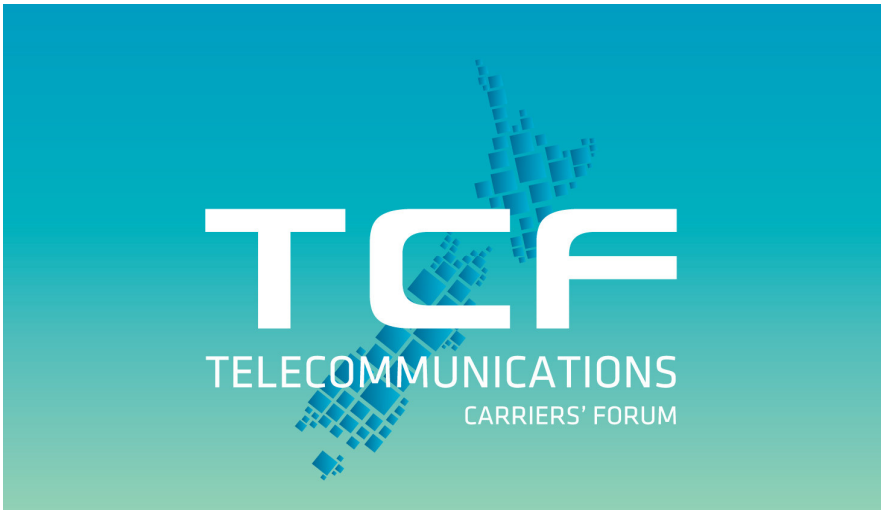


Telecommunications Carriers' Forum

Code for Residential, SOHO and Multi-dwelling Premises Wiring

("Premises Wiring Code of Practice")

~~**February 2010**~~

Version: 3.7 For Public Consultation

1 March 2011

V	DATE	AUTHOR	COMMENTS
2.2	February 2010	TCF	Endorsed by the TCF Board.
~~2.1~~3.0	October 2010	TCF	Changes made to incorporate UFB and multi-dwelling premises.
3.1	November 2010	TCF	Changes made to incorporate UFB and multi-dwelling premises.
3.2 – 3.3	December 2010	TCF	Changes made to incorporate UFB and multi-dwelling premises.
3.4 – 3.6	January – February 2011	TCF	Review by Working Party
3.7	March 2011	TCF	Final draft for public consultation

CONTENTS

A. INTRODUCTION

1. The Telecommunications Carriers' Forum ("TCF") established the Premises Wiring Working Party to provide recommendations on the provision and maintenance of Premises Wiring in residential and small business premises in New Zealand.

2. Recent developments in technologies and services, and the Governments Ultra-fast Broadband initiative now require extensive wiring and cross-connect facilities to be an essential part of the modern home. These facilities are required to support not only a wide range of current and future telecommunications services but also future in-home entertainment and building services.

3. This Code of Practice sets out principles and practices for planning, installing and maintaining a premises wiring system so as to provide an open, flexible platform for the communication and entertainment needs of the modern "intelligent home".

B. BACKGROUND

4. There is a clear trend towards the "intelligent home", with increasing levels of integration occurring between the various services and applications in the home. Not just telephony and data, but broadcast TV, audio, video, gaming, security and building control services are being brought together via a general purpose or "generic" cabling system.

5. The development of the "2-wire" telephone wiring code of practice in 1990s led to the widespread use of 2-pair telecommunications cable in most homes and small businesses. That wiring code of practice has proved satisfactory for supporting current telecommunications services, including telephone and broadband delivery.

6. However "Next Generation" network services as well as in-home network (LAN) and entertainment applications require a level of functionality and performance that traditional residential, SOHO and multi-dwelling premises wiring can not provide.

7. Although higher performing business grade wiring systems, typically Unshielded Twisted Pair (UTP) Cat5 and above, have been used in many new homes and offices for some years, most homes have continued to install the much lower performing 2-wire system for telecommunications-based services. That choice of cabling structure will limit the ability of those occupying the home to access and enjoy future network as well as in-home entertainment and control applications.

8. While alternative networking technologies, such as WiFi and G.hn (Home Grid) do exist, and are often useful extensions of wired networks, they cannot provide the same levels of consistency, reliability and security that structured wiring provides.

