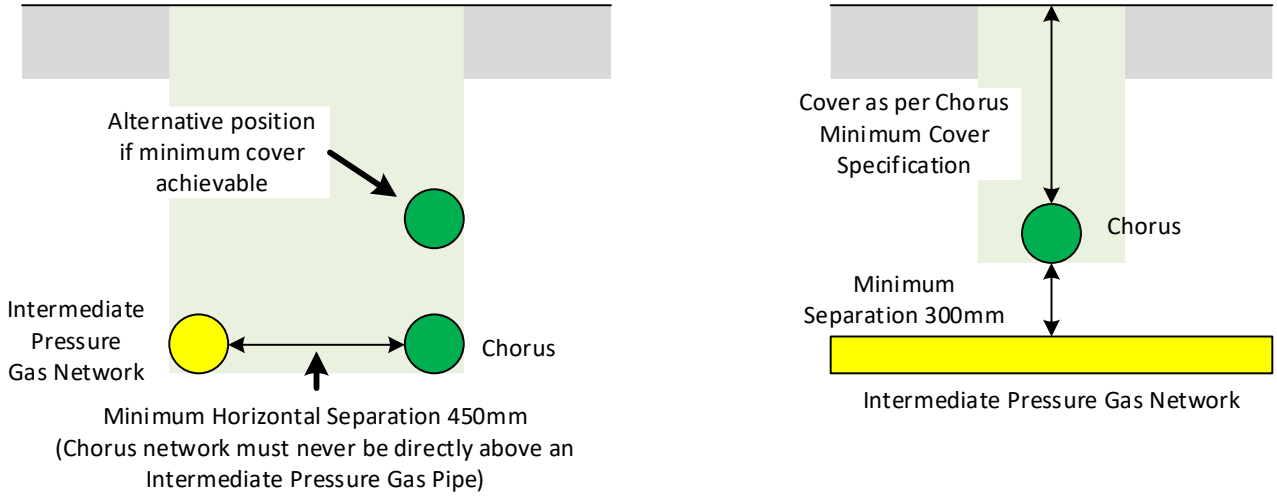


Figure 8. Parallel & Crossing Separation – Intermediate Pressure Gas Pipe

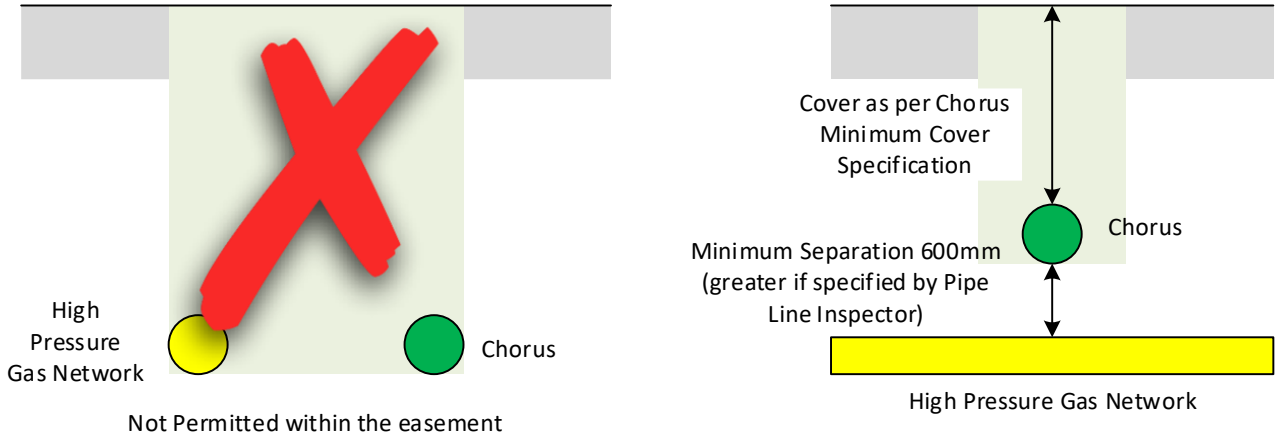


Figure 9. Parallel & Crossing Separation – High Pressure Gas Pipe

3.4. Other Services Clearance

There are no fixed clearance standards for other services, but in general a clearance of 300mm should be observed between Chorus network and water mains, storm water drains or sewer lines.

4. Communal Infrastructure

4.1. Civil Works

All Chorus cables, ducting, manholes and turning pits are to be installed at the correct level relative to the finished ground level. Pits that house FFP closures are installed by Chorus service companies.

The Chorus service company will provide all cables, ducting, manholes and turning pits including internal shutters. The manholes are to be installed in the locations as per the lay plan.

All cables and ducting are to be installed as per the supplied design plans after manholes and turning pits have been installed. Duct penetration into manholes and turning pit must be flush in concrete manholes and protrude by 50mm in Aluminium or plastic pits. All clearances from power and gas are to be maintained as per this document. Clearance from any other services is to be 300mm.

Trenches will need to be extended to the boundary locations from the main communal network for service lateral connections.

For a pit & pipe network 20mm or 50mm ducting can be teed off from a main pipe or pit to a Channell hand hole on the boundary located beside the power service box.

For a microduct network, lead-in microduct is tapped off from the main microduct to a Channell hand hole on the boundary located beside the power service box.

For copper cable installation, see Section 6.

Chorus network should not be installed until:

- berm levels have reached their final levels;
- kerb-lines and footpaths (where applicable) are in place (ducting may be placed under footpaths to facilitate the installation of service laterals at a later stage);
- boundary positions are accurately marked (final pegs do not necessarily have to be in place, but their final position must be accurately known);
- the installation of any other underground services, that may affect our network, has been completed.

