MDU Fibre In-Building Distribution Network Design and Installation

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1. Introduction

1.1.1. Objectives of Document

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 infrastructure.

This document covers:

- MDU In-Building Distribution Network design
- MDU fibre network cable and terminal description
- MDU fibre network deployment scope of responsibility

1.1.2. 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.

1.2. 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. 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
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.
Handhole	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
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

Term	Description
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	An Ericsson 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
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	**Regional 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	An Ericsson 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.
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.

Multi Dwelling Unit (MDU)

1.4. MDU Lead-In Infrastructure

For a Multi Dwelling Unit, the number of customer connections within the MDU and the design of the MDU determine the lead-in requirements. The following flowchart outlines condition and requirements.

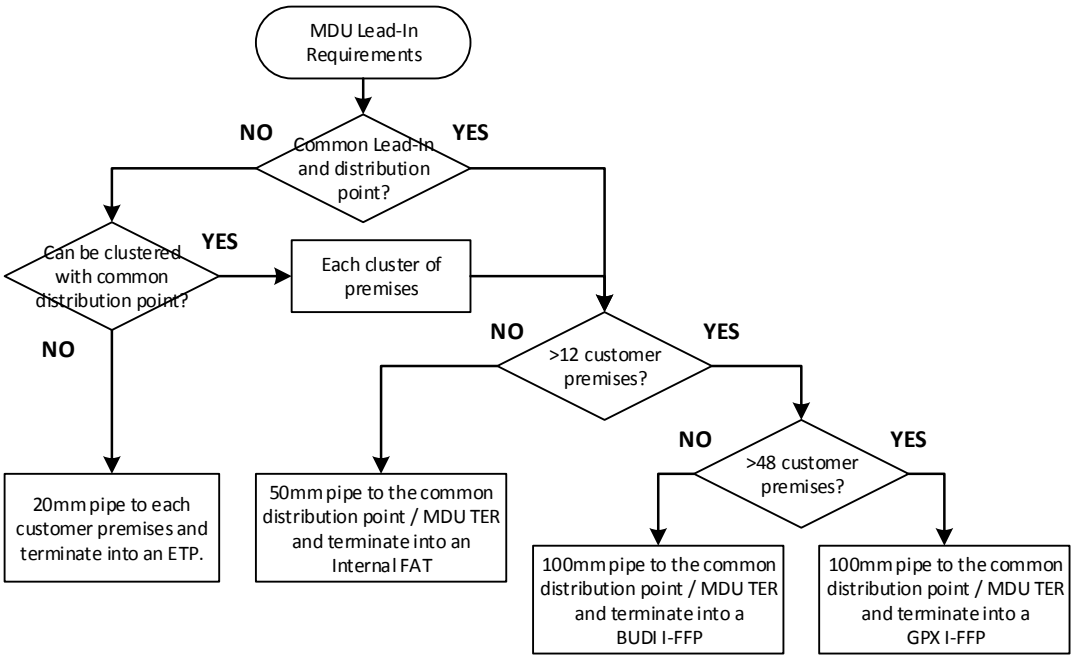


Figure 1. MDU Lead-In Infrastructure Requirements Flowchart

1.4.1. 20mm Pipe to Each Customer Premises

A green 20mm pipe is installed to each MDU premise ETP if there is no common lead-in and no common distribution point. In such a situation, each of the premises in the MDU is treated as an SDU. Refer to Volume 2 which outlines the SDU lead-in infrastructure.

1.4.2. 50mm Pipe to Common Distribution Point/MDU TER

For an MDU with 12 or less customer premises, with a common lead-in and a common distribution point/TER, a 50mm pipe is installed from the MDU boundary to the common location. Optical Fibre Cable is installed through the 50mm pipe into the MDU TER and terminated into the Internal FAT.

From the Internal FAT, 2-fibre drop cables are installed to each customer premise. This may be through the building riser, piping, capping, cable ladders or catenary wires. If the cables are installed within walls or in difficult to access areas, the drop cables must be easily removable if replacement is required.

Each of the drop cables is then routed into each of the MDU premise star wiring box.

1.4.3. 100mm Pipe to Common Distribution Point/MDU TER

For an MDU with more than 12 Customer Connections, with a common lead-in and a common distribution point/TER, a 100mm pipe is installed to the common location.

For the lead-in at the communal network side, a pit is installed as the terminating point of the green 100m pipe. If the number of Customer Connection is up to 48, a BUDI I-FFP is installed. If the number is more than 48, a GPX I-FFP is installed.

From the I-FFP, fibre cables are installed into the building riser and terminated into Internal FATs at every floor. From the Internal FAT, 2-fibre drop cables are installed to each customer premise on the respective floor. This may be through the building riser, piping, capping, cable ladders or catenary wires. If the cables are installed within walls or in difficult to access areas, the drop cables must be easily removable if replacement is required. Each of the drop cables is then routed into each premise star wiring box.

1.4.4. Lead-In Infrastructure Installation Scope

A distribution microduct or pipe is deployed along the front of the MDU lot. The following outlines the deployment by Chorus at the premise boundary:

- At the boundary of the MDU, a microduct tube or a 50mm/100mm pipe is laid up to the boundary.
- The microduct or pipe are brought above ground at the boundary. This is usually placed where the power cable is located.