C. PURPOSE

9. The purpose of this code is to provide the Telecommunications Industry's recommendations on the design, provisioning and maintenance of residential and SOHO and multi-dwelling premises cabling to Interested Parties. The objective being to define a set of policies and practices which will provide good long-term performance and reliability for the New Zealand consumer and home owner.

10. The Code deals with requirements for direct connection to Service and Access Network Providers networks.

11. This Code supports the general recommendations of the Australia and New Zealand Standard for generic cabling for homes (AS/NZS 15018) and for Coaxial and Fibre-Optic distribution of

Analog and Digital Television and Sound Signals in Single and Multiple Dwellings (AS/NZS 1367). It also sets out the functional specifications for the provision of Generic Cabling primarily to support Telecommunications Services in New Zealand Residential and Small Office Home Office (SOHO) premises, typically those premises have less than four access service Lines.

12. This Code of Practice is intended for use by Interested Parties involved in Generic Cabling installations for telecommunications and other services in both residential, small business and multi-dwelling premises, namely:

12.1. Consumers. Including building owners;
12.2. Building industry providers (architects, builders, developers, etc.);
12.3. Suppliers of technology (electrical contractors, equipment suppliers, etc.); ~~and~~
12.4. Retail Service Providers~~.~~; and
12.5. Access Network Providers.

13. This Code will take effect 3 months from the date the code has been endorsed by the TCF.

D. DOCUMENT OVERVIEW

14. This document is has been laid out to assist the reader in finding information that is relevant to their purpose of reading this document. The contents of each section are:

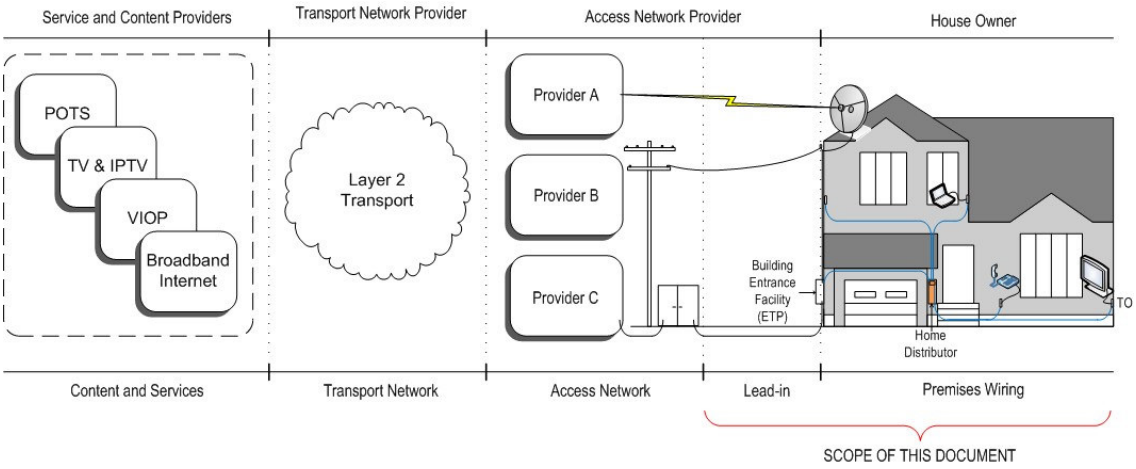
- **I. System Overview – Key Components and Architecture**: Introduces the purpose of the key components of the cabling system;
- **J. System Design Considerations**: The overview of the requirements when planning the cabling system. This section is useful for Premises Owners and planners during the design stage;
- **K. Installation Guidelines**: The detailed installation requirements are described for Data cabling installers and DIYers;
- **L. Installation testing**: It is recommended that all installations are tested to prove that they are fit-for-purpose. Premises owners should have an awareness and installers should have a detailed knowledge of the requirements of this section;
- **0. Records Management**: Guidelines are provided for the preparation of documentation describing the installation. This documentation will be primarily used by Premises owners and tenants to reconfigure the cabling as their needs change. While Installers should have a detailed understanding of this section in order to prepare the documentation, Premises Owners should also have an understanding of this section in order to be able to reconfigure the cabling in the future.

E. SCOPE AND OBJECTIVES

15. Scope

15.1. This Code addresses requirements for Telecommunication Services a Retail Service Provider may deliver over the Public Switched Telephony Network (PSTN), xDSL, Ethernet ~~or~~ , Radio Frequency (RF) or fibre to the premises network to residential, SOHO and multi-dwelling premises, as illustrated in Figure 1 below.

