CHORUS

UFB Ready Property Guidelines

Volume 1 - General Fibre Network Guidelines

Publication Date: 29 March, 2018
Document Number: ND0629 v3.0 (Volume 1)

Document Control

Copyright

Table of Contents

Table of Figures

Tables List

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 subdivision 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 RSP 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 star wiring box

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 star wiring box to all outlets.

1.1.2. 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.

1.1.3. 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 partners must use that product from the approved supplier.

1.1.4. 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 provider. If there is any conflict between the relevant contract and statements made in this document, the terms of the relevant contract shall prevail.

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.

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 3080	Telecommunications installations – Generic cabling for commercial premises
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 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
	TCF Premises Wiring - Cable Installers Guidelines for Telecommunication Services http://www.tcf.org.nz/library/85f5318d-fc71-409f-a04d-48ff414107f7.cmr

1.3. Occupational Safety and Health

1.3.1. Field Activity

Chorus prides itself on its quality installations for all customers. This company is fully cognisant of its health and safety obligations under the Health & Safety at Work Act 2015, including all its subornment legislation. The company provides fit for purpose equipment and complete our work to industry good practice standards.

All Service Providers engaged by Chorus are required to accept and apply the same high standards, ALL THE TIME.

We adopt work practice safety precautions that are proportionate to the specific risk exposure that each site may present. These include but are not limited to;

- Contracted Service Partners providing Chorus with project Specific Health and Safety Plans that include risk assessment prior to commencement of any works.
- Project specific safe work method statements or job safety analysis being created and shared with Chorus prior to commencement of works so that Chorus can ensure that any risks or the hazards that sit behind these, have been identified are managed properly.
- All persons undertaking associated works have appropriate levels of competency and training and that these meet the recognised industry standards and expectations.
- All incidents or events associated with the project are notified to Chorus within the agreed timelines and full investigations undertaken to identify root cause. This information can be shared with developers as required.
- Appropriate investigations and corrective actions are undertaken and completed to prevent recurrence after any significant event.
- All fibre and other waste material is to be removed from site and disposed, or recycled, in accordance with the Build Partner and Chorus environmental waste minimisation and management plans.

Technicians working on the Chorus network in customer premises including sub-divisions will be required to adhere to and comply with both their own company health and safety requirements, as well as the any developer's site specific protocols as required by the customer.

Technicians are responsible for establishing a robust hazard identification and management practice.

1.3.2. Optical Fibre Safety

This Chorus Build and Provisioning Programme provides supervision, of workers and/or site based safety supervisors with the general safety rules, task specific safety procedures and good practice industry standards for the installation of quality fibre optic cable systems, (cable handling, blowing, splicing, pulling, terminating testing and troubleshooting tasks as required for a great customer experience).

Our technicians take pride in their wormanship and this includes the appropriate steps to correctly dispose of fibre scraps carefully.

This is achieved with the use of disposable sharps containers that have a sealed lids.

Remembering that fibre scraps provide the same risk as would be experienced with glass splinters.

Handling cleaning chemicals and adhesives for quality checks are completed carefully and all Chorus technicians are familiar with the Material Safety Data Sheets (MSDS's) information pertaining to cleaning chemicals used.

Copies of further fibre optic safety and installation safe work method statements and a host of other safety related documentation can be made available to prospective subdivision developers upon request.

1.4. Glossary of Terms Used

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

Term	Description
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.
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 substandard 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 2F cable installed from the FFP or FAT in the Chorus distribution network. This is typically also referred to as the Service Lead.
ETP	**External Termination Point** An outdoor enclosure mounted on the side of a premise which provides a point of connectivity from the lead-in fibre cable and the premise fibre cable.
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

Term	Description
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.
IBDN	**In Building Distribution Network** The optical fibre distribution network within a building premise.
I-FFP	**Internal Fibre Flexibility Point** An FFP which is installed indoors, typically in a TER
ID	Internal Diameter
ISAM	**Intelligent Services Access Manager** A node equipment that provides access services such as DSL and GPON.
Lead-In Cable	The Lead-In Cable is a cable that is installed from the premises boundary to the building within the premises. This can be a large multi-fibre cable to feed an MDU or a Service Lead connecting a single unit such as an SDU
LFC	**Local Fibre Company** The operator of the local optical fibre network such as Chorus
MDU	**Multi Dwelling Unit** A building which has two or more premises such as an apartment building.
Microduct	A 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.
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 plant 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** More than one premises with separate ownership sharing a common access to the public roads.
RSP	**Retail Service Provider** Telecommunication companies who use Chorus' optical fibre network to create retail UFB-based services which are sold to residents, businesses, schools and health premises.
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 connections
Service Lead	A Service Lead is a cable that connects from the Chorus distribution network to a single premises. The Service Lead can be a Drop Cable or an Indoor Cable.

Term	Description
TER	**Telecoms Equipment Room** A location in an MDU where the lead-in cable terminates into an I-FFP and where the IBDN converges.
TSG	**The Subdivision Group** The Chorus contact point for property developers. Refer to the Chorus website www.chorus.co.nz for more details
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. Network Type Selection

2.1. Fibre/Copper Decision Flowchart

The type of network to be installed in a Greenfield or subdivision depends on the location of the development with respect to Chorus' UFB area.

The general Chorus decision is as outlined in the flowchart below. This chart is just a general guide, please contact Chorus TSG for guidance on the network type that will be provided to your property.

In an area where a fibre only network is installed, this will be based on the Chorus UFB network architecture and design.

In a copper and fibre network, usually a microduct system is installed together with a Sealed Loop RLG network.

In a copper only network, this will usually be based on a Sealed Loop RLG network architecture and design.