4.2. Microduct Installation

Microducts are flexible, lightweight, durable and easy to handle tubes. They have a low friction inner surface that enables optical fibre cables to be blown into them on a stream of air. To facilitate installation microducts are supplied in multi-duct bundles where several microducts are bound together in an outer sheath.

In greenfield deployments, the direct buried type microduct is usually used where it can be installed similar to conventional PVC pipe. The common microduct bundle has a 26-way configuration that has 26x 5/3.5mm tubes and 1x 12/10mm tube. Care must be taking during installation to prevent any kinking of the microduct as it will impede the blowing of optical fibre through to the premises. Microduct must be installed with direction arrow on sheath pointing away from the FFP and towards the customer premises.

Drop off from the microduct bundle to each premises is done by using a microduct clamp closure where a ruggedized microduct is joint and installed into a hand hole at the boundary. All microduct jointing and lateral drop off to the hand hole at the premises boundary is to be done by Chorus. Developer to provide access to microduct and supply all required trenching between microduct and boundary. Access points must be kept open for microduct jointing and testing.

- All ends of ducting must be protected with multi-duct end cap (SRS 1016 17+) whilst on the drum.
- All ends of ducting must be protected with a heatshrink end cap during installation and after installation.
- Ensure that adequate length is left at each joint location.
- Ensure that minimum bend radius and maximum hauling tension requirements are met when installing the ducting.

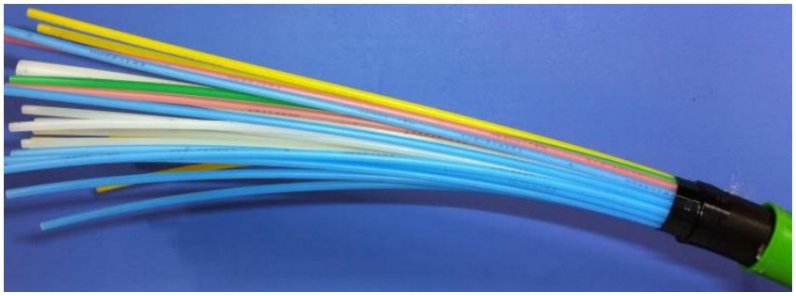


Figure 10. Direct Buried Microduct

Microduct Type	Outer Sheath Diameter (mm)	Weight (g/m)	Minimum Bending Radius (mm)	Max Pulling Force (N)
 26-way DB Microduct	40.0	770	380	2400
 1-way Ruggedized Microduct	7.3 – 8.6	100	100	300

Table 7. Microduct Specification

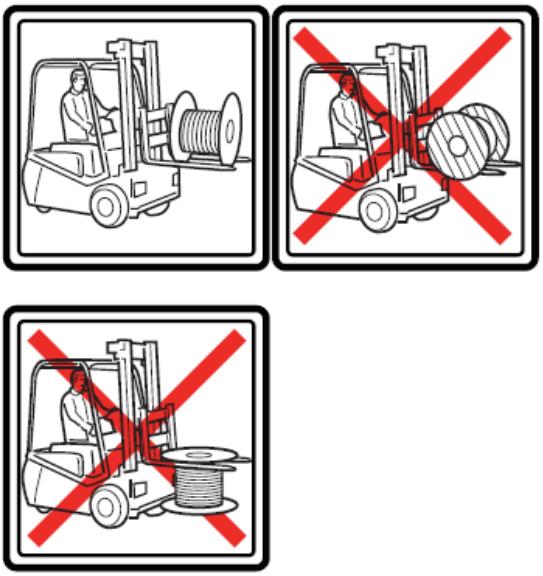
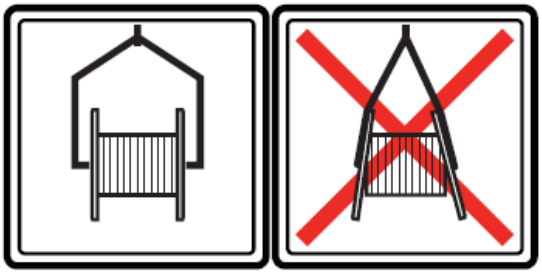
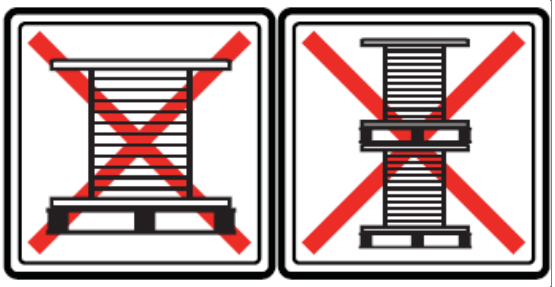
4.2.1. Handling of Drums

Fibre cable and multi-duct drums must be handled with care. Improper drum handling may cause damage to the cable or the duct. Cable or multi-duct drums must be transported on a jinker or suitable A-frame, capable of supporting the drum size and weight of up to 1000kg's.

***Note**: The multi-ducts may be supplied in wooden drums or steel drums. With steel drums, they may move around more when it is on a forklift or truck decks. Ensure that the drums are secured by using chocking blocks or straps.*

The rules around handling drums are described below.

When loading or unloading drums use a forklift or lift the drum through the centre hole	
Never try to roll the drum off a truck, a ramp or similar	

When using a forklift, the fork is only allowed to lift the drum from the flange side. Make sure that the fork grips both flanges of the drum, and that the fork never touches the duct or cable. Otherwise, the fork may damage the duct or cable.	
When lifting with a crane through the centre hole, make sure the lifting wires are kept with a distance using a rod or an axle spreader to avoid lateral pressure on the flanges.	
Never place the drum on the side. Always keep it standing upright.	
Make sure that the drum is secured both when stored and during transportation. Especially on site, this is extremely important, due to liability issues, if the drum rolls away.	
When storing the drum outside, make sure that the ground is firm and well drained.	