Figure 1: Scope of Premises Wiring Code of Practice



15.2. This Code specifies generic cabling as defined by AS/NZS 15018 and AS/NZS 1367, for two groups of applications:

a) Information and Communications (Telecommunications) Technologies (ICT); and

b) Broadcast and Communications Technologies (BCT).

15.3. The Code specifies cabling that comprises one or more of the following:

a) balanced cabling; ~~and~~

b) coaxial cabling~~.~~; and

c) fibre optic cabling.

15.4. The Generic Cabling practices detailed in this Code for ~~Residential~~residential, SOHO and multi-dwelling premises generally apply where the same type of cabling systems are utilized in Commercial premises.

16. Objectives

16.1. The objectives of this Code are:

16.1.1 To recommend minimum requirements regarding the provision of Generic Cabling to support Telecommunications Services in ~~Residential~~residential, SOHO and ~~Small Office Home Office (SOHO)~~multi-dwelling premises in New Zealand.

16.1.2 To set out best practice management principles that parties involved in the design, installation and maintenance of Generic Cabling and facilities should comply with, by:

a) Identifying the rights and responsibilities of Interested Parties;

b) Providing guidelines to providers of Generic Cabling to assist them to comply with their legal obligations and with this Code;

c) Documenting and testing ~~premise~~premises wiring installations;

d) Achieving a balance between industry and End-User interests;

e) Promoting the informed, fair and safe use of Generic Cabling; and

f) Being technology neutral.

17. Exclusions from Scope

17.1. This Code does not apply to;

a) Electrical Wiring and in-home power line carrier technology;

b) Customer ~~Premise~~Premises Equipment (CPE);

c) The use of Wireless networking technologies (e.g. WiFi);

- ~~The use of Fibre optics and screened cabling within residential and SOHO premises; and~~
- ~~Home automation, security systems and control applications within residential and SOHO premises.~~

d) Home automation, security systems, and entertainment systems and control applications within residential, SOHO and multi-dwelling premises.

18. Applicability

18.1. This code is applicable to all residential, SOHO and multi-dwelling units being constructed and undergoing major renovations.

18.2. It is also applicable to those premises that are not yet served by fibre optic or xDSL networks, including rural areas. The availability of economical cellular phone data services and satellite data services is expected to become more widespread and it would be advantageous for all premises to be suitably cabled to make use of those services.

F. COMPLIANCE

19. This self-regulatory Code is applicable to the Parties who are involved in the design, installation and maintenance of Generic Cabling which includes, but is not limited to, the Interested Parties.

20. Residential ~~and~~ , SOHO and multi-dwelling Generic Cabling installations should comply with this Code and must comply with any relevant legislation or Commerce Commission determinations.

21. If one Party defaults in the performance of any of its obligations under this Code, the defaulting Party will use its best endeavours to remedy the default as soon as possible and to prevent a recurrence of the default. This provision applies as long as the default does not prevent other parties to the Code complying with their obligations.

22. In the event of any inconsistency between this Code, any relevant legislation, any Bilateral Agreement and any Commerce Commission determinations, this inconsistency will be resolved in the following (descending) order of precedence:

    a) Any legislation;

    b) Any Commerce Commission determinations;

    c) This Code;

    d) Any Bilateral Agreement between Service Providers.

23. Compliance with the Law & other Codes

    23.1.1 While compliance with this Code may assist compliance with legal and regulatory obligations, this Code does not constitute legal advice or a comprehensive outline of all legal issues relevant to the provision of Premises Wiring services in New Zealand.

    23.1.2 In addition to compliance with this Code, industry participants are obliged to comply with all applicable laws, regulations and requirements of any government or statutory body, as well as with any other applicable industry standards or codes, whether voluntary or otherwise.

    23.1.3 It is the responsibility of the parties to this Code to be fully conversant with the latest version of this Code, and to ensure that they are at all times in compliance.

    23.1.4 The Parties who agree to be a Party to this Code will ensure that any contracts they enter in to with other potential Parties to this Code, which relate to the subject matter of this Code, will be bound to the Code as if they were also a Party to this Code.