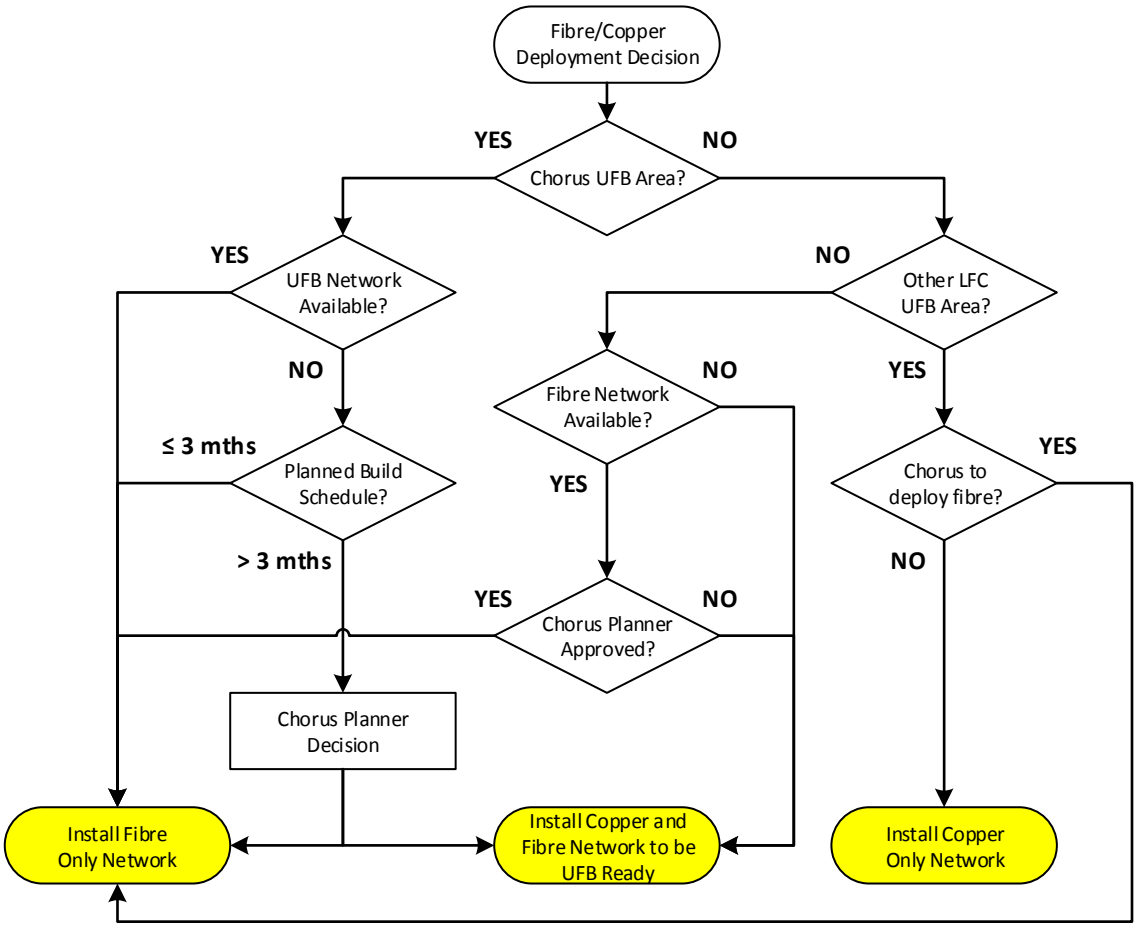


Figure 1. Chorus Fibre/Copper Decision Flowchart

3. General Information for Chorus Plant Installation

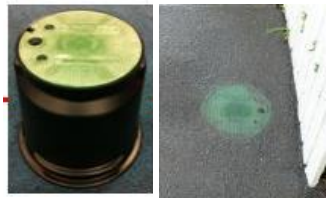
3.1. Chorus Plant Overview

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

- Green PVC chorus branded ducting (20mm, 32mm, 50mm and 100mm)
- Microducts of various sizes for air blown optical fibre cables and units
- Aluminium joint pits with one, two or four lids
- Plastic joint pits, Channell manufactured
- Access pits for service lead connections (usually sited on alternate boundaries with the power service box or pits

  ***NOTE**: see Section 7 for copper cable installations*

The material used for the Chorus plant 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.

Network Element	Description	Photo
Green pipe	Green 20mm, 32mm, 50mm and 100mm pipes used in the Chorus network ***Note**: The green pipe used must be a Chorus Network Specified Product supplied by Chorus approved distributors/manufacturers*	
Microducts	Microducts with green Chorus marked outer sheath. Microducts consists of a bundle of tubes that are used for blowing optical fibre units through to premises.	
Plastic pit	Plastic pits that are manufactured by Channell. Pits come in three different sizes which are: 1230 – L762 x W305 x D609mm Used as in-line cable hauling point or as distribution pits in ROWs with 4 or more premises. 1730 – L762 x W432 x D609mm Used as turning pit and for FFP or FAT installation 2436 – L914 x W609 x D609mm In situations where a larger than 1730 is required ***Note**: This is a Class B pit and is only suitable for installation in footpaths and is not roadway rated.*	
Hand holes	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.*	
Internal Fibre Flexibility Point (I-FFP)	Wall-mounted termination box or cabinet that is usually installed in a telecoms 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.	

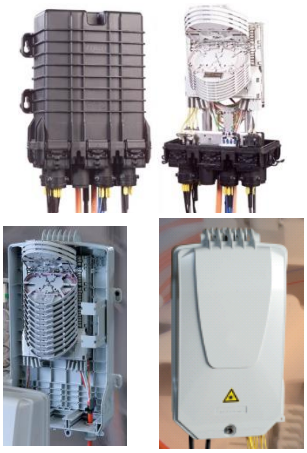
Network Element	Description	Photo
Fibre Access Terminal (FAT)	A FAT functions as a distribution point to branch off optical fibres from distribution cables to multiple drop cables to separate premises. For outdoor installation, the FAT can be installed underground in a pit, in a pedestal, wall-mounted 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 telecoms room or in risers.	
External Termination Pont (ETP)	A termination box that is usually wall-mounted on the external wall of a Single Dwelling Unit (SDU). 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. Usually used in houses with daisy-chained copper cabling.	
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	A wall-mounted equipment at the end of the Chorus network where the optical fibre is terminated. This is usually installed in the customer star wiring hub or in the lounge by the TV location. This equipment needs to be powered by a 230V AC power source.	
Residential Gateway (RGW)	Depending on the Regional Service Provider (RSP), an RGW is provided to be connected to the Chorus ONT to provide broadband service and Wi-Fi.	

Table 1. Chorus Plant Examples

3.2. Trench Requirement

The physical requirement of trenches to contain Chorus plant will be as follows:

- The offset for the trench will be as required by the local authority
- A shared trench with other services is acceptable if all recommended clearances, separations and covers are adhered to, and the offset is acceptable
- The Chorus plant must end up with a required cover of 450mm to 600mm cover in the berm and 800mm to 1000mm cover in roadways from the finished ground level. Refer to the local council requirements for more details.
- Suitable bedding material, for example, sand, crusher dust, pea gravel is to be installed below and above the cable or duct to a depth of 100mm
- Our plastic warning tape is to be installed 300mm below ground level between the plant and the finished ground level.

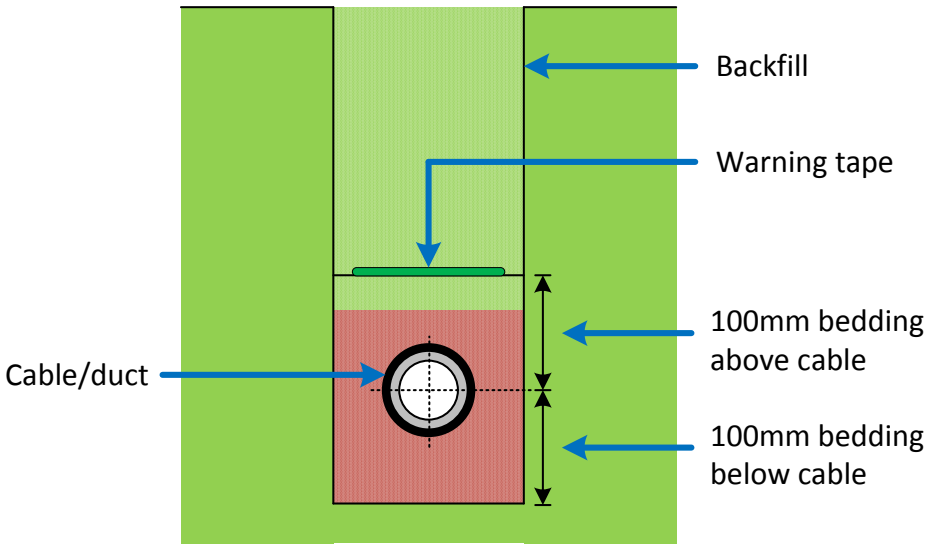


Figure 2. Trench Example

3.3. Chorus Plant Installation

A Chorus representative will supervise the installation of our plant, as required. Any instruction given by that representative, either in the first instance or to correct a problem, must be followed. Developer must contact the Chorus appointed field manager before commencing work.