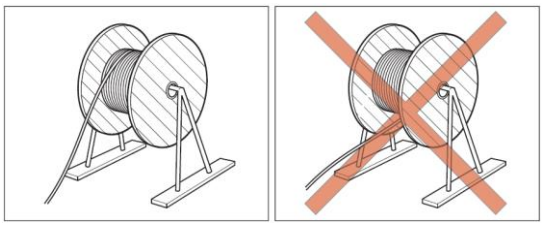
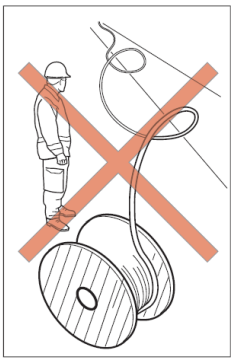
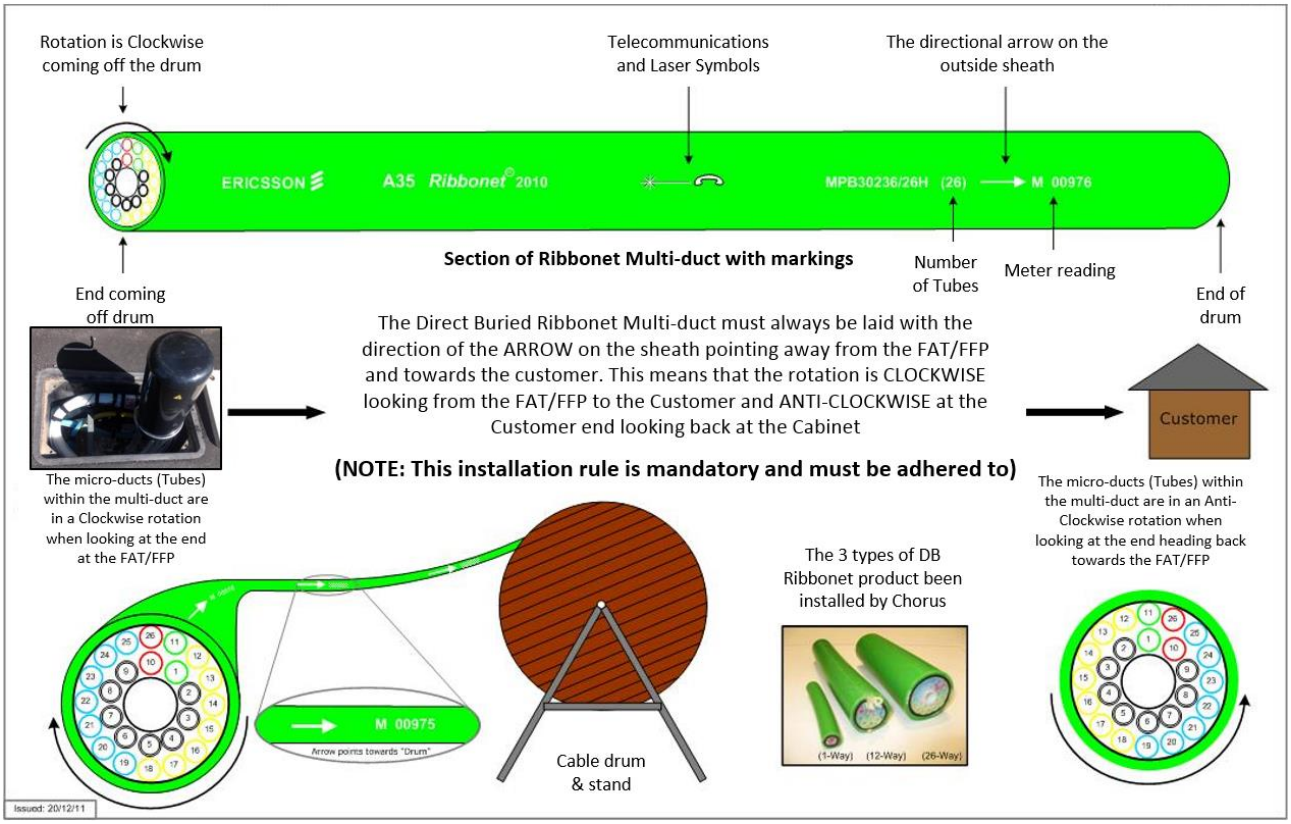
Do not store the drum in direct sunlight, and do not expose it for extreme temperatures. Store under cover in an upright position. Leave enough room between the drums to facilitate removing (at least 600mm)	
Always roll the drum in the direction of the arrow indicated on the drum. This will make sure that the duct or cable do not uncoil during the transportation.	
When rolling the duct or the cable off a drum, always roll it from the top side of the drum.	
Always use a drum stand or jinker. Do not lift the drum up on one side and coil the duct off the drum, this will cause the duct to be twisted and undulate in the trench or conduit. A twisted duct will cause problems when blowing a cable.	

Table 8. Drum Handling

4.2.2. Microduct Installation Reference Guide

There is a difference in the installation direction of the microduct product. Care must be taken to ensure that installers are aware of the differences in the direction of installation.