    23.1.5 Service Providers are responsible for ensuring that the content and promotion of all Generic Cabling, whether that cabling is manufactured by themselves or others, comply with all relevant provisions of this Code.

G. DEFINED TERMS

In this Code, unless the context otherwise requires:

"Access Network Provider" (ANP) means the Party to whose network an access line is directly connected and over which services are supplied. Note that an ANP may also be an Access Service Wholesaler and/or a Retail Service Provider.

"Accessory" any device, not itself directly providing a telecommunications function, which is plug connected to the premises wiring.

"APC" refers to Angle Polished Cut.

"Balanced Cabling" Cable consisting of one or more metallic symmetrical cable elements (twisted pairs or quads) also known as Cat5e and above, as referenced in the ISO/IEC 11801.

"Bilateral Agreement" means an agreement between a Party who is obliged to comply with the terms of this Code and another party (who might or might not also be a party to this Code).

"BISCI" (Building Industry Consulting Services, International) is an association that promotes data cabling standards.

"BT jackpoint" means any jackpoint which mates with a plug to BS 6312.

"Business Day" means a day on which registered banks are open for normal banking business, excluding Saturdays, Sundays and nation-wide public holidays. Regional public holidays are considered to be Business Days.

"Carrier" means an entity that operates:

(a) A public switched telephone network (or a functionally equivalent system) that originates, transits or terminates calls; and/or

(b) A public data network.

A Person may be both a Carrier and a Service Provider. If a Party has more than one network, it can be classified as more than one Carrier.

"Category" refers to the rated design performance of a particular cable.

"Chorus permitted" CPE, hardware or cable marked with a "Chorus permit" label to indicate that it complies with Chorus specifications for connection to its local copper or fibre access network. A Chorus permit is a prerequisite to the granting of a Telecom New Zealand Telepermit.

"Clause" refers to a clause in this Code.

"Cross-connection: any arrangement which enables a jackpoint to be associated with a specific service.

"Customer premises equipment (CPE)" any telecommunications terminal equipment connected to the customer's wiring, other than CLNE.

"Customer" means a person who has a bona fide Billing Relationship with a Service Provider in respect of a Telecommunication and/or Broadcast Service. The Customer is the end user (i.e. not a wholesale customer).

"Customer-located network equipment (CLNE)" access network provider / service provider network terminating equipment required to provide a specific service and located within the customer's premises on the customer's side of the network demarcation point.

"Daisy-chain (or loop) wiring" means a common form of wiring where a cable to one jackpoint is connected to another cable to the next jackpoint.

"Demarcation point" The network demarcation point is at which the lead-in cable enters the customer's building and, usually, also the point at which the customer's wiring is connected to the network lead-in cable~~.~~, and is detailed in section 27.5.

- To avoid any doubt, the service delivery point is on the customer side of the CLNE.

"External cable" cable intended for installation outside buildings, exposed to the weather or ground contact, and provided with an appropriate protective sheath.

"External Terminating Point (ETP)" means external termination point which is an external box, in which the lead-in cable is connected to the internal building wiring. It is also (incorrectly) known as External Test Point, the Network Termination Device or demarcation point, when provided.

"Fibre" a thin, flexible, transparent fiber that acts as a waveguide, or "light pipe", to transmit light between the two ends of the fiber. It is typically made from glass. Two standards are used when specifying fibre: ITU-T G.657 (bend insensitive) and ITU-T G.652

"Generic cabling" often referred to as "structured cabling", a cabling system capable of supporting a wide range of ICT and BCT services which is installed without detailed knowledge of the required applications. As referred to in section 5 of the AS/NZS 15018

"Hardware (or line hardware)" any fixed wired device other than CPE.

"Home Distributor" the central point of a generic cabling system, consisting of a cabinet or cupboard housing cross-connection and test facilities for the premises cabling and associated services.

'Insulation Displacement Connector' (IDC) commonly used to terminate wiring at hardware.

"Inside cable" telecommunications cable intended only for use within a building.

"Interested Parties" includes the following: Architects, Specifiers, Installers, Cablers, Security System providers, Home Automation specialists, Electrical Contractors, Builders, Consumers, Developers, Equipment Suppliers and Service Providers.

"ITU-T G.hn" is a standard promoted by the HomeGrid Forum that allows existing power, telephony and coaxial wiring to be used for providing Ethernet services.