The following outlines the requirement on the property developer from the boundary to the premises:

- Depending on the size and design of the MDU, green 20mm pipes are installed from the boundary to each of the premises or a 50/100mm pipe is installed from the boundary to the MDU TER.
- At the boundary, the pipe is brought above ground where the Chorus infrastructure is located.
- At the premises:
  - If a 20mm pipe is used, it is transitioned above ground into a grey or white 20mm pipe.
  - If a 50/100mm pipe is used, it is installed into the building with a pathway to the TER.

The pipe will be joint at the boundary and cable installed to the building when the customer requests for service or when the building structured cabling is installed.

1.5. MDU In-Building Distribution Network (IBDN)

The MDU IBDN consists of the lead-in cable, distribution cables, drop cables and terminals. The design and dimensioning depends on the number of customer connections in the MDU. Chorus **do not** encourage the use of air blown microducts in a Greenfield MDU development.

1.5.1. IBDN Overview

The table below provides an overview of the cable and terminals to be installed in an MDU depending on the number of customer connections in the building.

Note: *The dimensions of terminals outlined in the table below does not take into consideration the space required for cable routing and management.*

<table>
<tr><th>Requirement</th><th>2-12 Customer Connections</th><th>13-48 Customer Connections</th><th>>48 Customer Connections</th></tr>
<tr><td>TER Room Floor / Wall Space</td><td>Internal FAT space required:
<u>Up to 6 customer connections:</u>
H310mm x W170mm x D60mm wall mount space.
<u>Up to 12 customer connections:</u>
H500mm x W300mm x D120mm wall mount space

About 1.5m of front working space is required for both.</td><td>BUDI I-FFP space required:

H650mm x W400mm x D175mm wall mount space, with about 1.5m of front working space.</td><td>GPX I-FFP space required:
<u>Up to 288 customer connections:</u>
H900mm x W9000mm x D300mm wall mount space, left swing open door with about 1.5m of front working space or;
<u>> 288 customer connections:</u>
H2200mm x W900mm x D300mm, with about 1.5m of front working space.</td></tr>
<tr><td>Cabling Space</td><td rowspan="3">No distribution cable from the Internal FAT.

Each Drop Cable from the Internal FAT to the customer premise is:
Dimension – 1.7mm x 2.9mm
Bend Radius – 50mm swept bend

At areas which are not easily accessible for maintenance or damaged cable replacement, the Drop Cable shall be installed in a 20mm conduit.</td><td><u>Each Distribution Cable from the I-FFP:</u>
Outer Diameter – 10.5mm
Bend Radius – 105mm swept bend</td><td><u>Each Distribution Cable from the I-FFP:</u>
Outer Diameter – 10.5mm
Bend Radius – 105mm swept bend</td></tr>
<tr><td>Riser Space</td><td colspan="2"><u>Up to 6 customer connections:</u>
H310mm x W170mm x D60mm wall mount space.
<u>Up to 24 customer connections:</u>
H500mm x W300mm x D120mm wall mount space
<u>Up to 32 customer connections:</u>
H650mm x W400mm x D175mm wall mount space

About 1.5m of front working space is required for all FATs.</td></tr>
<tr><td>Conduit from riser to premise</td><td colspan="2">Each Drop Cable from the Internal FAT to the customer premise is:
Dimension – 1.7mm x 2.9mm
Bend Radius – 50mm swept bend
At areas which are not easily accessible for maintenance or damaged cable replacement, the Drop Cable shall be installed in a 20mm conduit.</td></tr>
</table>

Table 1. MDU IBDN Overview

Infrastructure Name	Description	Photo
BUDI-2S	Functionality: As an internal FAT where a distribution cable is terminated and Drop Cables are connected to customer premises. Up to 6x customer premise connections. Area of Installation: Wall-mounted in a secure communal location such as a building riser. Dimensions: H310mm x W170mm x D60mm wall mount space required.	
BUDI-1S	Functionality: As an internal FAT where a distribution cable is terminated and Drop Cables are connected to customer premises. Up to 24x customer premise connections. Area of Installation: Wall-mounted in a secure communal location such as a building riser. Dimensions: H500mm x W300mm x D120mm wall mount space required.	
BUDI-M	Functionality: As an internal FAT where a distribution cable is terminated and Drop Cables are connected to customer premises. Up to 36x customer premise connections. Area of Installation: Wall-mounted in a secure communal location such as a building riser. Dimensions: H650mm x W400mm x D175mm wall mount space required.	
BUDI I-FFP	Functionality: As a central terminal where the Lead-In cable is terminated and optical splitter is installed. Distribution cable and drop cables can be routed out from the BUDI I-FFP. Area of Installation: Wall-mounted in a secure communal location such as a building TER. Dimensions: H650mm x W400mm x D175mm wall mount space required.	
GPX I-FFP	Functionality: As a central terminal where the Lead-In cable is terminated and optical splitter is installed. Distribution cables are routed out from the GPX I-FFP. Area of Installation: Wall-mounted in a secure communal location such as a building TER. Dimensions: H900mm x W9000mm x D300mm wall mount space required.	
GR3 I-FFP	Functionality: As a central terminal where the Lead-In cable is terminated and optical splitter is installed. Distribution cables are routed out from the GR3 I-FFP. Area of Installation: Free standing rack in a secure communal location such as a building TER. Dimensions: Free standing rack with W900mm x D300mm floor space required and 2200mm height clearance.	
Verticasa Cable	Functionality: As a distribution cable to feed Internal FATs on each floor. Area of Installation: Indoor Distribution Cable usually installed in distribution routes such as cable trays and building risers. Dimensions: 10.5mm cable diameter with a minimum bending radius of 105mm	
Drop Cable	Functionality: As a drop cable from the Internal FAT or BUDI I-FFP to each customer premise ONT. Area of Installation: Indoor Drop Cable usually installed in distribution routes such as cable trays, conduits, wall capping and false ceilings. Dimensions: 1.7mm x 2.9mm with a minimum bending radius of 50mm	