Chorus requires the telecoms service point to be located together with the power service point at the boundary. The final positions will be confirmed in the final lay specification, and after liaison with the power authority.

The installation will involve laying of the Chorus ducting/cable in the main trench in the road reserve area and lateral ducting to Chorus pit positions near the section boundary line.

4. General Infrastructure Compliance

4.1. 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.

4.2. Power Network Clearance

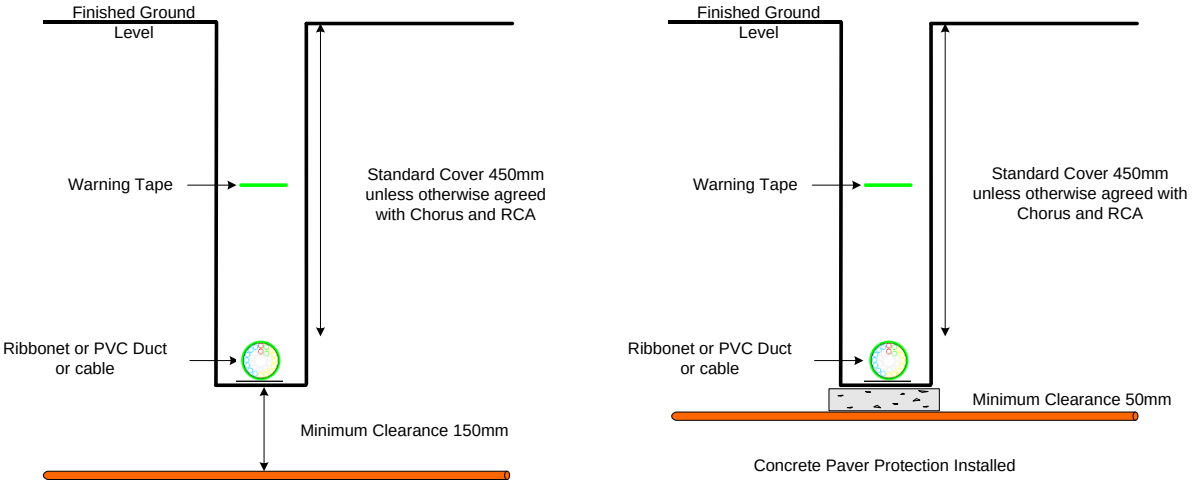
A guideline on the minimum separation between the Chorus network and a power network is as outlined. Refer to the NZCCPTS Cable Separation Guide for more details.

Power Cable Type and Voltage	At Crossings		On Parallel Runs		
	With Protection	Without Protection	In Road Reserve		Service Lead Into House
			Separation in Shared Trench (any direction) or separation when cables are vertically apart	Separation when cables are horizontally apart (NOT in a shared trench)	
Low Voltage – Neutral Screened or Armoured exceeding 50V AC or 120V ripple free DC, but not exceeding 1000V AC or 1500V DC	50mm	150mm	150mm	300mm	Same as "In Road Reserve" EXCEPT FOR residential urban undergrounding projects. Where 0m is permitted for neutral screened cables if the requirements of Section 3 Rule (3) of the NZCCPTS Cable Separation Guide are not met.
Low Voltage – NOT Neutral Screened or Armoured exceeding 50V AC or 120V ripple free DC, but not exceeding 1000V AC or 1500V DC	50mm	450mm	450mm	600mm	Same as "In Road Reserve"
High Voltage – any voltage exceeding 1000V AC or 1500V DC	150mm	450mm	450mm (2.4km limit on length)	600mm	Same as "In Road Reserve"

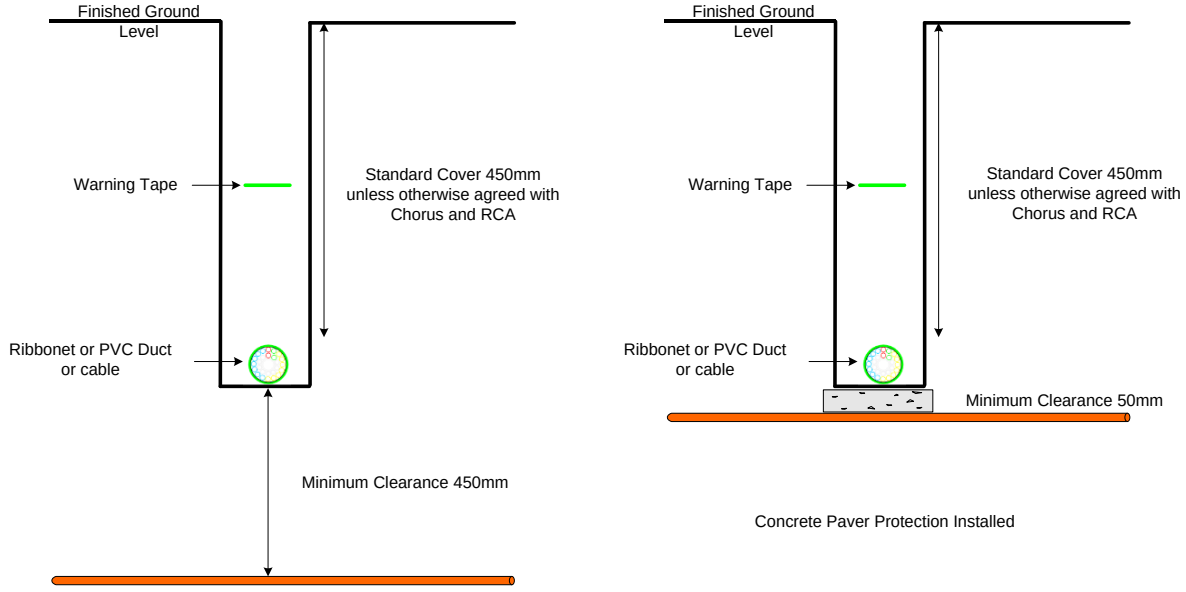
Table 2. Clearances between Power and Telecommunication

Mechanical protection are 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.