"Jackpoint" is any type of outlet used for plug-connecting CPE.

"Jumper" refers to a hard-wired cross-connection (not using plugs and sockets).

"Keystone" a keystone module is an industry standard type of telecommunications outlet used in residential and business environments. The systems consist of a modular faceplate to which outlets are mounted.

"Lead-in cable" the cable used from the street to the customer's premises.

"Line grabbing" a function of series connected CPE which disconnects other wiring and CPE from the line to either terminate or initiate a call on a voice line.

- Examples are medical and security alarms programmed to call a pre-determined number when triggered independent of whether the line is already in use.

"Low Voltage (LV)" any voltage exceeding 42.4 V peak AC or 60 V DC, but not exceeding 1000 V peak AC or 1500 V DC.,

- 230 V wiring is defined as Low Voltage and must be segregated from telecommunications wiring as explained in ~~clause 30.3~~section 29.11.

"May" refers to matters which are optional.

"Multi-dwelling Unit" (MDU) includes semi-detached, apartments, townhouses, gated communities and assisted-living facilities that share a common property boundary. MDU facilities may be under a single roof or they may consist of multiple buildings on a residential campus. MDUs may include only residential units or they may have residential units along with commercial and retail spaces. The BICSI defines 3 types of MDUs[1]:

(a) **Low-rise MDUs**: Each unit has access to the ground level and also has a roof line such as townhouses and semi detached dwellings.

(b) **Mid-rise MDUs**: These include duplexes, two storey apartments and other building styles in which units are stacked upon one another.

(c) **High-rise MDUs**: High-rise MDUs most closely resemble large commercial buildings with few units having direct access to the roof line or ground floor.

"Must" refers to matters which are essential for compliance with the Code.

"Optical Network Termination (ONT)" a unit provided to terminate its optical fibre lead-in cable.

"Pair" any set of two wires, which are usually twisted in a cable, used to provide a circuit.

"Party" means a Person bound by this Code under the Telecommunications Act or a Person signed up to this Code.

"Patch cord" a means of cross-connection using plug-ended cords between the socket terminating the associated jackpoint cable and the socket used for the service being connected.

"Person" means a legal person and includes a company and any other legal entity.

"PHD" mean primary Home Distributor, which provides a point of connection to external network services and also to local equipment.

"Premises" Single building or structure located on a defined geographical site. A premises can contain one potential End User, e.g., stand alone house), or more than one potential End User e.g., apartment building or high rise office building.

"Premises Wiring" is the physical deployment of Generic Cabling principles.

"Private Dwelling" means any private dwelling that is both fixed in location and of durable or permanent construction. A private dwelling accommodates a person or a group of persons, but is not available to the public. This includes: houses, flats, and apartments; residences attached to a business or institutions; baches, cribs, and holiday homes; and dwellings of the above types that are under construction. Garages; caravans, cabins and tents; vehicles; vessels; are also included. Exclusions: a private dwelling with 6 or more boarders or lodgers should be classified as a boarding house[2].

[1] Excerpt from '*Residential Network Cabling' by BICSI*, http://books.google.co.nz/books?id=EDSW8ZXByAcC&pg=PA420&lpg=PA420&dq=bicsi+mdu&source=bl&ots=ulnJq1bqgA&sig=QVWN_b3bqTsmYi83H69jCHvvhFo&hl=en&ei=QjxHTbfGAdDJcYefudUD&sa=X&oi=book_result&ct=result&resnum=5&ved=0CCwQ6AEwBA#v=onepage&q&f=false Accessed 1 February 2011

[2] Abridged, Statistics New Zealand

"Residential-type" a general term to describe wiring systems intended mainly for residential customers' premises, but also commonly used for small business applications.

"Retail Service Provider" (RSP) means any person providing a Telecommunication and/or Broadcast Service to a Customer and who has the Billing Relationship with the Customer for that service.

"RJ 45" a generic term used to describe the 8-way modular socket or associated plug originally used in North America and now standardised internationally[3].

"Series CPE" any CPE connected in the path between other CPE and the network.

"Service Line" is a physical bearer that supports telephony, data and video or any combination thereof.

"SHD" means Secondary Home Distributor, which connects primary home cabling to secondary home cabling and provides connections to outlets or unit Home Distributors.