Table 2. MDU Chorus Infrastructure Overview

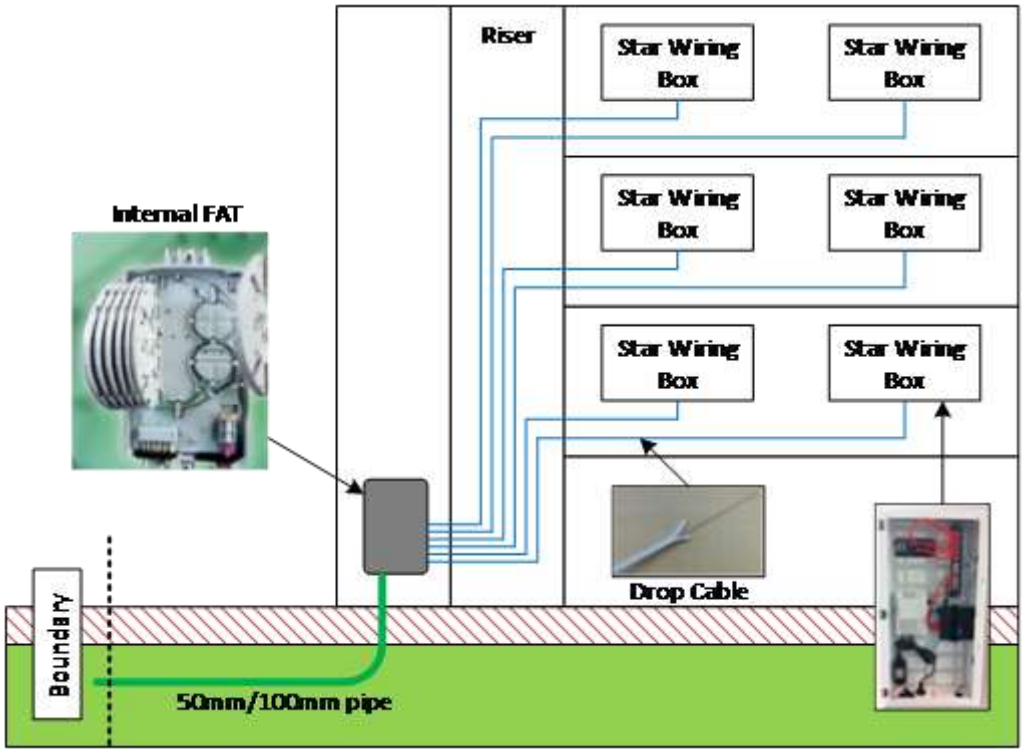


Figure 2. Small MDU (Up to 12 Customer Premises) IBDN Example

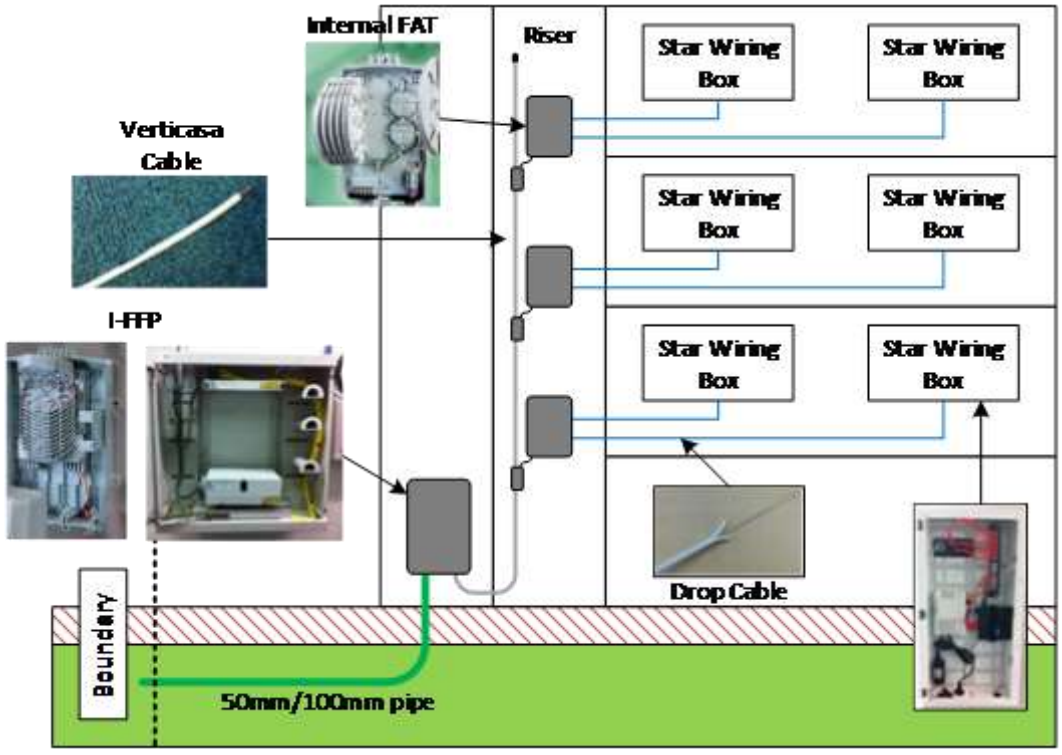


Figure 3. Large MDU (>48 Customer Premises) IBDN Example

1.5.2. Greenfield MDU IBDN Deployment Process

As part of the Chorus strategy to improve efficiencies of building fibre-ready buildings, the following section outlines the process and scope of work between Chorus and the property developer.