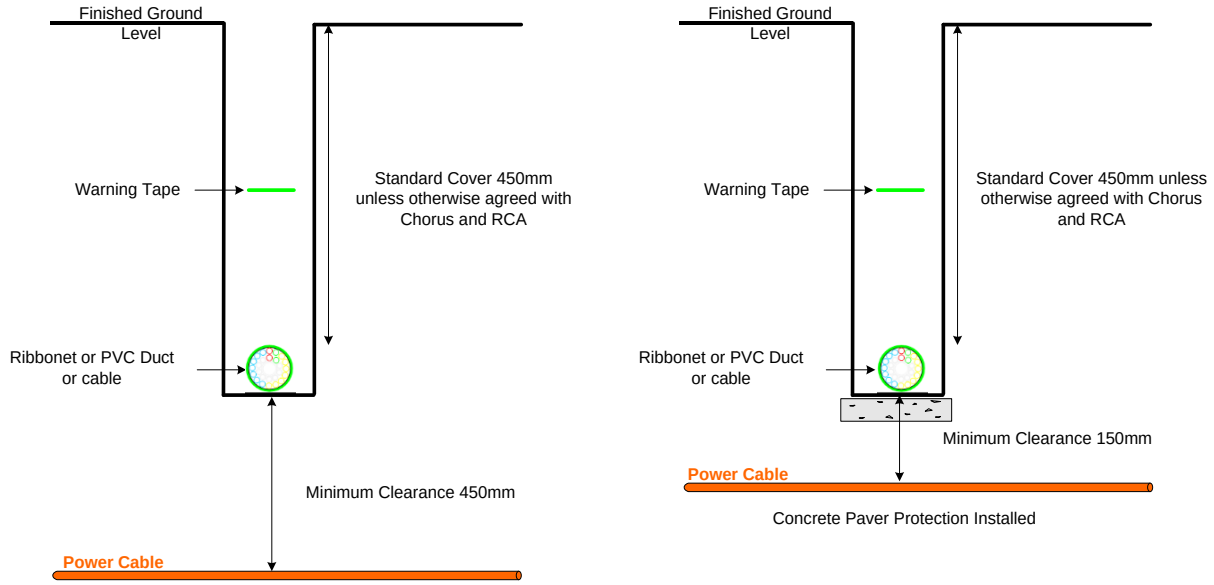
- Concrete slab: Minimum 50mm thickness
- Ground contact treated timber: Minimum 25mm thickness
- Tough plastic slab minimum dimension: 10mm thick x 150mm wide x 750mm long



Minimum Crossing Clearances between Chorus and LV Power Neutral Screened or Armoured Cables



Minimum Crossing Clearances between Chorus and LV Power Non-armoured or Unscreened Cables



Minimum Crossing Clearances between Chorus and HV Single or Multicore Cables

Figure 3. Examples of Telecommunication Infrastructure In a Shared Trench

4.3. Gas Plant Clearance

The minimum separation between the Chorus network and gas plant is as outlined below:

Situations	Clearance	Pipeline Pressure
Crossings	150mm minimum	420 kPa
Parallel	150mm minimum	420 kPa
Crossings	300mm	420 – 2000 kPa
Parallel	150mm 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.	420 – 2000 kPa
Crossings	600mm minimum (greater if specified by the Pipe Line Inspector)	2000 kPa
Parallel	Not permitted within the easement	

Table 3. Clearances between Gas Plant and Telecommunication

4.4. Other Services Clearance

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

5. Communal Infrastructure

5.1. Civil Works

The developer's contractor is to install all Chorus cables, pipes, microducts, manholes and turning pits at the correct level relative to the finished ground level. Pits that houses Flash9 closures are installed by Chorus service companies.

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

The developer's contractor is to install all cables, pipes, microducts, as per the attached lay plans after manholes and turning pits have been installed. Pipe 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 pipe can be tee 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.

Inside the premises boundary, 20mm green pipes are to be laid from the hand hole to the side of the house within the premises where the ETP is to be mounted. The 20mm green pipe must be installed below the finished ground level as outlined in document ND0629 Volume 2.

For copper cable installation, see Section 7.

Chorus plant 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 plant, has been completed.

5.2. Microduct Installation

Microducts are flexible, lightweight, durable and easy to handle tubes. They have a low friction inner surface that enables optical fibres to be blown into them on a stream of air. To facilitate installation microducts are supplied in multiduct 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 tensions requirements are met when installing the ducting

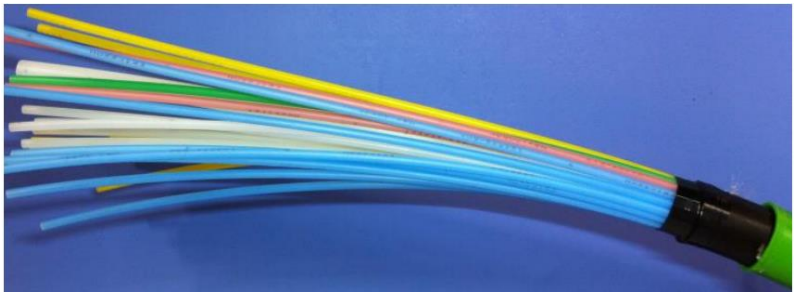


Figure 4. Direct Buried Microduct

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 4. Microduct Specification

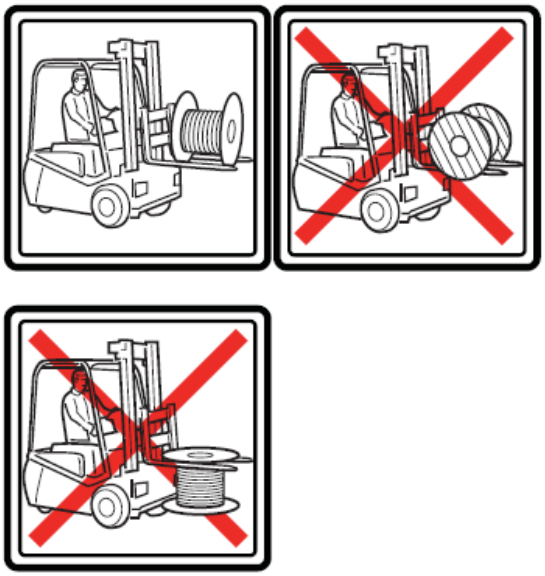
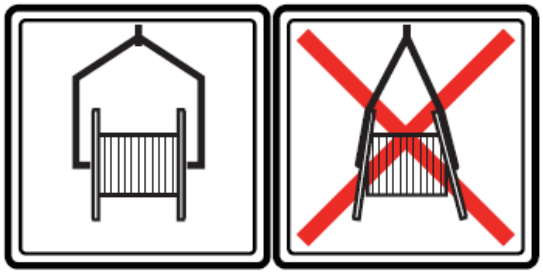
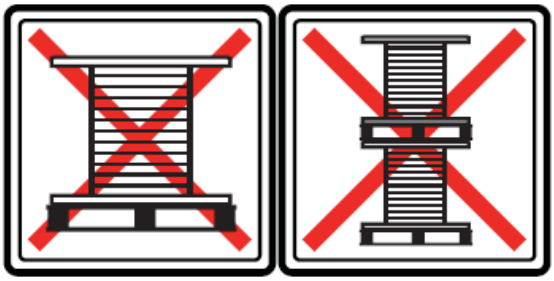
5.2.1. Handling of Drums

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 fork lift or lift the drum through the centre hole	
Never try to roll the drum off a truck, a ramp or similar	

When using a fork lifter, 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.	

