

New Property Technical Requirements - Premises Wiring (Volume 4)

Network Deployment Standard

Copyright

Copyright © 2011 Chorus New Zealand Ltd

All rights reserved

No part of this publication may be reproduced, stored in a retrieval system, or transmitted in any form or by any means, electronic, mechanical, photocopying, recording or otherwise without the prior written permission of Chorus New Zealand Limited.

This document is the property of Chorus New Zealand Limited and may not be disclosed to a third party, other than to any wholly owned subsidiary of Chorus New Zealand Limited, or copied without consent.

Table of Contents

1.	INTRODUCTION.....	4
1.1.1.	Objectives of Manual	4
1.1.2.	Artefact Constraints	4
1.1.3.	Intended Audience	4
1.1.4.	Chorus Network Specified Product (CNSP).....	4
1.1.5.	Contractual Reference	4
1.2.	RELATED REFERENCE MATERIAL	5
1.3.	GLOSSARY OF TERMS USED	5
2.	CUSTOMER PREMISES WIRING.....	8
2.1.	SDU BUILDING PENETRATION	8
2.2.	ETP TO HOME DISTRIBUTOR HUB	9
2.2.1.	Cable route	9
2.2.2.	ETP.....	9
2.3.	FAT TO HOME DISTRIBUTOR HUB	10
2.4.	INTERNAL PREMISES CABLING RECOMMENDATION.....	11
2.4.1.	Home distributor hub	11
2.4.2.	Recommended Cabling Standard	12
2.4.3.	Chorus ITP and ONT dimensions	13
2.4.4.	Premises Star Wiring.....	15
3.	WHO DOES WHAT?	19

Table of Figures

Figure 1.	Building Penetration Guidelines	8
Figure 2.	Non-metallic Home Distributor Hub.....	9
Figure 3.	Chorus ETP	9
Figure 4.	Example of Lead-in pipe, ETP and Home Distributor Hub	10
Figure 5.	Home Distributor Hub & Power Socket Orientation	12
Figure 6.	Power points with different orientations.....	12
Figure 7.	Chorus ITP and ONT dimensions.....	13
Figure 8.	Chorus ITP and ONT	13
Figure 9.	LSZH Internal Microduct	13
Figure 10.	Example of Good and Sub-standard Copper Wires in Cat6 Cable.....	14
Figure 11.	Example of Sub-standard Cat6 Cable Crimping & Punch Down	14
Figure 12.	Example of Premises Broadband Cabling Recommendation	15
Figure 13.	Example of Premises Broadband Cabling for Fibre with voice calls from ONT	16
Figure 14.	Example of Premises Broadband Cabling for Fibre ONT as RGW	17
Figure 15.	Example of Premises Broadband Cabling for Fibre with voice calls from ISP modem, and Ethernet Switch for multiple Ethernet connections.....	18

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 infrastructure. This document is separated into 4 volumes which covers different topics of the network.

This document is Volume 4 which covers:

The recommended 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
ND0588	UFB Premises Boundary Deployment Standards
ND0545	UFB Network Design Rules
ND0574	UFB MDU Design and Installation
ND0563	NGA Provisioning and Assure Task Handbook
ND0635	UFB MDU Cable and Terminals Installation Handbook
ND13006	UFB Aerial Road Crossing, RoW and Infill Technical Guide

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 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 Guide – tcf.org.nz
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.

Term	Description
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.
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.

Term	Description
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	Polyethylene
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.
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. Customer Premises Wiring

2.1. SDU Building Penetration

It is the responsibility of the installers to ensure that all building penetrations are sealed in accordance with the current version of the Building Code. The Building Code clause for External Moisture (E2) requires that buildings must be built to resist leaks, damp or the accumulation of external moisture in concealed spaces.

Acceptable Solution E2/AS1 is a supporting document to the Building Code clause for External Moisture. This solution provides one way of complying with the Building Code clause for External Moisture.

The link below is to the document "Acceptable Solutions and Verification Methods for New Zealand Building Code Clause E2 External Moisture". Refer to the section which outlines the general pipe and services penetration

<https://www.building.govt.nz/building-code-compliance/e-moisture/e2-external-moisture>

The figure below is a copy of figure 68 from the E2/AS1 compliance document.

Source: <https://www.building.govt.nz/assets/Uploads/building-code-compliance/e-moisture/e2-external-moisture/asvm/e2-external-moisture-3rd-edition-amendment-10.pdf>

This details acceptable solutions, and at the time of publication of this document, was effective from 5th November 2020. Installers must ensure that they comply with the current version of E2/AS1 as the current acceptable solution may differ from that shown below.

Note: The information here is for reference only. Always check the Building Code for the latest rules and regulations.