Section	Area of Responsibility	Current State
General Network Design	- Lead-In Network Design - Distribution Network Design - Drop Network Design - Customer Premise Network Design	**Chorus** will provide the design for the Lead-In, Distribution Network and the Drop Network in collaboration with the developer.
Lead In Network	Supply of materials: Pipes, Ducts, cables, enclosures	**Chorus** will be supplying the fibre cables for the Lead-In including the first terminal in the building (either a FAT or I-FFP). **Developer** is responsible for providing the pipes & in-building cable mounting infrastructure such as cable trays to install the ducts and cable leading up to the location of the first terminal.
	Installation of pipes, cables/microducts and the terminal (FAT or I-FFP)	**Chorus** is responsible to install the cable and the first terminal (FAT or I-FFP) location. **Developer** is responsible for providing the trench, install the lead-in pipe in the trench & in-building cable mounting infrastructure to install the ducts and cable leading up to the location of the first terminal.
Distribution Network	Supply of materials: Distribution Cable, Internal FATs	**Chorus** will supply fibre related material only such as fibre cable and terminals. **Developer** will supply installation materials such as Velcro straps, cable ties, screws, bolts, conduits, etc.
	Installation of Distribution Cables and Internal FATs.	**Chorus** is responsible for the installation of termination boxes and termination of the distribution cables and drop cables within the terminals. **Developer** is responsible to install the distribution cables and drop cables.
Drop Network	Supply of materials: Drop Cables	**Chorus** will supply fibre related products only such as fibre cable. **Developer** will supply installation materials such as Velcro straps, cable ties, screws, bolts, conduits, etc.
	Installation of Drop Cables	**Developer** is responsible to install the drop cables supplied by Chorus and perform all required reinstatement.
	Terminating Drop Cables at both ends	**Chorus** will terminate the Drop Cables in the FAT and in the customer premises.
Customer Premises	Supply of materials, installation and termination	**Developer** is responsible to install all premise cabling beyond the ONT (non-Chorus cabling), termination including the testing and commissioning.
Network Testing	End-to-End testing of the MDU fibre network	**Chorus** will perform a quality audit and test the optical performance of the MDU fibre network
Customer Premise Network Testing	Testing of the Ethernet/telephony cabling in each premise	**Developer** is responsible for all testing and commissioning of the Ethernet/telephony cabling in each premises

Table 3. MDU IBDN Deployment Responsibility Demarcation

1.5.3. MDU Distribution Cable Capacity Dimensioning

When dimensioning the number of fibres and/or copper to be installed in a building riser for an MDU, the following must be taken into consideration:

- There must be sufficient fibres to allocate 2 fibres per customer connection.
- Each SubUnit in the Verticasa Cable or loose tube has 12 fibres. As a general rule, the fibres within the same SubUnit or loose tube must not be split between multiple floors; i.e. each SubUnit must be allocated to one floor only with unused fibres to be kept as spares.
- Each 12F subunit or loose tube can connect up to 6 customer premises.

1.5.3.1. Definition of Customer Connection

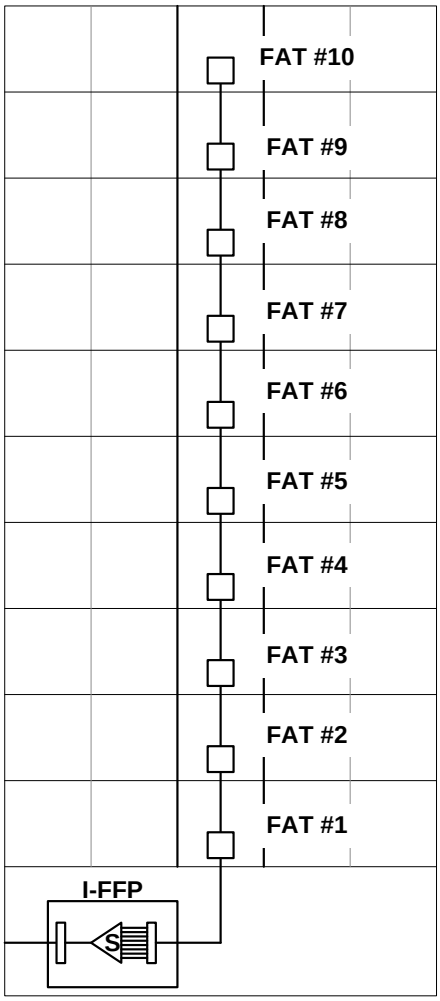
A customer connection is an end point where fibre is terminated into an ONT is required to provide fibre service. A customer connection can be, but not limited to, a customer apartment, lift phones, Wi-Fi hotspots, ATMs and mobile cell site backhaul.

Refer to Chorus to discuss on the identification of potential customer connection points to the Chorus fibre network.