***Note**: The rules shown below are mandatory and must be adhered to*



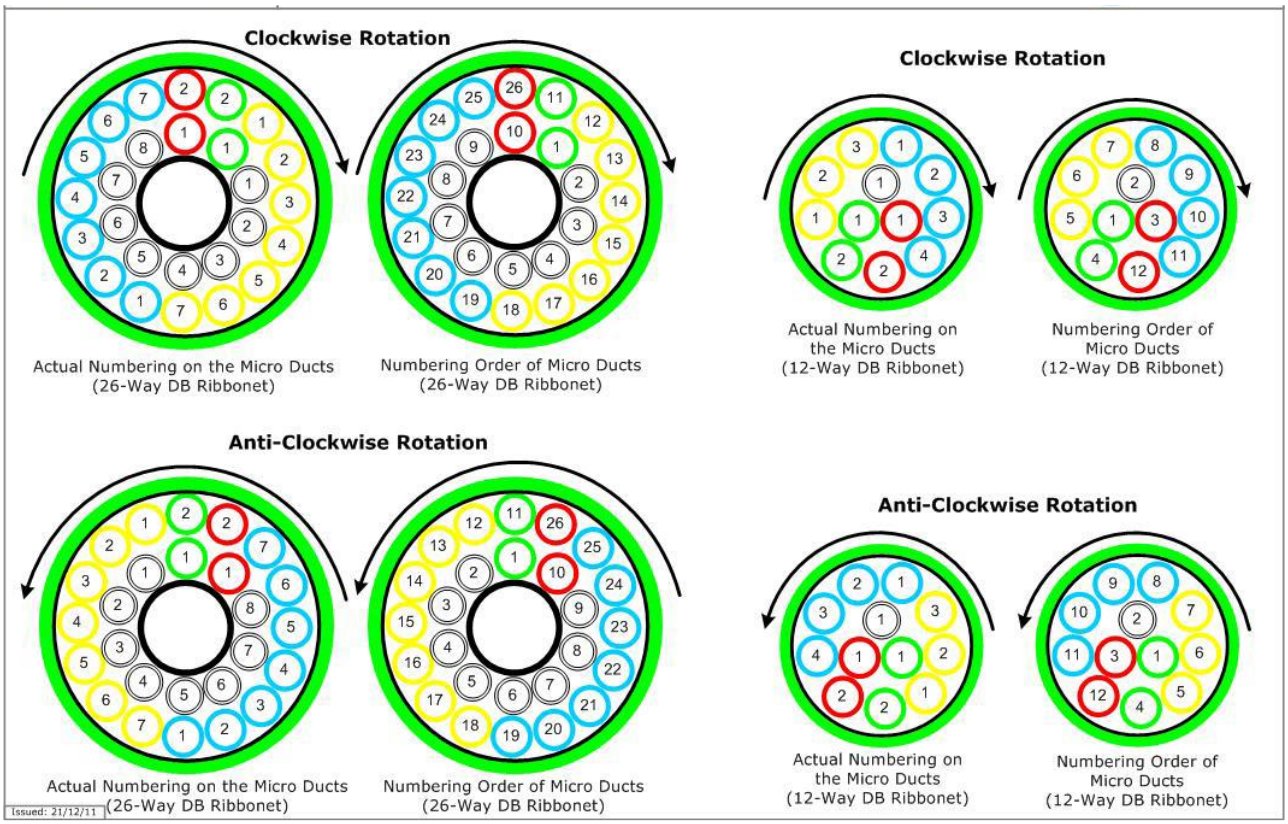


Figure 11. Microduct Installation Reference Guide

4.3. Duct 'T' Installation

100mm or 50mm duct that will have the Duct 'T' installed must always be on the property boundary side of any other Chorus ducting in the same trench to allow easy access to install a Duct 'T' and to ensure the Duct 'T' is installed onto the correct duct in the correct direction from the FFP/FAT to customer premises.

Duct 'T' installation must be installed to a very high standard using PVC glue and cable ties. The Duct 'T' must be installed correctly so no air escapes during the blowing in of fibre cables by the Chorus service companies.

There is a protruding locating knob on the inside of the duct 'T'. It is important to drill a small hole in the duct for this to sit in to ensure that the duct 'T' will seal and not twist when the PVC glue is setting in.

No trenches are to be back filled until the Duct 'T' are installed. The reason for this is to ensure that the Duct 'T' installation is on the correct duct when there are multiple ducts in the trench.

Figure 12. Duct 'T'

4.4. Road-Crossings

In cases where the network design requires road-crossings, and where the roads will be formed before the service trenches are opened, Chorus will provide 100mm PVC ducts to be installed at the road-crossing points before the roads are formed to allow the cables to be pulled through later. These road-crossing points will be indicated in the final design specification provided by the Chorus service company representative.

4.5. Hand Hole at Boundary

The Channell hand hole is 305mm deep and 362mm in diameter at the bottom. The installation of the hand hole in hard surfaces must follow the following rules.