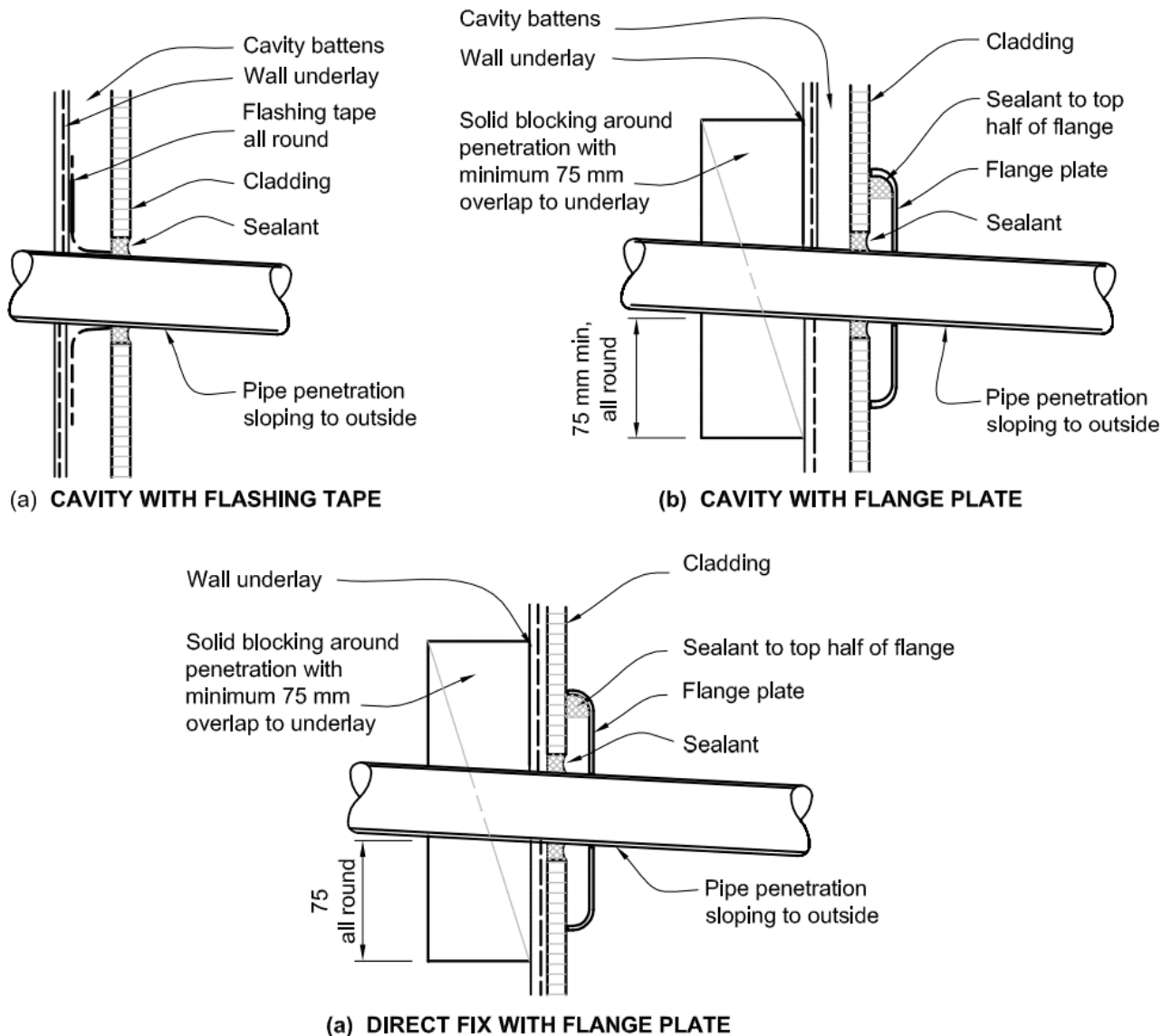


Figure 1. Building Penetration Guidelines

2.2. ETP to Home distributor hub

2.2.1. Cable route

For a Single Dwelling Unit (SDU), an optical fibre cable needs to be routed from the ETP to the home distributor hub (or star wiring box) to establish connection.

Install 20mm conduit from the ETP position, through the wall and up into the home distributor hub with no more than 3 radiused bends. Do not use elbow bends or use flexi-conduit. Install a draw-tape.

If 20mm conduit cannot be installed, use Prysmian OptiC@t composite cable or Hexatronic Low Smoke Zero Halogen (LSZH) 5/3.5mm or 7/3.5mm microduct, pre-installed from the ETP to the home distributor. Ensure the cable/microduct is accessible from both ends. If Optic@t cable is used, there must be a minimum of 1.2m slack of cable at each end. Make sure there are no tight bends or kinks along this cable/microduct from the ETP to the ONT.



Figure 2. Non-metallic Home Distributor Hub

2.2.2. ETP

The ETP must be installed at a height of 300mm to 1500mm from ground level to stop water ingress at ground level, and to make the ETP accessible for splicing fibre. The lead-in point will be from the bottom of the ETP. The conduit from the home distributor hub must exit the side wall of the premises within the range of the ETP install height.

As the ETP will be installed when the end customer requests for service, or as part of pre-built fibre option, it is advisable for the conduit access hole from the external wall be temporarily sealed to prevent water ingress into the premises.

The ETP should not be placed on the front of the building. We recommend taking the service lead pipe to the side of the premises enabling the ETP to be installed in a similar location to where other services enter the premises.