1.5.3.2. Distribution Cable Capacity Design

When determining the number of distribution cables to be installed up the riser, the designer needs to take into consideration the possible unused spares in the subunit. Two apartments with the same number of customer premises but with different premises distribution on floors can have a different number of cables needed to be installed in the riser.

Example Building #1:



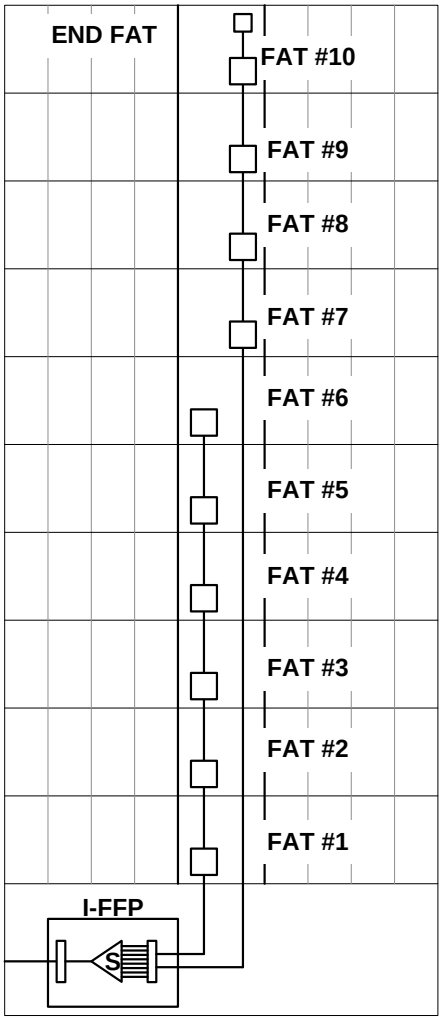
Scenario:
Total Number of Customer Connections: 40
Number of Customer Connections per floor: 4

Internal FAT:
- 4 Customer Connections = 8 Fibres
- Allocate 1 SubUnit per Internal FAT
- 10 Internal FAT in MDU (1 per floor)
- Total 10 SubUnits required

Total SubUnits required:
- 10 SubUnit

Total Number of Riser Cable required:
1 Cable = 12 SubCable/SubUnit
Only 1 Riser Cable is required

Example Building #2:



Scenario:
Total Number of Customer Connections: 80
Number of Customer Connections per floor: 8

Internal FAT:
- 8 Customer Connections = 16 Fibres
- Allocate 2 SubUnit per Internal FAT
- 10 Internal FAT in MDU (1 per floor)
- Total 20 SubUnits required

End FAT:
- Allocate 1 SubUnit

Total SubCable/SubUnit required:
- 20 + 1 = 21 SubUnit

Total Number of Riser Cable required:
1 Cable = 12 SubUnit
2 Riser Cables are required

Figure 4. MDU Distribution Cable Capacity Design

1.5.4. MDU Distribution Cable Installation and Management

It is important that the cable is installed and managed within the cable specification threshold levels. The following table outlines the Verticasa Cable specification:

Specification	Unit	Verticasa Cable Specification
Module Ø	Mm	1.3
Cable Diameter	Mm	10.5
Cable Weight	Kg/km	110
Max Installation Tension	daN	50
Min Bend Radius	Mm	10D without tension
Temperature Range	°C	Installation: -5 ~ +60 Transport: -40 ~ +70 Operation: -10 ~ +60

Fibre SubUnit in Verticasa Cable.

SubUnits are loosely packed within the cable.

Table 4. Verticasa Cable Specification

As the Subunits within the Verticasa Cable are free moving, the cable must be installed in the proper manner to prevent the Subunits from twisting. The proper installation procedure is as follows:

1. Setting up the Verticasa Cable
2. Cable installation into riser
3. Securing the Verticasa Cable
4. Top floor extra length

1. **Setting up the Verticasa Cable**
   a. Unreel the Verticasa Cable from the drum and lay it on the ground to straighten it. If there is insufficient space, perform a "Figure-8".
   b. Do not tape the Subunits at the end of the cable during this process to avoid fibre twisting.
   c. Cut the required length; coil the cable into a small reel to be transported to the installation location.

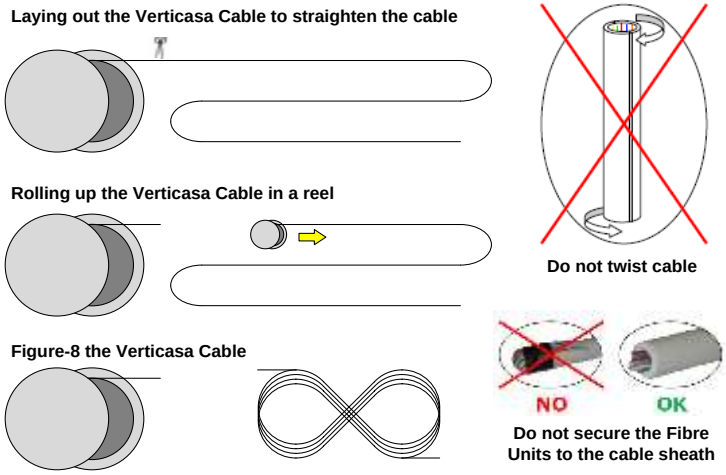


Figure 5. Setting Up the Verticasa Cable for Installation

2. **Cable installation into riser**
   a. Uncoil the Verticasa Cable and straighten it out on the floor. If there is insufficient space, perform a "Figure-8".
   b. Do not twist the cable while it is being installed in the vertical riser.
   c. The cable can be installed from the top floor downwards, or from the bottom floor upwards.
   d. If installing from the top floor, leave the Subunits free on the cable end to be pushed down while securing the Subunits on the top end by taping them to the outer sheath.
   e. If installing from the bottom floor, secure the Subunits on the cable end to be pulled upwards by taping them to the outer sheath, while the Subunits on the bottom end is left free.