***Note**: In some instances, a heavy duty hand hole may be required*

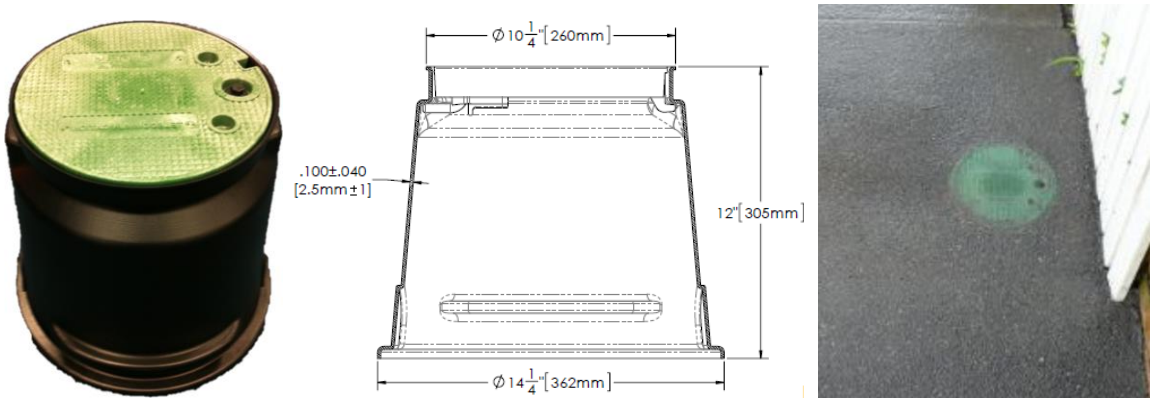
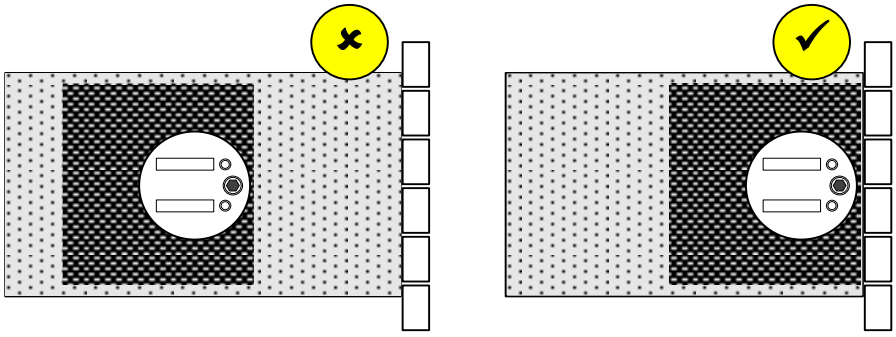


Figure 13. Channell Hand hole

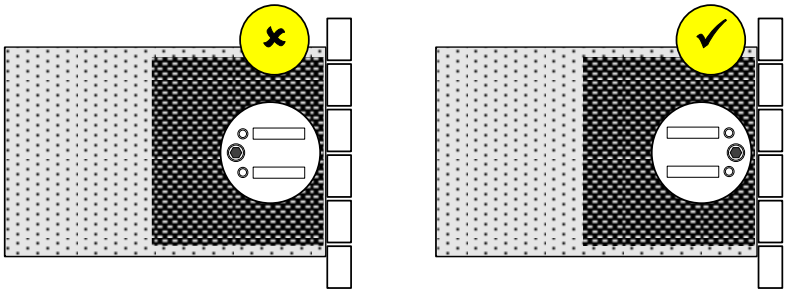
1. Whenever possible, the hand hole shall be installed as close as possible to the customer boundary such that it is easily accessible from the customer side during provisioning.



Too far from customer boundary

Close to customer boundary

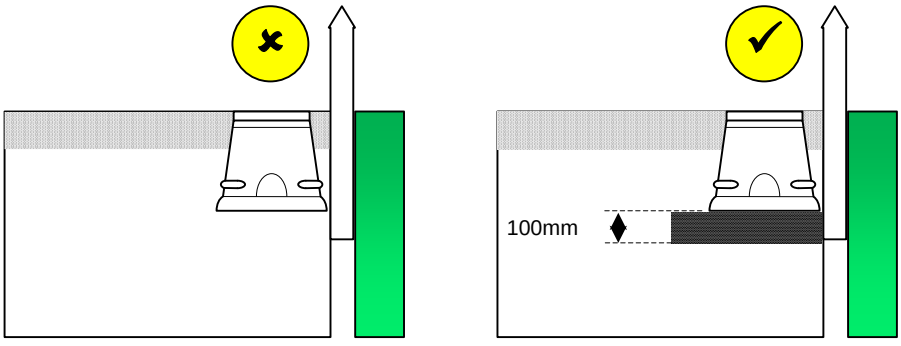
2. The orientation of the top cover shall have the lock facing the boundary. This is to ensure the lid lifting hole is on the boundary side to prevent it from being a trip hazard.



Wrong HEX lock orientation

HEX lock facing customer boundary

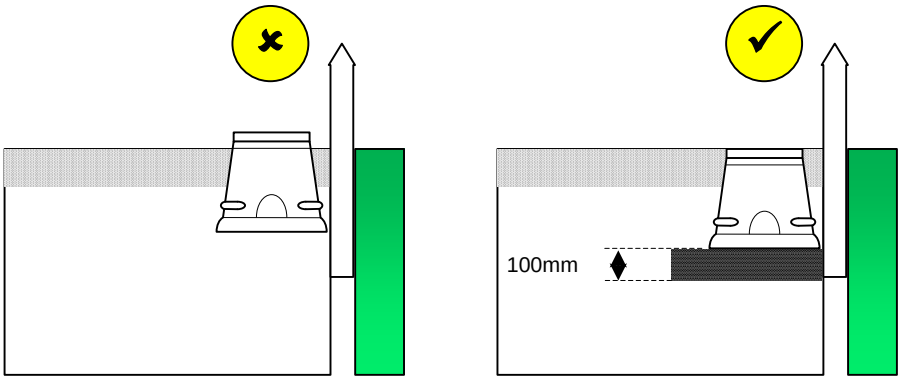
3. There must be a min of 100mm compacted gravel below the Hand Hole.



No gravel below pit

100mm Compacted Gravel below pit

4. The top cover of the pit shall be level with the reinstated ground.



Pit above ground level

Pit is at the same level as ground

4.6. Marker Post at Boundary

The Mini Marker Post and Large Marker Posts are installed into a soft surface at the customer boundary to indicate the location of service leads buried underground. At the boundary, microducts allocated to premises are labelled, capped and heat shrunk. These microducts are brought up above ground level and secured to the marker post by using cable ties.

Mini Marker Post

Deployed if Pre-Built Fibre (PBF) is agreed for the greenfields development. The Mini Marker Post is 500mm long and is to be buried at a 300mm depth with 200mm above ground. It has slots at the top and bottom to enable microducts to be secured by using cable ties.