Figure 3. Chorus ETP

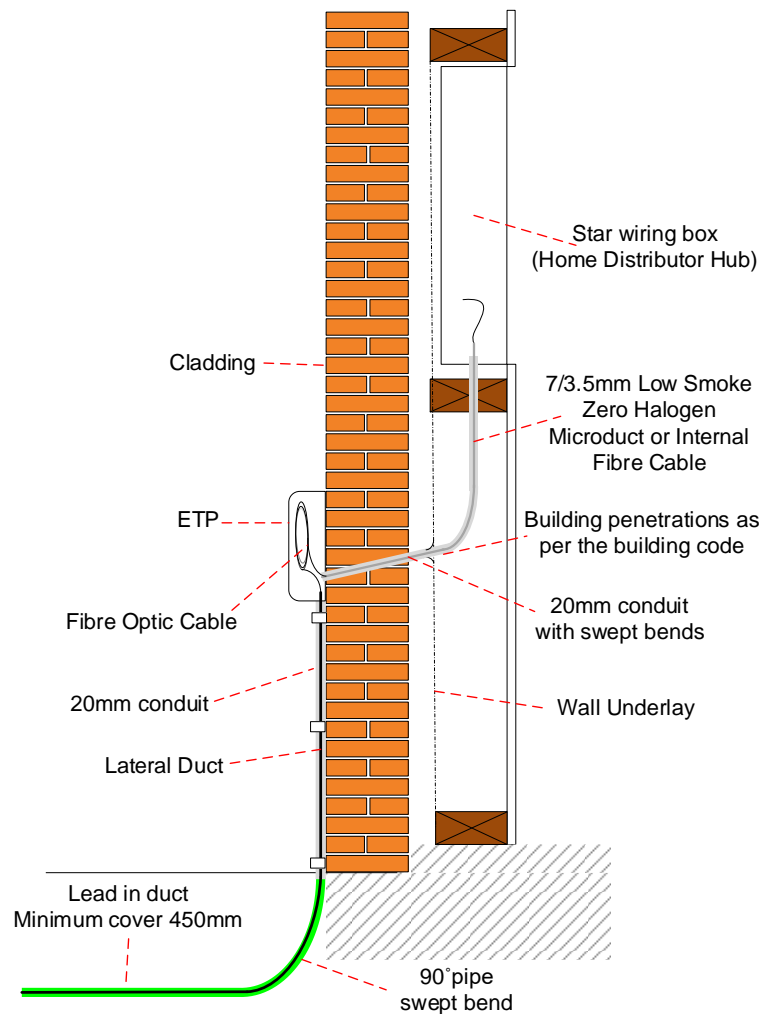


Figure 4. Example of Lead-in pipe, ETP and Home Distributor Hub

2.3. FAT to Home distributor hub

For a Multi-Dwelling Unit (MDU), a Chorus approved and provided two-fibre optical fibre drop cable needs to be routed from the Fibre Access Terminal (FAT) to the home distributor to provide service. One drop cable is to be installed for each customer premises. It is advisable for the drop cable from the FAT to the home distributor be installed in a conduit as it allows:

- A separation of optical fibre cable with other utilities.
- Easy access to replace the drop cable in the cable in the future without breaking walls or ceilings.

The conduit needs to be continuous with swept bends. For longer runs, accessible inspection boxes at regular intervals will be preferable.

2.4. Internal Premises Cabling Recommendation

The following section outlines the recommended minimum premises wiring standards to enable an efficient distribution of broadband and telephone services throughout the premises. This standard enables:

- A star configuration which has a centralised connectivity and test point.
- Easy reconfiguration of services to be distributed throughout the premises.

2.4.1. Home distributor hub

Requirements summary:

- Plastic, WiFi transparent
- Large enough to house ONT, modem, switch, structured cabling, UPS etc
- Suitable location
- Power outlets

Note: This is aligned to the New Zealand Telecommunications Forum (TCF) and Chorus' home wiring recommendation. Depending on the conditions such as the premises design, intended equipment connectivity, connection flexibility, and network expansion capability, additional Ethernet cables can be installed to the various rooms for any additional requirements.

The wiring recommendation is applicable for either fibre or copper broadband services and future-proofs the premises.

It is recommended for a home distributor hub to have the following requirements, specifications, and functionality:

- Use a plastic home distributor hub such as the Dynamix HWS-2803WR - a metallic box will affect Wi-Fi performance.
- Ensure easy access in case the equipment inside needs to be accessed or reset.
- It is dry, well ventilated, and in an area where it is not subject to splashes, steam or condensation. It must not be installed in a location with poor ventilation e.g. close to a heat source or high humidity.
- A minimum dimension of H700mm x W350mm x D80mm including door with ventilation, plus a 20mm conduit routed to the ETP. Bigger is better, allowing for multiple active devices such as ONT, RGW (Modem), Ethernet switch, alarm system, remote control repeaters etc.
- Internally mounted typically set into the side wall of a utility room or garage with easy access and front working space, somewhere it is not subject to accidental damage.
- If required, have sufficient space to house a UPS for power critical equipment.
- Integrated with patch panels suitable for connection types throughout the premises for cross-connect functionality.
- 4x Ethernet jack points to the primary TV position, 2x Ethernet jack points to every other non-wet room.
- Have at least two double power outlets to power equipment such as ONT, RGW, set top boxes and other centrally controlled devices. These power outlets need to be situated and orientated so that the door can be closed whilst in use – the bottom of the lowest plug to be no lower than 50mm from the base of the hub.

Note: If mounted on the floor of the home distributor hub at least one power outlet orientation must have the earth pin parallel to the door. This is to enable the ONT power plug to be terminated in the socket.

- The RGW may be installed in the home distributor hub. With structured cabling the RGW can also be situated elsewhere in the house.