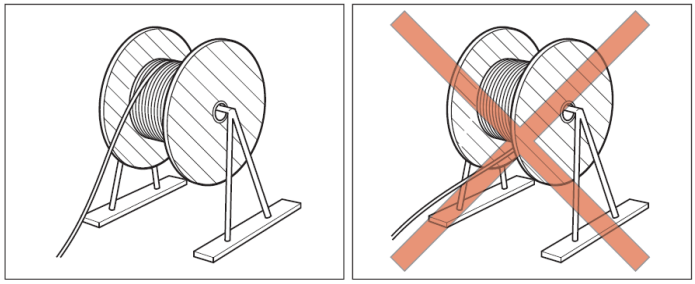
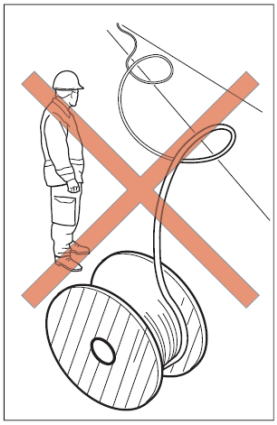
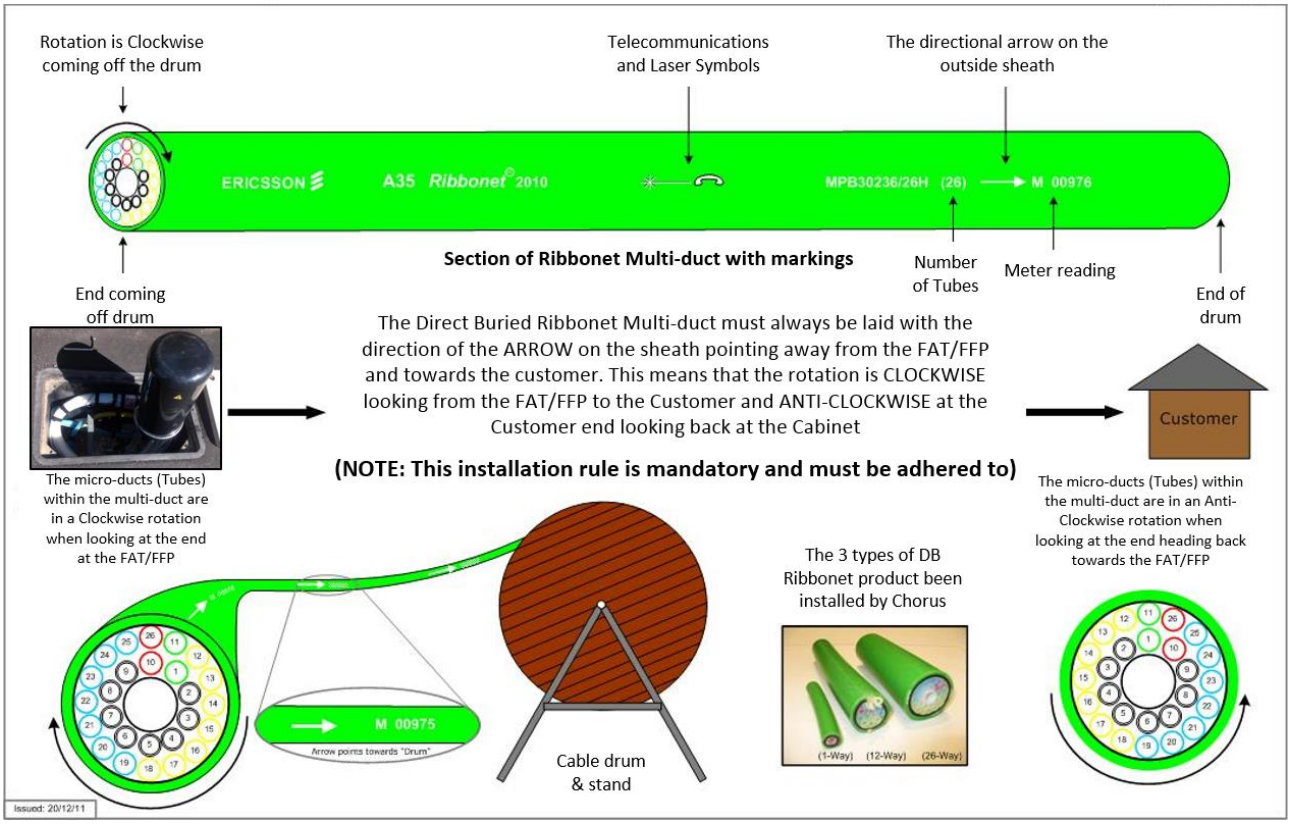
Do not store the drum in direct sunlight, and do not expose it for extreme temperatures. Store under cover in an upright position. Leave enough room between the drums to facilitate removing (at least 600mm)	
Always roll the drum in the direction of the arrow indicated on the drum. This will make sure 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 5. Drum Handling

5.2.2. 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*



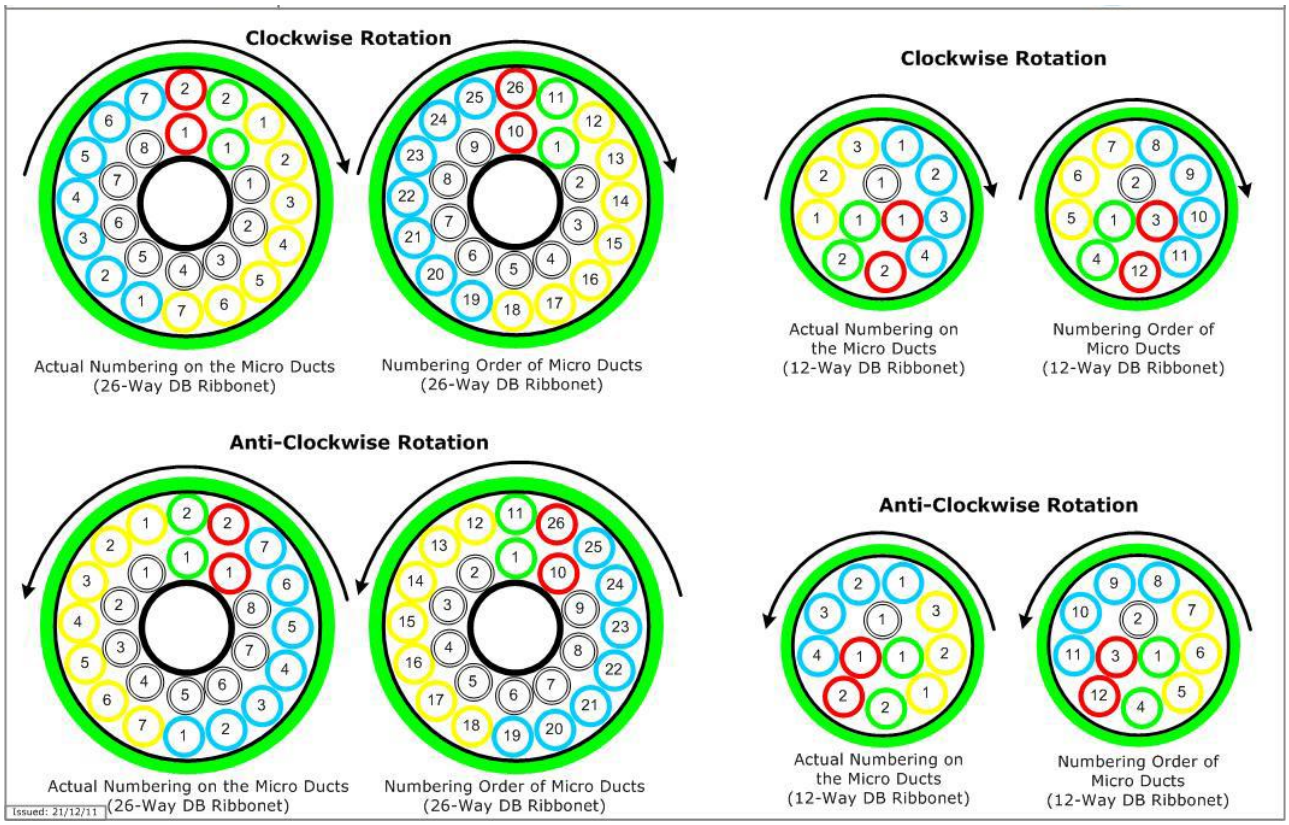


Figure 5. Microduct Installation Reference Guide

5.3. Duct 'T' Installation

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

Duct 'T' installation will be completed by the developer's contractor and 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 if the duct tee. It is important to drill a small hole in the duct for this to sit in to ensure that the duct tee will seal and not twist when the PVC glue is setting in.