   Note: *It is very important for the Subunits to be secured at the top end of the cable because it is* ***possible for the Subunits to slip out*** *to the bottom of the riser during installation if they are not secured.*

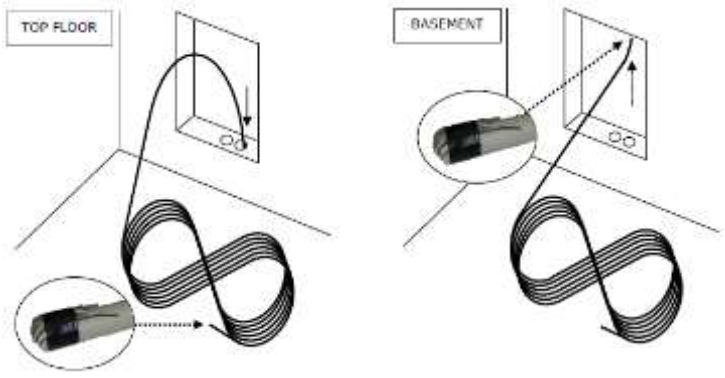


Figure 6. Verticasa Cable Vertical Hauling Method

3. **Securing the Verticasa Cable**
   a. Once the Verticasa Cable is installed in the riser, secure the cable to the wall or cable tray by using cable tie or Velcro straps.
   b. If there are obstacles along the riser path, the cable may be required to divert its path. The minimum bending radius is 105mm.

   Note: *Additional bends increases friction and decreases the Subunit extractability.*

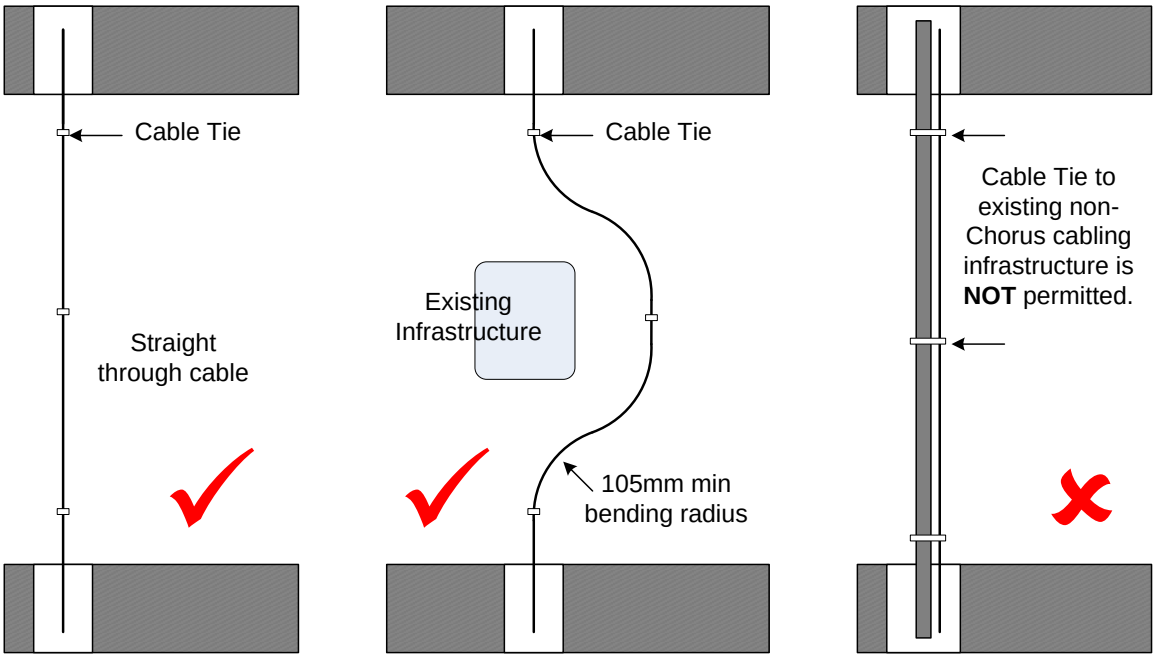


Figure 7. Management of Verticasa Cable in Riser

4. Top floor extra length

a. At the top floor, the fibre Subunits are folded back and taped

b. Ensure that the extra length at the top floor can be managed by making a 3m coil of cable with at most 100mm bending radius.

c. At the end of the cable, bend the fibre back and tape it to the cable to secure the fibre.