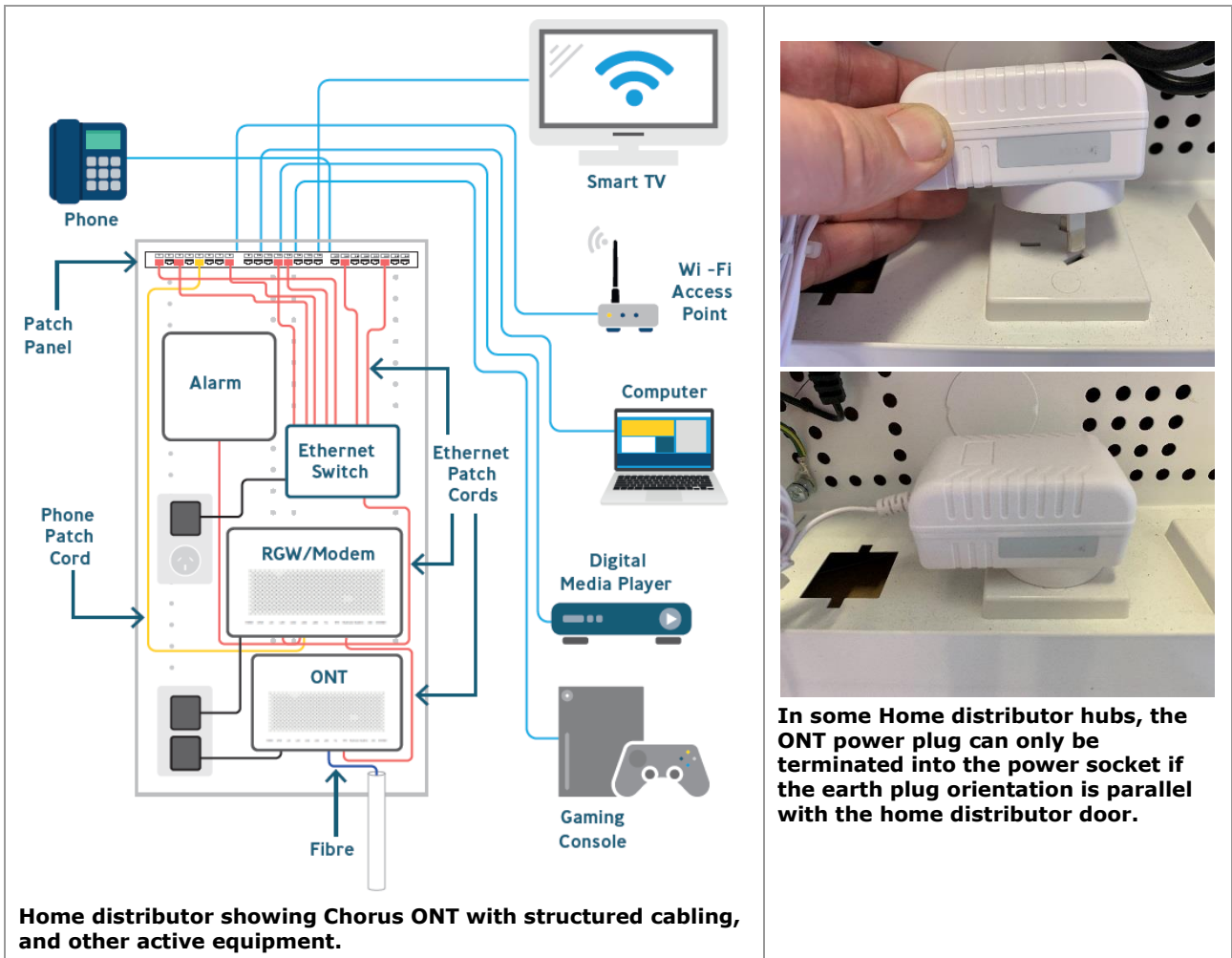


Figure 5. Home Distributor Hub & Power Socket Orientation

Installing four power points, with different orientations or on the back wall of the home distributor will account for different equipment with different shaped and sized power supplies.



Figure 6. Power points with different orientations

2.4.2. Recommended Cabling Standard

The internal cabling of the premises is the responsibility of the developer, builder, electrician, or premises owner. It needs to be installed during the build process.

It is important that such cabling is compatible and compliant with the New Zealand Telecommunications Forum (www.tcf.org.nz) recommendations and international standards.

Chorus technicians have previously experienced low quality cable and sub-standard workmanship even in brand new houses.

Such low quality cabling will result in broadband services with reduced performance or in more severe cases, no service. We recommend at a bare minimum to use Cat 6 cabling to get the best quality broadband service.

No internal rated conduit or cabling to be used externally, and no externally rated conduit or cabling to be installed internally.

The premises owner will have to rectify any sub-standard cabling through their own contractor. It is advised for all home wiring to be tested and verified by qualified technicians before commissioning.

2.4.3. Chorus ITP and ONT dimensions

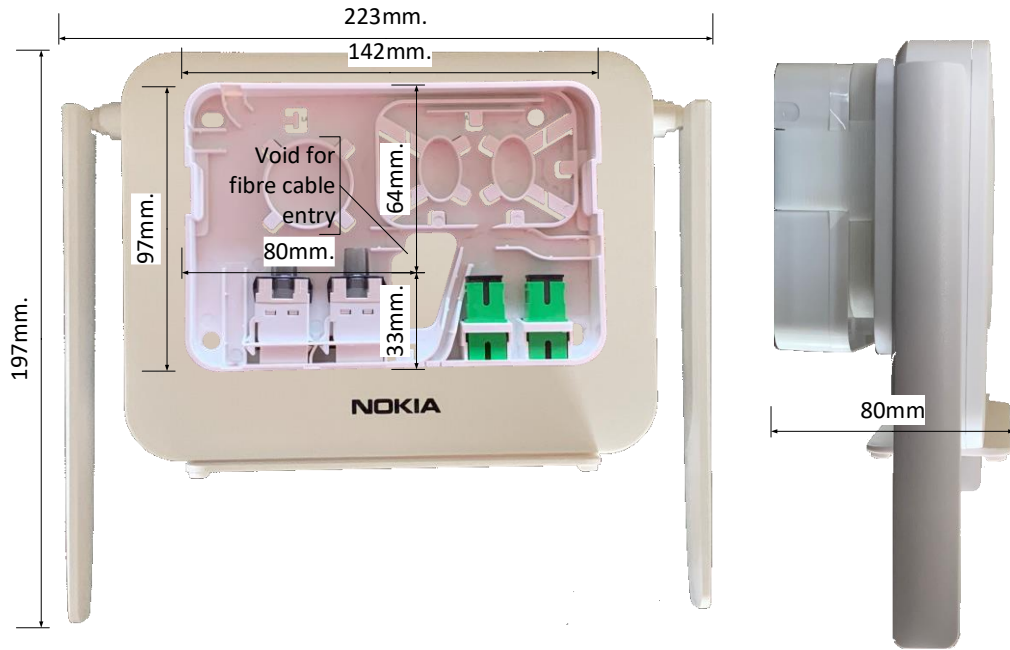


Figure 7. Chorus ITP and ONT dimensions

The Chorus ONT is installed on top of an Internal Termination Point (ITP). In some smaller premises, there may not be a Home Distributor Hub. The dimensions above will allow space to be allocated, and for the pre-installer fibre cable to exit the wall in the correct location.