Large Marker Post

Deployed if there is no PBF agreed for the greenfields development. The Large Marker Post is 1.4m long and is to be buried at a 400mm depth with 1m above ground. Holes are to be drilled into the Large Marker Post to enable microducts to be secured by using cable ties.

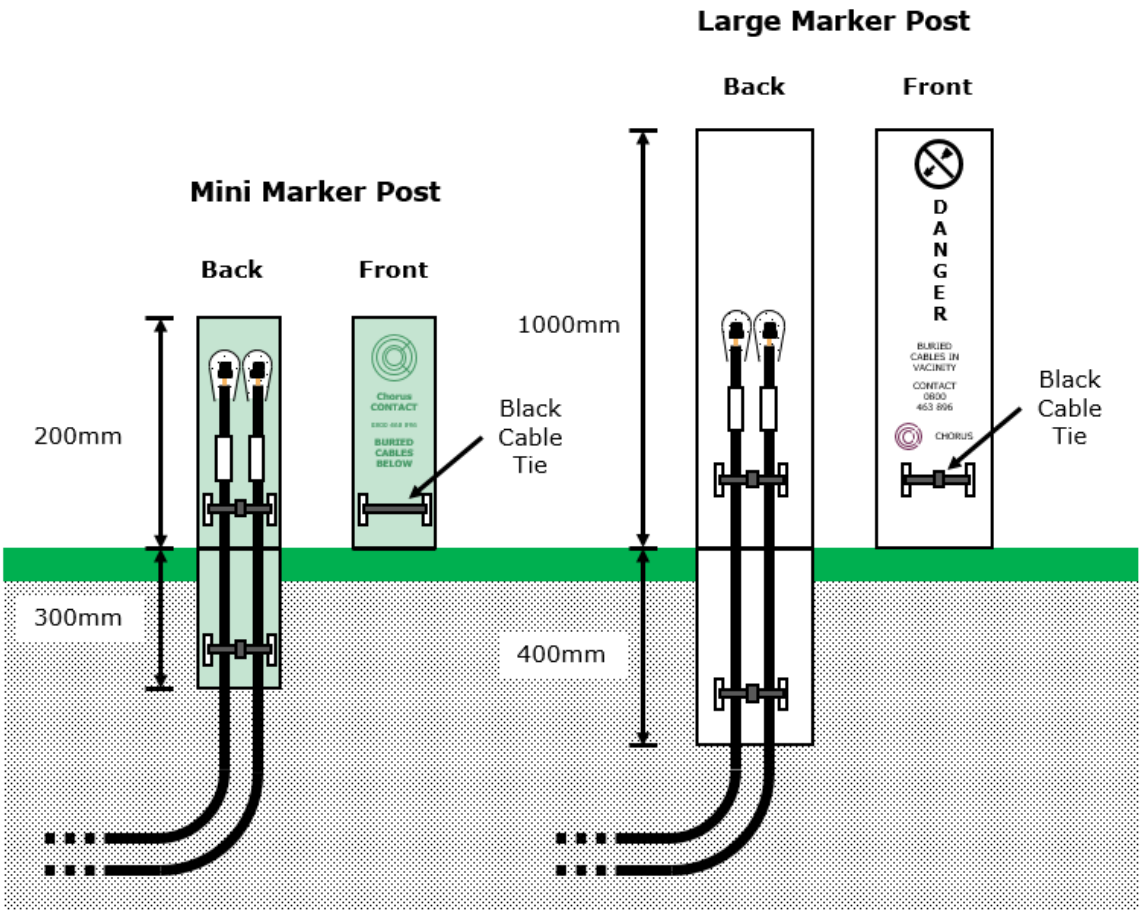


Figure 14. Marker Post at Boundary

4.7. Service Layout Examples

4.7.1. Typical Air Blown Microduct Boundary Layout

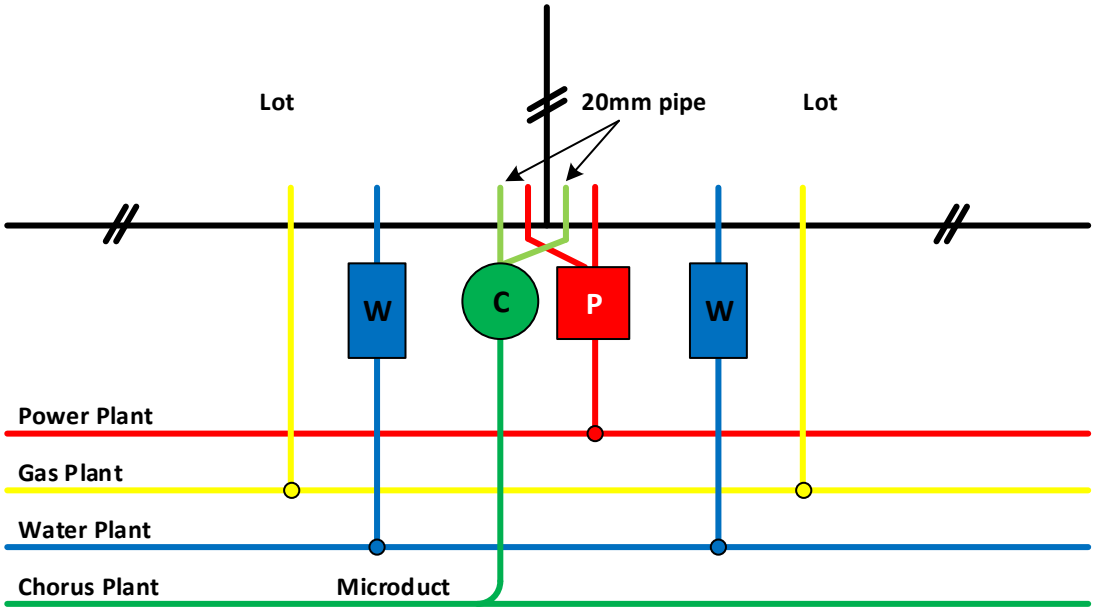


Figure 15. Typical Air Blown Microduct Boundary Layout

4.7.2. Typical Pit & Pipe Boundary Layout

The diagram below shows a typical pit & pipe boundary layout. Depending on the type of building, the boundary hand hole and the service lead-in pipe/duct size may differ.