No trenches at 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 pipe when there are multiple pipes in the trench.

Figure 6. Duct 'T'

5.4. 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.

The road-crossing ducts will be available from the service companies supply depot along with other materials required. The developer is responsible for placing these ducts, recording their location and for pulling the required cables through the ducts when the main service trenches are open and the cable is laid.

5.5. Hand Hole at Boundary

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

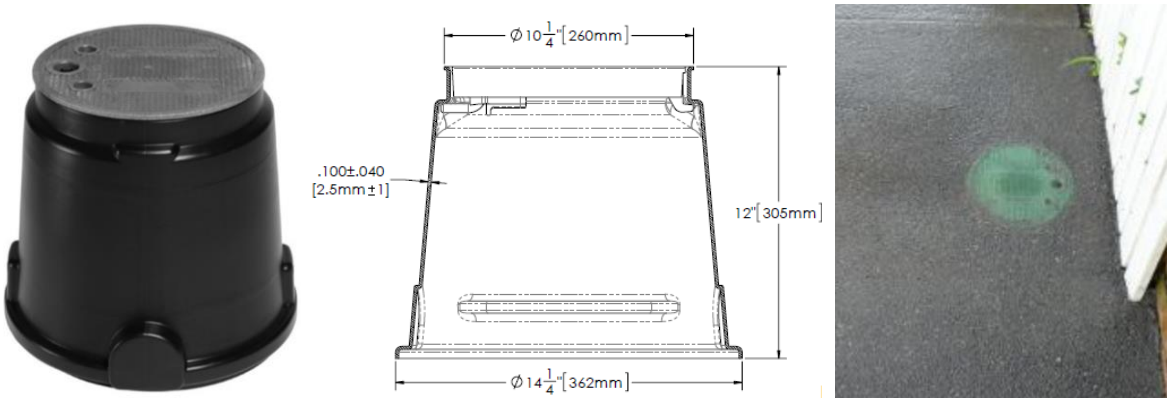
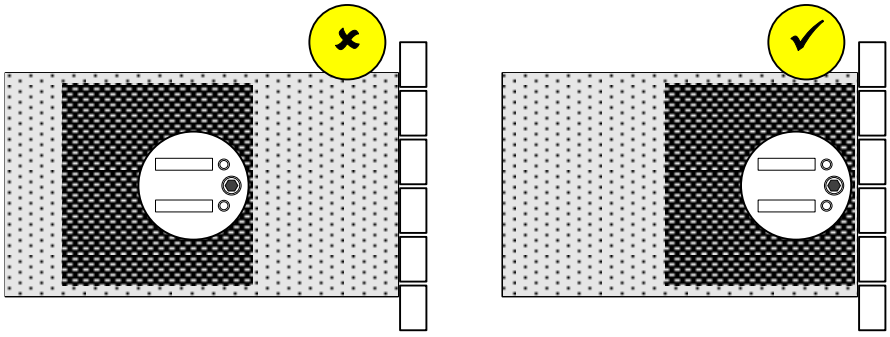


Figure 7. Channell Hand hole

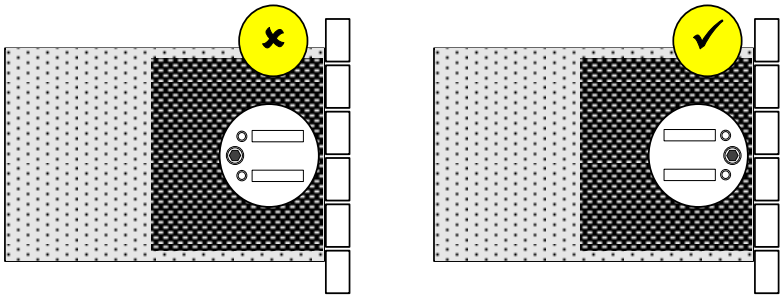
1. Whenever possible, the hand hole shall be installed as close as possible to the customer boundary such that it is easily accessible from the customer side during provisioning.



Too far from customer boundary

Close to customer boundary

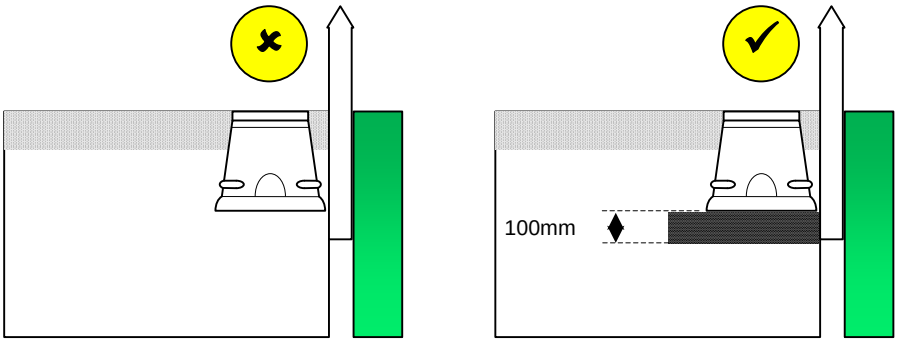
2. The orientation of the top cover shall have the lock facing the boundary. This is to ensure the lid lifting hole is on the boundary side to prevent it from being a trip hazard.



Wrong HEX lock orientation

HEX lock facing customer boundary

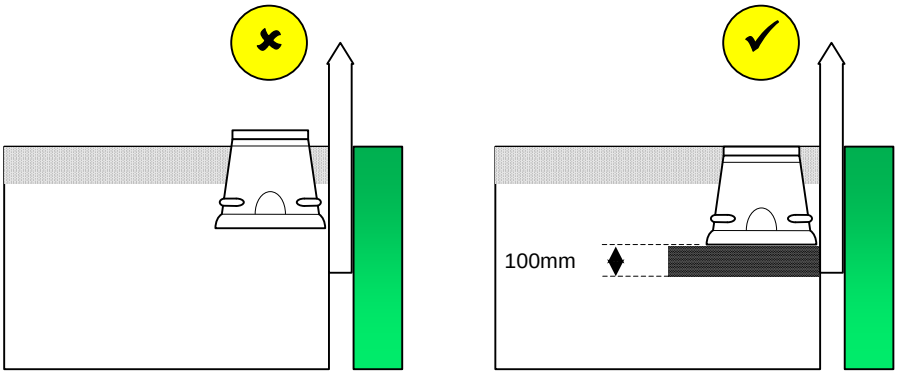
3. There must be a min of 100mm compacted gravel below the Hand Hole.