Figure 8. Chorus ITP and ONT

2.4.3.1. Fibre pathways

Additional fibre pathways for future fibre installation are also recommended. These pathways will allow fibre to be installed further into the premises beyond the home distributor hub. Pathways are typically microduct. Internal rated Low Smoke Zero Halogen (LSZH) microduct with an outer sheath is preferred. These products can be sourced from your local electrical wholesaler, or from Hexatronic online shop (www.hexatronic.co.nz).



Figure 9. LSZH Internal Microduct

2.4.3.2. Wiring for Access Points

Many devices rely on Wi-Fi for connectivity today. To get a good Wi-Fi experience, install ethernet access points for any devices that do not move. This will leave your Wi-Fi capacity for the mobile devices within your premise.

To ensure you get the best in home Wi-Fi experience, follow these rules of thumb:

- One CAT6 cable and outlet to each Wi-Fi Access Point position (one of the access points may be the primary TV position or modem position)
- One Wi-Fi Access Point per 100m²
- At least one Access Point per floor
- Preferably not more than 20m between Access Points.

2.4.3.3. Sub-standard Cabling

Chorus recommends a minimum of Cat6 cabling to be installed when new cables are installed in the premises. Ensure that such cables and components are sourced from reputable suppliers or manufacturers.

In general, the quality of Cat6 cables is determined by factors such as the cable design, quality of the wires and the copper twist, while the quality of the components are determined by the material and contact.

An example of sub-standard wire quality is as shown below where a Copper Clad Aluminium (CCA) wire is used instead of full copper wires within the cable. Installing cheaper CCA wire will result in sub-standard Ethernet performance, and a poor customer experience.

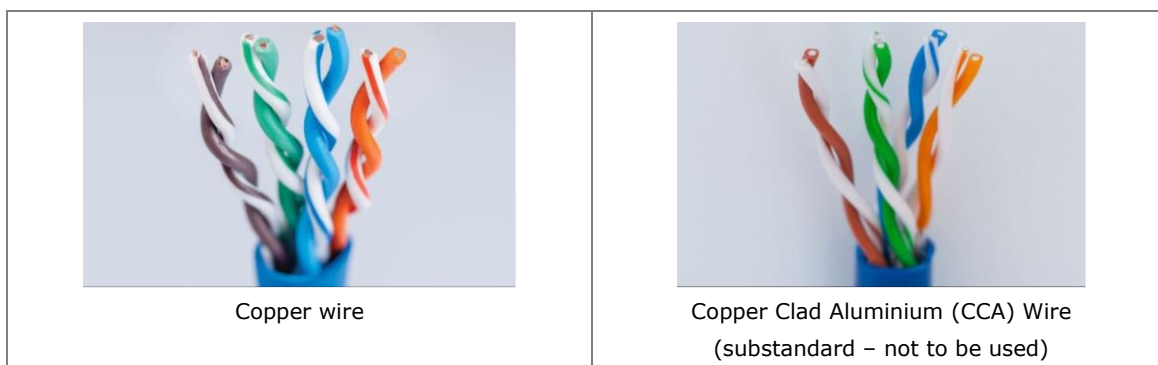


Figure 10. Example of Good and Sub-standard Copper Wires in Cat6 Cable

2.4.3.4. Sub-standard Cable Installation & Termination

The performance of Cat6 cabling depends on the proper installation and termination of the cable. A few main points on the cabling are:

- Ensuring that the cable is not bent beyond the minimum bending radius limit
- Ensuring that the cable is properly punched into keystones and crimped onto connectors
- Copper pairs are kept twisted as close as possible to the point of termination
- Cables are not installed too close to electrical cabling, causing interference.

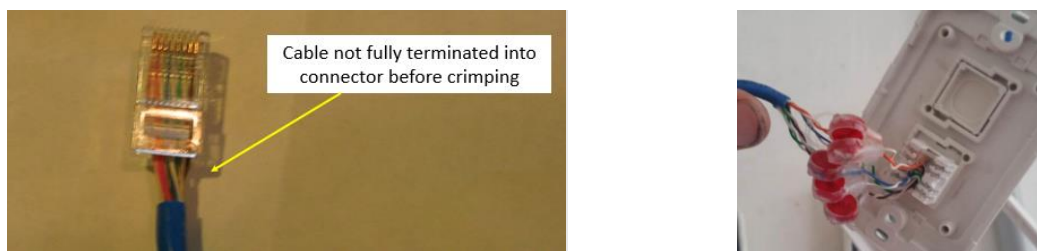


Figure 11. Example of Sub-standard Cat6 Cable Crimping & Punch Down

2.4.4. Premises Star Wiring

The recommended premises cabling is shown in the following diagram. Each RJ45 requires its own dedicated Cat6 cable.

This example does not include cabling for TV distribution through RF. For Coax cabling recommendation, please contact a specialist home wiring technician.