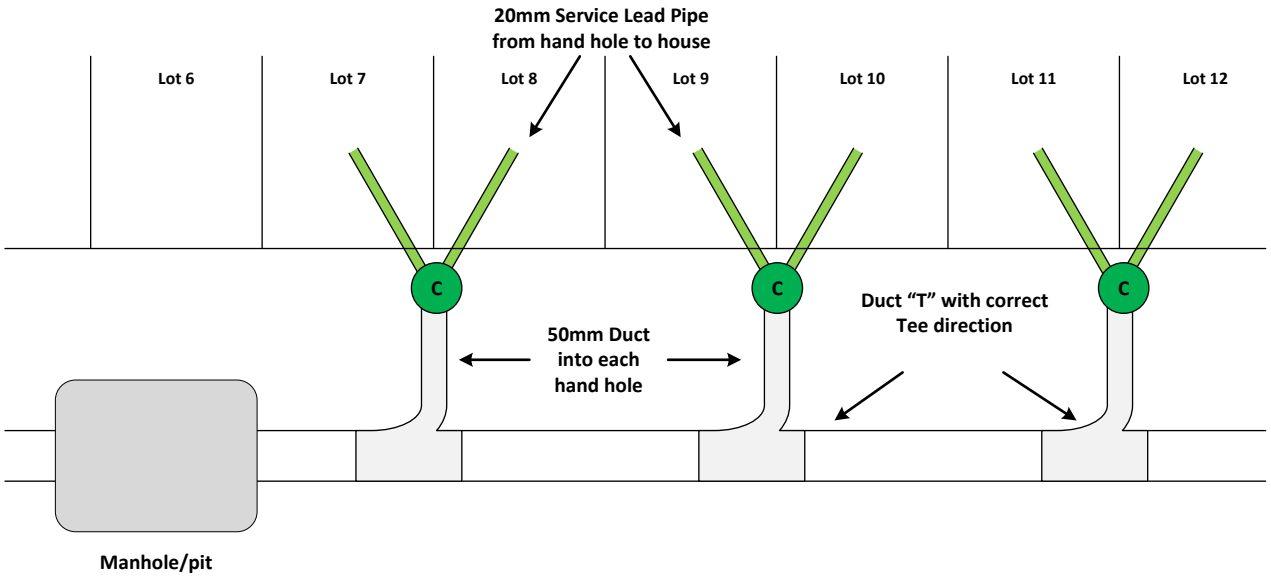


Figure 16. Typical Pit and Pipe Boundary Layout

4.7.3. Typical Copper Only Network Boundary Layout

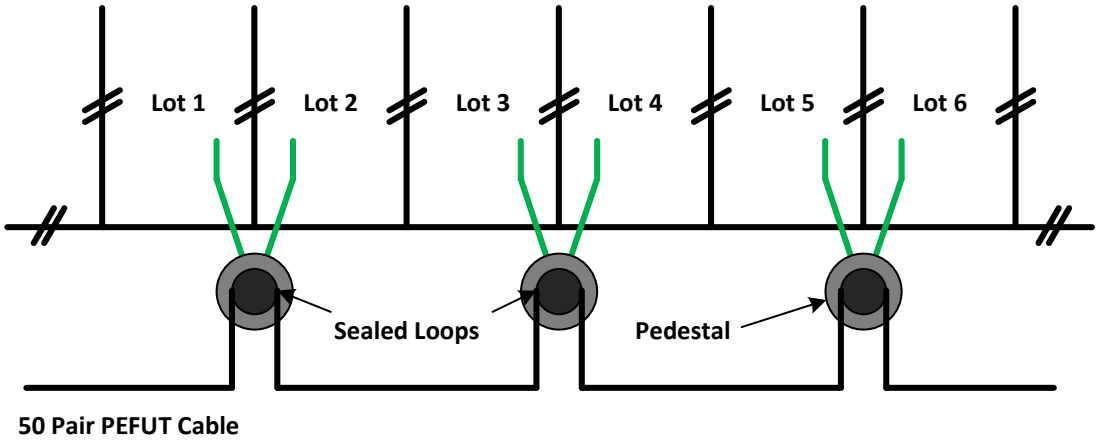


Figure 17. Typical Copper Only Network Boundary Layout

4.7.4. Service Lead Pipe Installation

A 20mm green lead-in pipe is to be installed from the pit or pedestal to the side of the house where the ETP is to be mounted. If there is no dwelling at time of subdivision communal network build, then a 20mm pipe is installed from the handhole, pit or pedestal to 600mm inside the property with 500mm showing above ground.

The 20mm green lead-in pipe must be installed below the finished ground level as outlined in document ND0629 Volume 2.

5. Chorus Communal Fibre Distribution Network

5.1. Overview

Chorus is actively building New Zealand's UFB fibre future by deploying optical fibre in the communal network.

In line with the UFB initiative, Chorus is producing this design guideline for property developers to ensure new properties, subdivisions and renovations are completed in such a way to ensure fibre readiness for connection to the Chorus UFB network.

There are three types of Communal Distribution Networks which are the:

- Microduct system using air blown technology
- A pit & pipe system using conventional fibre cable
- An aerial distribution cable.

Chorus typically deploys an underground air blown microduct system in new greenfield development areas, however, in locations such as in a CBD area where there is a higher possibility for network change, a pit & pipe system is the preferred network type.