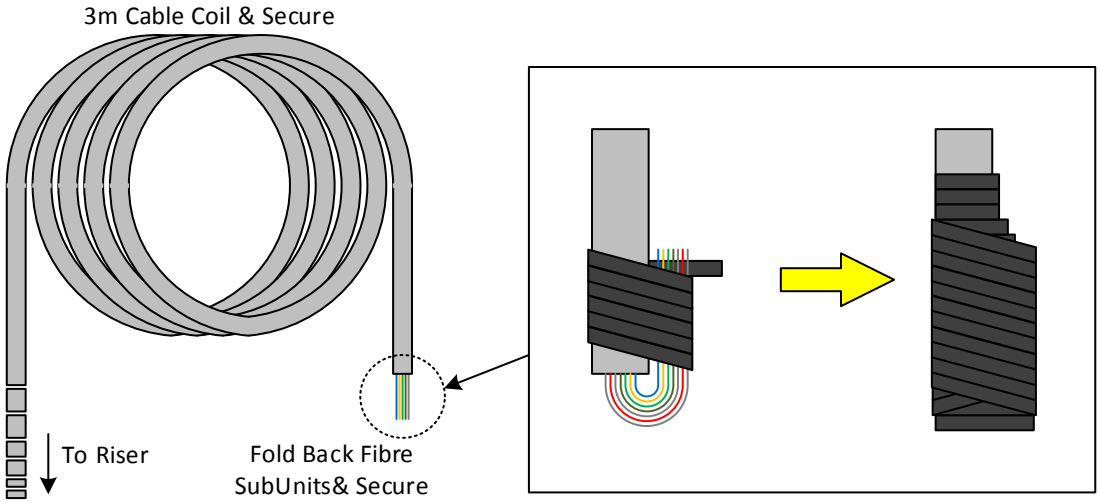


Figure 8. Management of Verticasa at the Top Floor

5. Gravity Loops

Gravity Loops are useful to be installed at a position before the first Subunit extraction is performed. These are usually at the following locations:

- At the bottom of the building riser
- If more than 1 Verticasa Cable is installed, on the floor where the previous Verticasa Cable is finally terminated.

The following diagram outlines the two locations outlined above

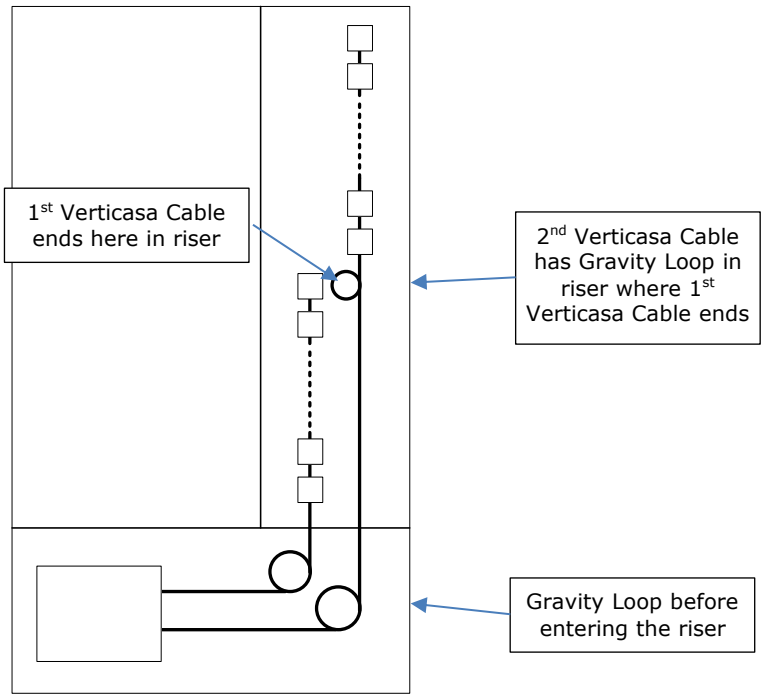


Figure 9. Management of Verticasa Gravity Loops

6. Subunit branch out installation

The Subunit branch out installation will be performed by Chorus when the Internal FATs are mounted in the riser. The Internal FAT is installed offset from the Verticasa Cable. A window cut is performed on the Verticasa cable and the required fibre is routed to the location where the Internal FAT is mounted.