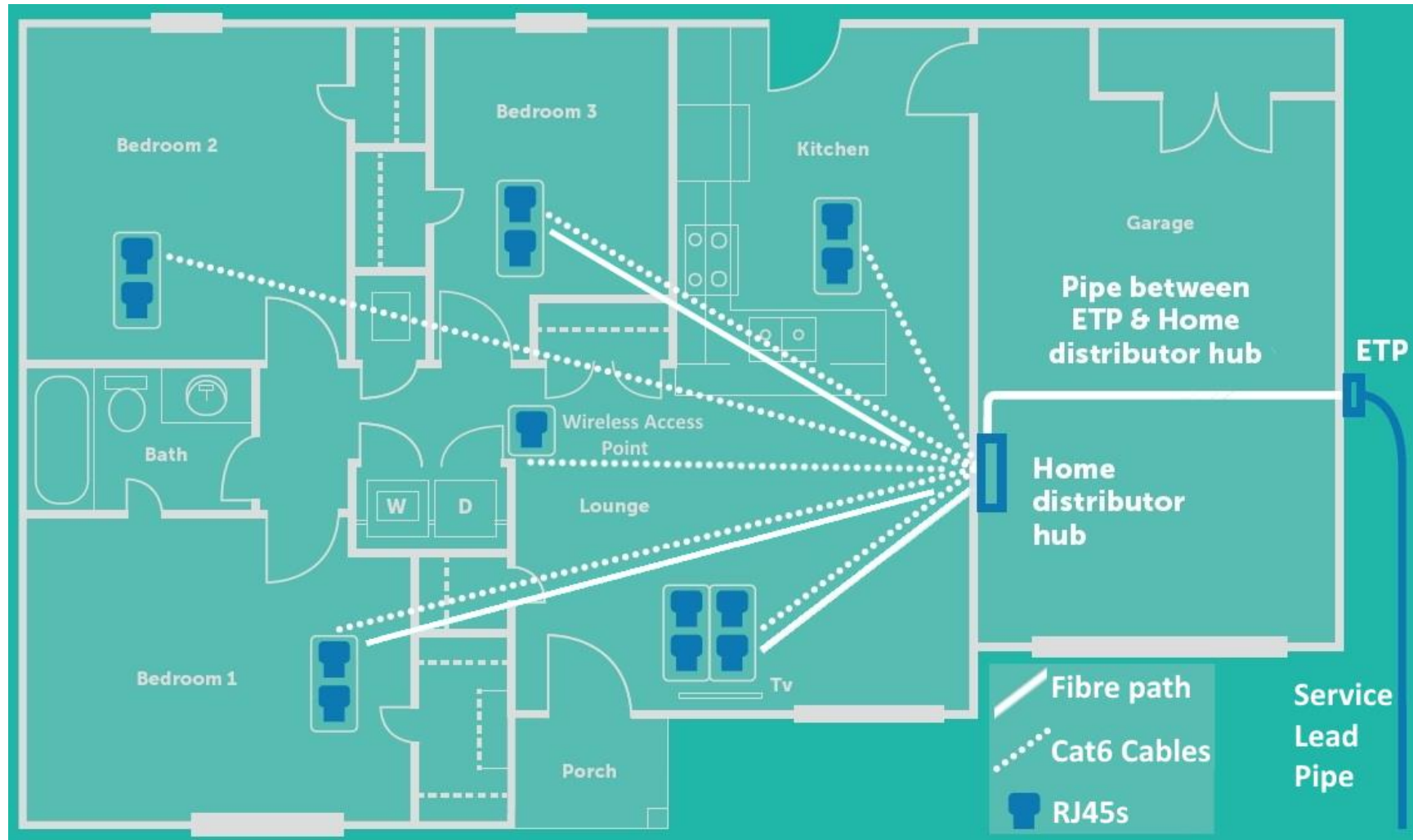


Figure 12. Example of Premises Broadband Cabling Recommendation

2.4.4.1. Fibre Connection, voice calls from ONT, RGW by TV

The diagram below shows an example of a fibre connection, with the ATA voice service from the ONT, through the home distributor.

- The ONT Ethernet output is ported to an RJ45 port on the RGW by the main TV.

The Ethernet output from the RGW is terminated back to the home distributor which is then patched to the jack points where broadband is required.

Note: An Ethernet switch is NOT required in this situation as there are four jack points in the lounge, three that can be used to directly patch back to other equipment in the house.
- The ATA voice output from the ONT is ported to a cordless phone base station.

Note: Broadband can be supplied alone, or in conjunction with a voice service.