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

5.6. Service Layout Examples

5.6.1. Typical Air Blown Microduct Boundary Layout

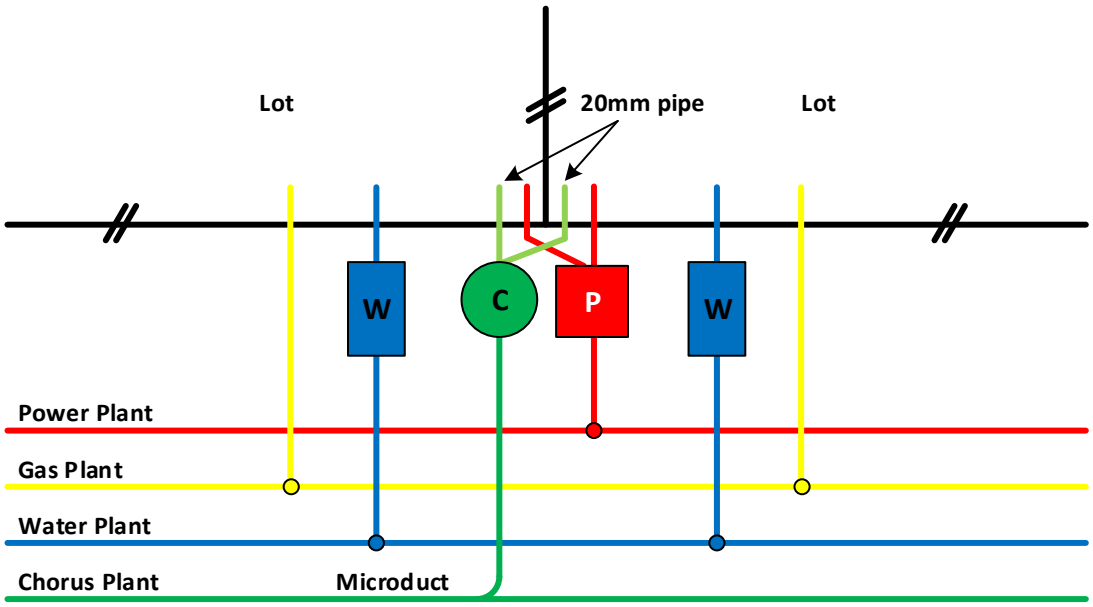


Figure 8. Typical Air Blown Microduct Boundary Layout

5.6.2. 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 pipe size may differ.

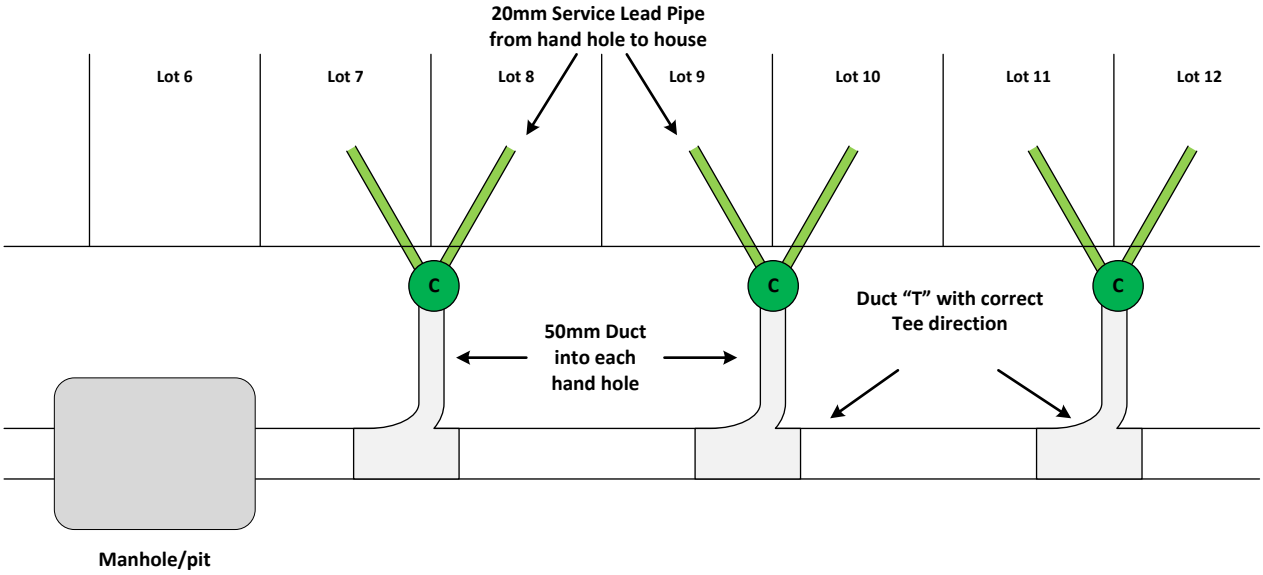


Figure 9. Typical Pit and Pipe Boundary Layout

5.6.3. Typical Copper Only Network Boundary Layout

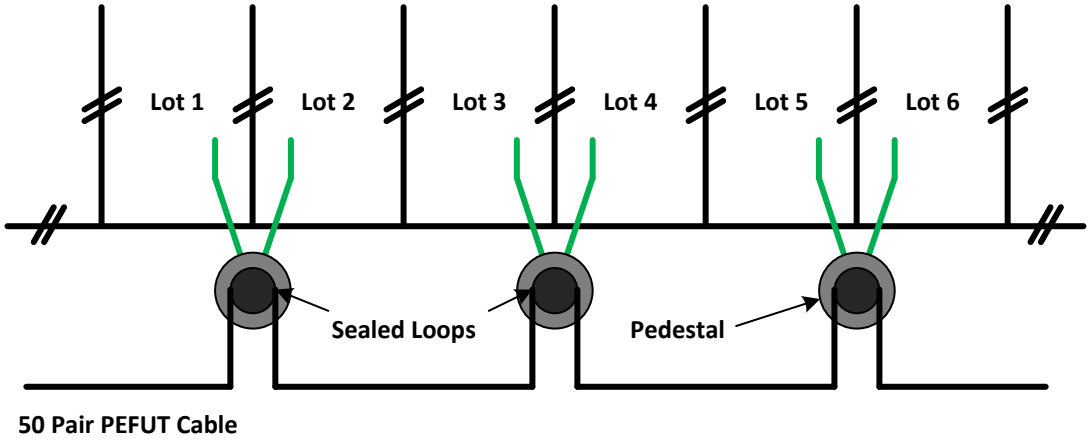


Figure 10. Typical Copper Only Network Boundary Layout

6. Chorus Communal Fibre Distribution Network

6.1. 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, sub divisions 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 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.

6.1.1. 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 a RGW, depending on the Retail Service Provider selling the service.

In order to future proof for the provision of these multiple services, optical fibre must be installed into the star wiring box where the ONT is to be placed. This is important because there are 4x Ethernet ports and 2x 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.

6.2. 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.