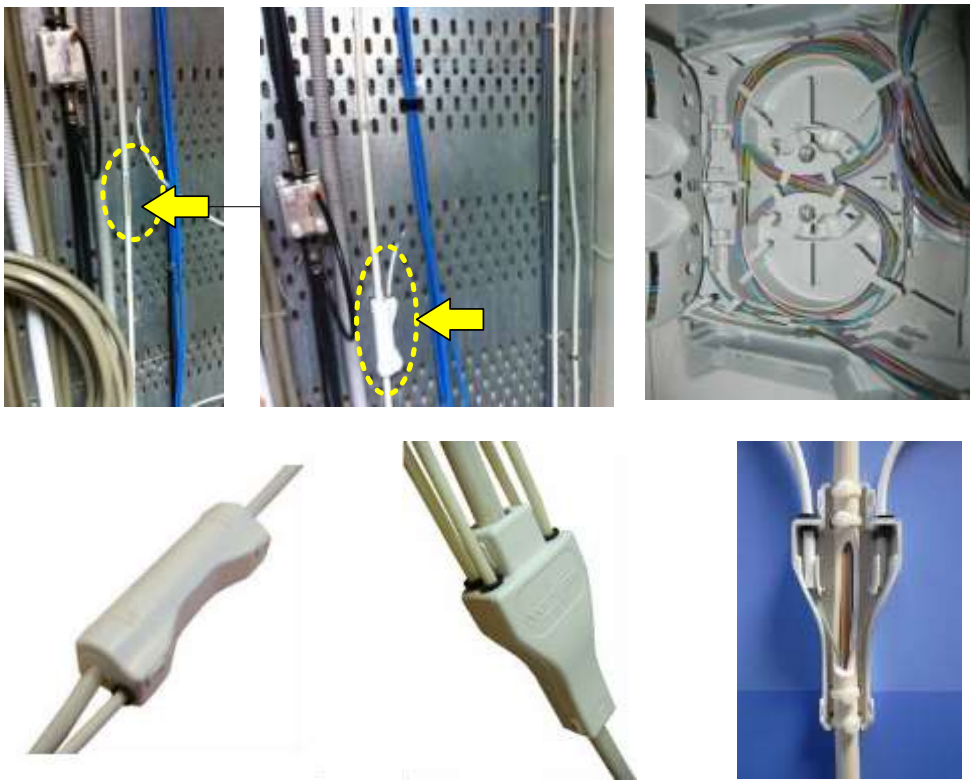


Figure 10. Verticasa Window-Cut and Offset Configuration Cable Cover

1.5.5. MDU Drop Network

The Drop Network is the fibre cable to be installed to connect the Customer Connections. The Drop Network may be directly from the Lead-In Network for a small MDU or from an Internal FAT or I-FFP in a medium MDU. In a large MDU, the drop cable is usually installed from the Internal FAT but in certain situations, limited ABF drop can be installed directly from the I-FFP. The Drop Network may be fixed fibre or ABF depending on the Lead-In or Distribution Network scenario and the number of customer connections in the MDU.

1.5.5.1. Drop Network Installation Standards

The Drop Network is usually installed on a horizontal pathway along a corridor to the customer connection locations. The pathway is preferably a conduit from the riser where the Internal FAT is mounted to each customer connection. Each Drop Cable is a 2 fibre, 1.7mm x 2.9mm cable dimension.

Note that the drop cable outlined is an internal cable which is not suitable for external installation. If an external pathway is established, ensure that the cable is installed within a duct, conduit or capping to protect the cable from an external environment. If multiple cables are installed, ensure they are not tied together inside ducts or conduits as this will prevent individual cables to be easily replaced in the future if they are damaged.

It is the decision of the Property Developer to design the pathway to each customer connection. The following should be taken into consideration when designing the pathway for the Drop Cable:

- If there is any cable fault, are the Drop Cables easily replaced without breaking any walls or barriers?
- Can the Drop Cables be secured to prevent them from being pulled out?
- Are the Drop Cables installed with sufficient separation from other infrastructure such as power cables?

1.5.5.2. Drop Network Pathway

A Drop Cable is routed from the Internal FAT in the riser into each customer connection point, which in most cases are premise units. The installation and management of the Drop Cables must be as follows:

- Drop Cables must be routed from a FAT to each customer connection point.
- There must be at least 3m of cable slack at both ends of the Drop Cable (At the FAT & Star Wiring Box) for fibre management and termination.
- The Drop Cable must be labelled at the FAT end with the corresponding unit address.

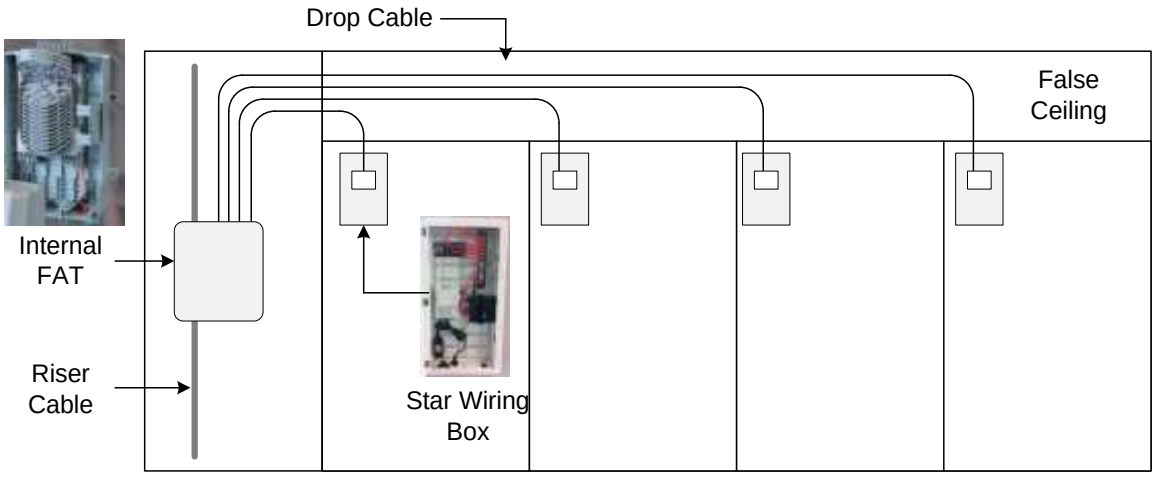


Figure 11. Example of Drop Network Pathway

1.6. MDU IBDN Testing

After the building developer and their contractors have installed the riser cable and the drop cable to every customer connection point, Chorus will be notified to terminate the fibre. Chorus contractors will test the network to ensure end-to-end fibre continuity to ensure that the fibre is not broken or damaged at any point in the network.

Testing is usually done before the walls are sealed so that if there are any faulty cables detected, they can be easily replaced without breaking, removing or cutting through walls or ceilings.

If there is any broken or damaged fibre cables due to poor installation practices, the developer will need to replace the cable at their own cost.