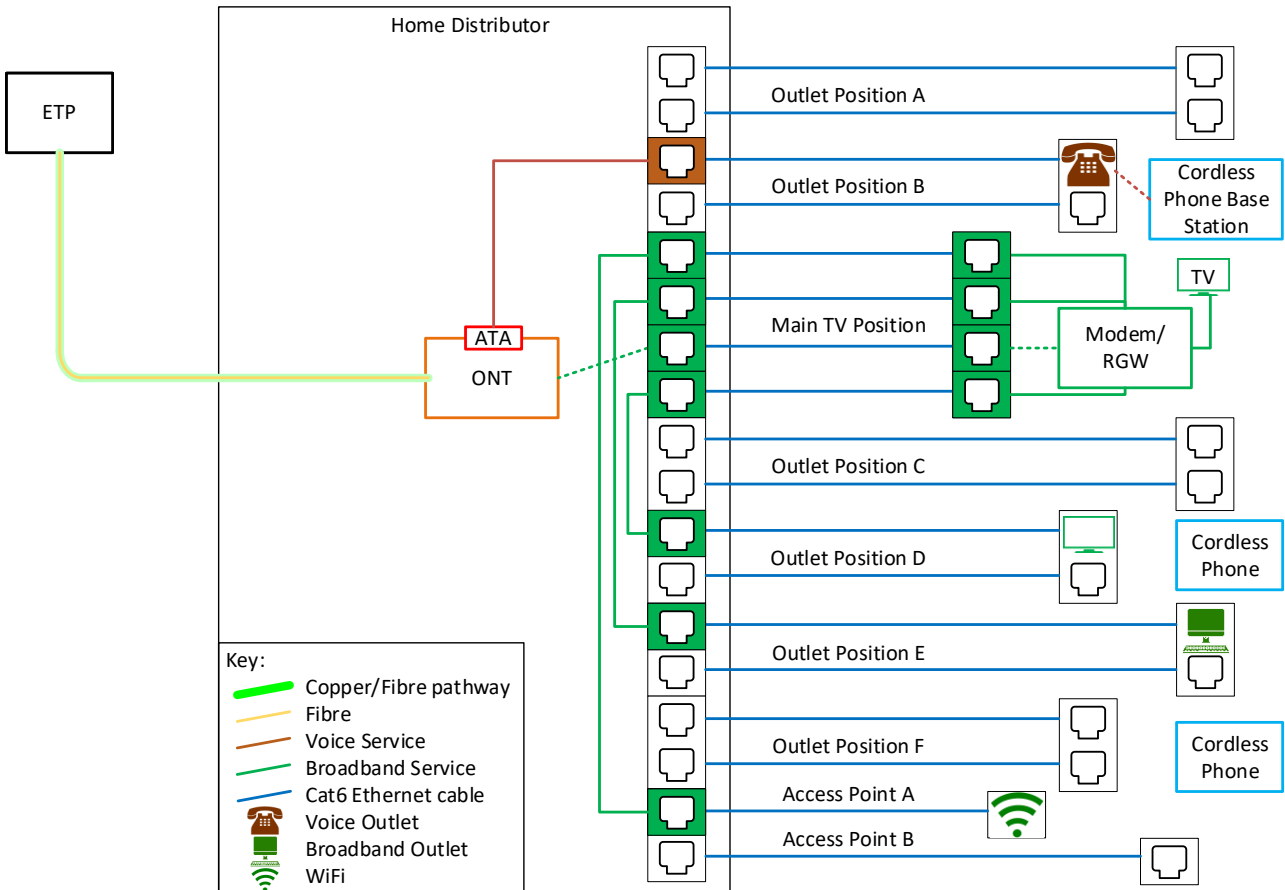


Figure 13. Example of Premises Broadband Cabling for Fibre with voice calls from ONT

2.4.4.2. Example of Fibre Connectivity with ONT acting as RGW

The diagram below shows an example of a fibre connection, with the ONT acting as an RGW.

- The ONT Ethernet output is ported to several devices throughout the house.

Note: Broadband can be supplied alone, or in conjunction with a voice service.

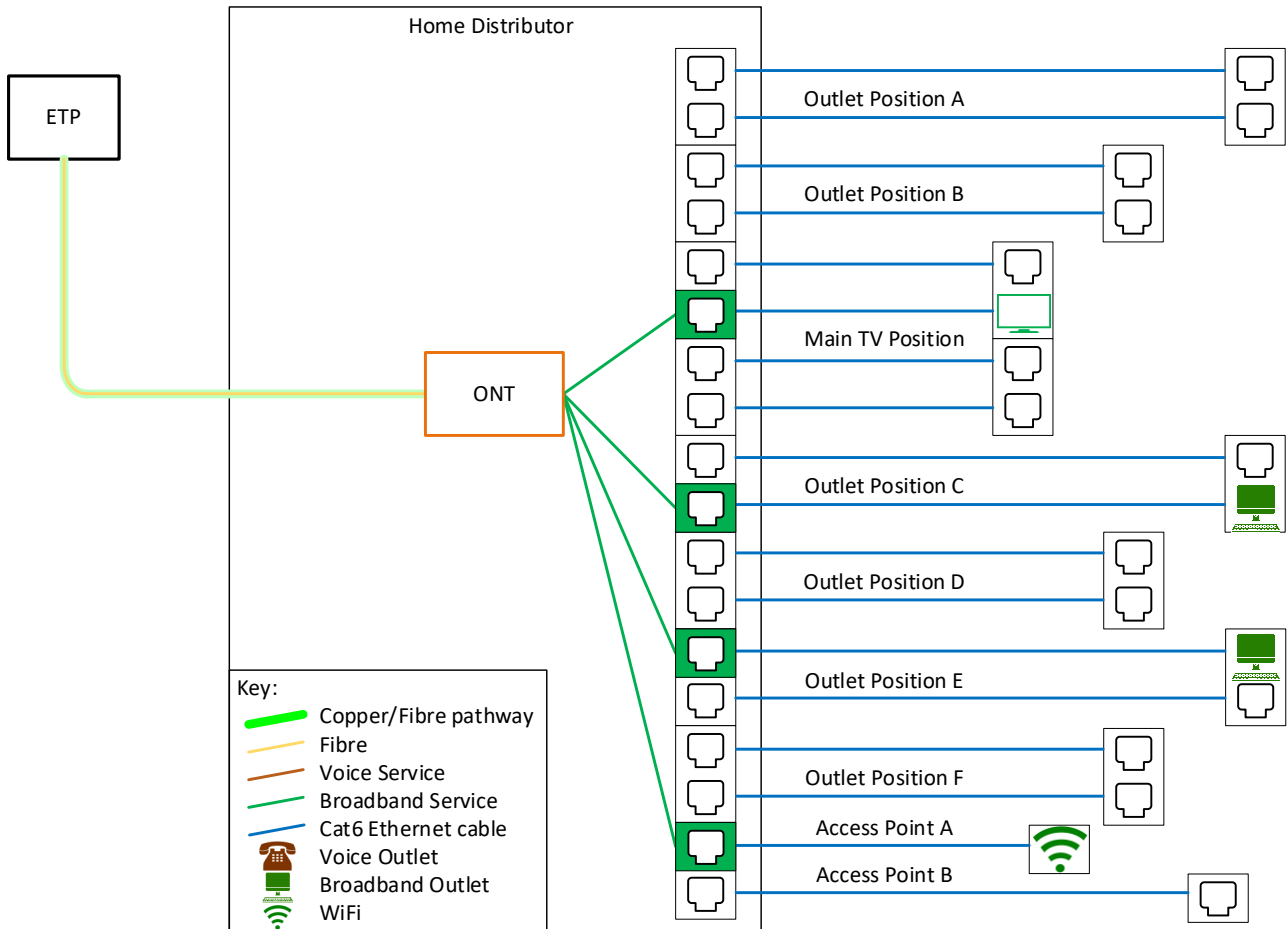


Figure 14. Example of Premises Broadband Cabling for Fibre ONT as RGW

2.4.4.3. Example of Fibre Connectivity with voice calls from ISP modem

The diagram below shows an example of a fibre connection, with the ATA voice service from the modem or RGW, through the home distributor.