5.1.1. Services Through UFB

There is a myriad of services that can potentially be provided through the UFB network. The most common services are High Speed Internet Service, VoIP Telephone Service, Broadcast TV, Video on Demand (VOD) and others. All these services can be provided through a port out of an ONT or an RGW, depending on the Internet Service Provider selling the service.

In order to future proof for the provision of these multiple services, optical fibre must be installed into the home distributor hub where the ONT is to be placed. This is important because there are 4x Ethernet ports and 1x ATA ports on the (current) ONT and different services may be provided through separate ports which can be connected to the Cat6 cabling throughout the premise.

5.2. Chorus UFB Network

The Chorus fibre network is based on a GPON deployment with a centralised passive splitting architecture. The diagram below shows the typical Chorus communal network design.

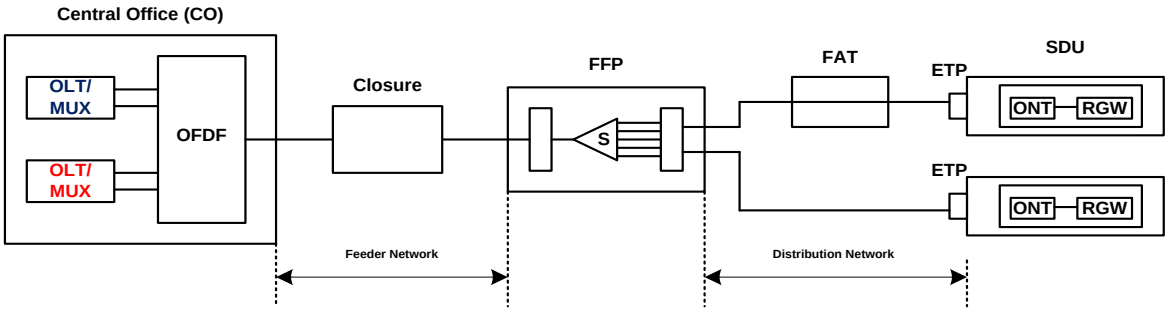


Figure 18. Typical Chorus UFB Network for SDU

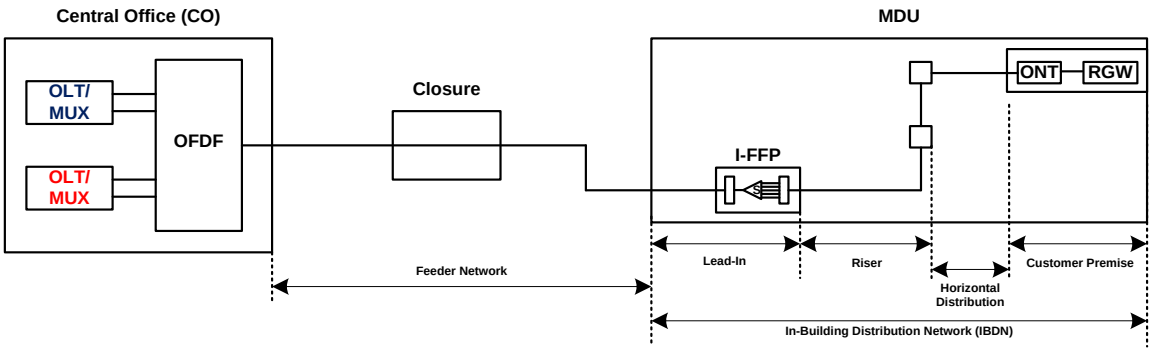


Figure 19. Typical Chorus UFB Network for MDU

6. Chorus Communal Copper Distribution Network

6.1. Overview

In areas that are not covered under the Chorus UFB network or within an area that cannot be connected to a Chorus fibre network, copper distribution will be installed to the development area. If the network is a copper only network, it will be based on the Sealed Loop RLG architecture as outlined in this section.

6.2. Chorus Sealed Loop RLG Architecture

The Chorus Sealed Loop RLG architecture uses a direct buried copper cable, with the cable looped through pillars/pedestals located on the boundaries (to coincide with power boundary box positions where possible). In a standard system, a 50 pair cable will be laid to serve 30 premises.

6.2.1. Cable Installation

Refer to Sections 3 and 5 for the trench and civils works requirements.

A pillar/pedestal will normally be situated adjacent to the premises boundary. The pillar/pedestal is to be installed at the finished ground level at the required boundary

The cable is to be looped at each pillar/pedestal such that there is 1m to 1.2m of cable above the ground to form a loop **without kinking the cable**.

A 20mm green lead-in pipe is to be installed from the pillar/pedestal to the side of the house where the ETP is to be mounted. If there is no building at time of build, then a 20mm green lead-in pipe is installed from the pillar/pedestals to 600mm inside the lots with 500mm showing above ground. All buried pipe must have the joints glued.

Cable on drums must be transported on a cable jinker or suitable A-frame, capable of supporting the drum size and weight of up to 1,000kgs.

6.2.2. Pipe Installation

On occasion a 50mm or 100mm lead-in pipe may be laid instead of direct buried cable.

For road crossings, please refer to Section 4.

6.2.3. Pipe for Future Use

In addition to the installation of the cable, a 50mm or 100mm pipe may also be installed with the cable along the road reserve trenches, in designated subdivision areas – this is for feeding future stages where applicable, or used to convert to fibre in the future.

Where these pipes terminate underground, they must be sealed with an endcap.

Any pipe, on completion of installation, may be subject to a pull-through test.

6.2.4. Jointing Cable

Cable joint positions are to be kept open until jointing is completed.

Consultation between the Chorus service company representative and the developer will be required to ensure that the cable jointing is completed prior to the completion of footpaths and berms.