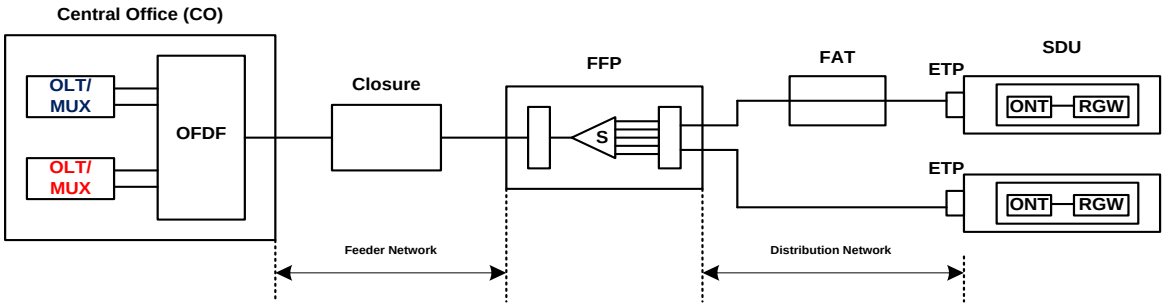


Figure 11. Typical Chorus UFB Network for SDU

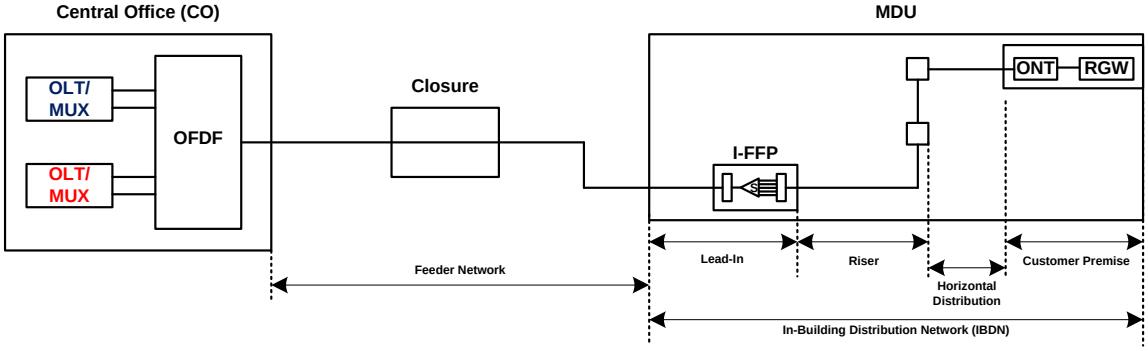


Figure 12. Typical Chorus UFB Network for MDU

7. Chorus Communal Copper Distribution Network

7.1. 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.

7.2. 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.

7.2.1. 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**.

20mm service lead pipes are to be installed from the pillar/pedestal to the side of the house where the copper ETP is to be mounted. If there is no building at time of build, then a 20mm pipe is installed from the pillar/pedestals to 600mm inside the lots with 500mm showing above ground.

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 10000kgs

7.2.2. Pipe Installation

On Occasions a 50mm or 100mm pipe may be laid instead of direct buried cable.

In this case the Chorus Service Company will haul in the cable. The developer will still be responsible for installing the pipe (and any associated chambers/pits) and the pillars/pedestals as per the design plan.

For road crossings, please refer to Section5.

7.2.3. 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.

7.2.4. 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.

Appendix A Acknowledgement

A.1 Standard Subdivision Lay Specification

As per the subdivision agreement between the Developer and Chorus, you are required to meet all costs associated with the trenching and installation of Chorus Plant required to complete the Telecommunication Reticulation.

Please find below the procedures for the installation of the Chorus Plant.

A.1.1. On-site Commencement

The Developers contractor is required to provide no less than 15 Working days' notice of commencement of work on-site. The 15 Working days' notice is required so material and resource can be organized.

Before commencement of work, please arrange an on-site meeting between the Developers contractor and the Chorus Service Company Representative so that all plans and specifications can be discussed with any potential issues resolved before site works begin.

The Chorus Service Company Representative will supply a detailed copy of the Chorus Lay Plans. No alteration can be made to the Chorus Lay Plans without prior approval from the Chorus Service Company Representative. If there are alterations, additional charges will be incurred. Please refer to section A.1.5.

A.1.2. Inventory Supply

All inventory, which may include pipes, manholes, warning tape, etc, must be picked up from the Chorus Service Company Depot. Some material may also be required to be picked up from other product suppliers' Depot. If the development is large enough, then some material may be ordered directly to site.

The developer and their contractors have the responsibility to provide suitable equipment such as hiabs and cable jinkers to collect and transport the supplied material.

All inventory uplifted or delivered to site becomes the responsibility of the Developers contractor, and as such the cost of theft or damage must be met by the Developers contractor.

After completion of the job all remaining inventory must be returned to the Chorus Service Company Depot. Any damaged or missing inventory will be charged to the Developers contractor.

A.1.3. Installation of Chorus Plant

The Chorus Plant must not be installed into any open trench until all other services have been installed. The reason behind this procedure is to ensure correct separation from the other services is maintained.

All trenching and laying of Chorus Plant relating to the subdivision reticulation is the responsibility of the Developers sub-contractor. This includes any trenching required for the installation of Channell Pits on property boundaries, which will require excavation from the main trench to the final location of the Channell Pit on the boundary or where indicated on the Lay Plan.

The trench is to be suitable for the installation of the Chorus Plant, i.e.. level, correct depth and free from sharp stones. Suitable bedding material free of stones, such as sand or crusher dust, and compacted will be required as outlined earlier in this document.

The Chorus Plant installed in the open trenches must be inspected by the Chorus Service Company Representative before back filling of the trench. Failure to comply will result in the trench being re-opened in as many places as required to satisfy the Chorus Service Company Representative.

In addition to the pipe/cable, a warning strip also must be installed in the trench. This will be shown on the cross section on the Lay Plan. The trench must be backfilled to the appropriate level and compacted prior to the warning strip being installed.

The final ground level must be marked and survey pegs visible before the installation of the Chorus Channell Pits.

The final ground level must be marked before the installation of any Chorus manholes or Turning Pits. If a SIKA pit is used, it must be installed as per the manufacturer's instructions. The concrete surround is not required if Channell pits are used. Pipe entry into all Chorus manholes and Turning Pits must be installed as per outlined in Section 5.1.

A.1.4. Installation of Chorus Plant Outside the Development

When a trench is to be provided (typically open cut) by the Developers contractor on Council or NZTA land, the appropriate written permission from the Council or NZTA via a CAR (Corridor Access Request) must be obtained by the Developers contractor prior to the commencement of any works. Chorus Plant 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 plant 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 Plant is installed.

The Developers 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 Developers 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

A.1.5. Extra Charge

Any material, additional labour and travel incurred by the Chorus Service Company due to the Developers contractor altering designs, delay or being negligent in the installation of the Chorus Plant will be invoiced to the Developer or the Developers contractor.

A.1.6. Subdivision Clearance Certificate

The Developers contractor is to notify the Chorus Service Company Representative that all work has been completed on site. The Chorus Service Company Representative will quality check the installation and inform the Developers contractor if anything needs to be corrected before handover to Chorus.

The subdivision clearance certificate will be issued by Chorus once all work has been completed, the Chorus Service Company Representative has passed on the handover documentation, LT Plans have been supplied and the appropriate easements are in place.

If there are changes in finished ground levels within the development site after the clearance certificate has been issued, which result in remedial action being required to restore Chorus plant to meet the installation standards, the site civil contractor will be requested to carry out that work. If the Chorus Service Company has to carry out remedial work, this cost will be charged back to the subdivision developer.

Network as-built information must be provided to Chorus's service company to update the network records as part of completion.

Acknowledgement

Civil contractor to sign and return to Chorus Service Company Representative.

Acknowledgement that the Chorus Standard Subdivision Lay Specification for Telecommunications (Fibre to the Premises) has been received and the required installation standards can and will be met.

Civil Contractor Representative

Company Name: _____

Contact Name: _____

Contact Position: _____

Sign: _____ Date: _____

Chorus Service Company Representative

Company Name: _____

Contact Name: _____

Contact Position: _____

Sign: _____ Date: _____