- The Ethernet output from the RGW is connected to an Ethernet switch
- The Ethernet switch output is terminated to the jack points where broadband is required.

Note: An Ethernet switch is required in this situation as the RGW has insufficient Ethernet connections for all the devices that require them.

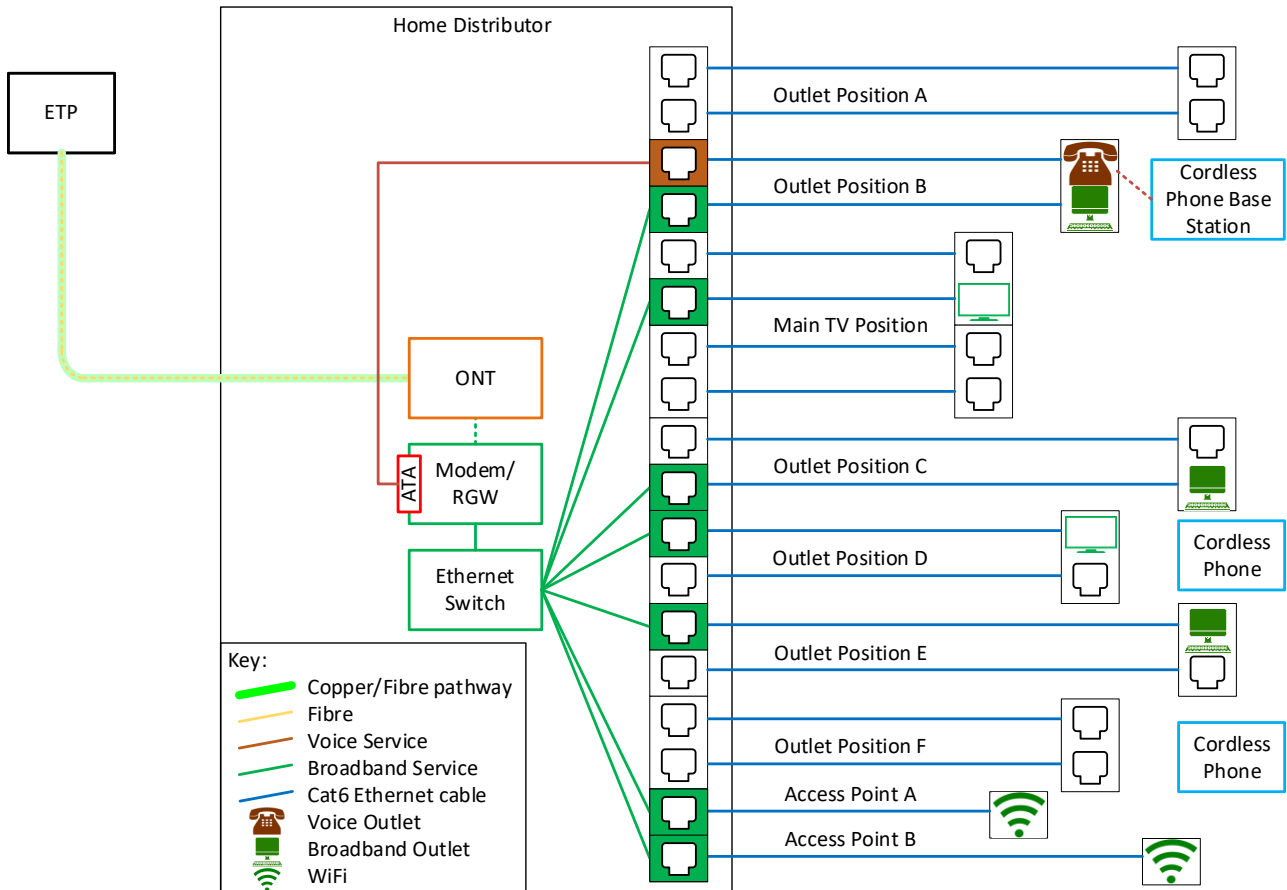


Figure 15. Example of Premises Broadband Cabling for Fibre with voice calls from ISP modem, and Ethernet Switch for multiple Ethernet connections

3. Who does what?

Section	Area of responsibility	Current State
Lead-in Duct and ETP	Supply of materials: Pipes, Ducts, cables, enclosures	<p>Chorus will be supplying the cables for the Lead-In and the ETP.</p> <p>Developer/Builder is responsible for obtaining the 20mm green lead-in pipe.</p> <p>If an ETP is required earlier, this can be purchased from an electrical wholesaler or www.hexatronic.co.nz</p>
Building penetration	Installation of pipes/cables	Builder is responsible for providing the building penetration for the Chorus network to enter the premises via the ETP. The penetration is to comply with the appropriate building code.
ETP to Home Distributor Hub	Supply of materials: Pipes, Ducts, cables, enclosures	<p>Builder/Electrician is responsible for:</p> <ul style="list-style-type: none"> Supplying and installing the 20mm conduit and Home Distributor Hub. Supplying and installing LSZH microduct or composite cable from the ETP to the Home Distributor Hub or the ONT location.
Home Distributor Hub to RJ45 Ethernet sockets	Supply of materials: Cables, RJ45 ethernet ports, plug faceplates	Builder/Electrician is responsible for providing, installing, and testing the ethernet cabling from the Home Distributor Hub to all RJ45 ethernet ports.
Power to Home Distributor Hub	Supply of materials: Cables, electrical plug faceplates	Builder/Electrician is responsible for providing, installing, and testing power sockets in the Home Distributor Hub.