"Service Provider (SP)" means any person providing a Telecommunication and/or Broadcast Service to a Customer and who has the Billing Relationship with the Customer for that service. The same person may be both an ~~ASD~~Access Network Provider and a Service Provider.

"Should" refers to matters which are optional.

"Shall" refers to matters which are essential for compliance with the Code.

"Socket" the term used to describe the specific type of socket component incorporated in "jackpoint" or "telecommunications outlet".

"SOHO (Small Office/Home Office) cabling" an optional cabling standard, typically used for those installations requiring additional flexibility for voice and data services, and currently standardised in ISO/IEC 15018: 2005.

"Star wiring" an arrangement whereby each jackpoint is separately cabled to a central point, where cross-connect facilities may be provided.

"STP (Shielded Twisted Pair)" balanced pair cable with some form of shielding for improved EMC compatibility.

"Structured cabling multi-purpose high performance cabling systems installed to AS/NZS 3080 or equivalent standards.

"Telecom" refers to Telecom New Zealand Ltd including its subsidiaries.

"Telecommunication(s) Service" refers to any good, service, equipment and/or facility that enables or facilitates Telecommunication.

"Telecommunication" is the conveyance by electromagnetic means from one device to another of any encrypted or non-encrypted sign, signal, impulse, writing, image, sound, instruction, information, or intelligence of any nature, whether for the information of any person using the device or not; but excluding any conveyance that constitutes broadcasting.

"Telecommunications Act" means the Telecommunications Act 2001 as amended from time to time.

"Telecommunications Carriers" Forum" or "TCF" means the Telecommunications Carriers' Forum Incorporated Society of New Zealand.

[3] Refer to the IEC 60603-7 and related standards.

"Telecommunications Outlet (TO)" means the international term to describe any type of socket or jackpoint into which terminal equipment may be connected.

"Telepermitted" CPE, hardware or cable marked with a "Telepermit" label to indicate that it complies with Telecom New Zealand's specifications for connection and use on their network and with the designated service. A Chorus permit as a prerequisite to the granting of a Telepermit.

"Telephone hub" any form of communing facility, typically used to provide terminations where multiple TO's are to access the same telephone line

"Test termination" a sealed resistor/capacitor combination usually fitted within an ETP to provide a remote line test capability independent of whether any CPE is connected to that line.

"TNV (Telecommunications Network Voltage)" a non-hazardous class of voltage for safety rating purposes, subdivided into three sub-classes.

- TNV-1 normal operating voltages do not exceed SELV (Safety Extra Low Voltage, which does not exceeding 42.4 V peak a.c or 60 V d.c.) but could be subject to over-voltages from a network.
- TNV-2 normal operating voltages do not exceed SELV and are not subject to network over-voltages.
- TNV-3 normal operating voltages do exceed SELV and are subject to network over-voltages. Because of ringing voltage and the possibility of mains contacts or lightning transients, a PSTN line and the wiring directly connected to it are rated at TNV-3. Wiring carrying Ethernet is rated at SELV.

"Two-wire (2-wire)" the present standard BT jackpoint system where one pair interconnects all 2-wire TO's, each of which incorporates a capacitor to ring older 3-wire connected CPE.

"UHD" means unit Home Distributor, which, in a multi-dwelling unit, connects to external network services and provides connections to outlets in an individual dwelling unit

"UTP (Unshielded Twisted Pair)" the more commonly used type of balanced pair cable (as distinct from STP) in New Zealand.

"Voiceband" frequencies up to 4 000 Hz and, in particular, the nominal frequency range 300 Hz – 3400 Hz used for voice transmission

"Wiring (premises wiring)" refers to all cable and directly connected hardware on the customer's side of the demarcation point.

H. DOCUMENT REFERENCES

AS/NZS 1367:2007	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 3000:2007	Electrical Installations
AS/NZS 3080:2003	Telecommunications installations - Generic cabling for commercial premises
AS/NZS 3084:2003	Telecommunications installations - Telecommunications pathways and spaces for commercial buildings
AS/NZS 3085:2004	Telecommunications installations - Basic requirements
AS/NZS 3112:2004	Approval and test specification - Plugs and socket-outlets
AS/NZS ISO / IEC 15018:2005	Information technology - Generic cabling for homes
AS/NZS ISCO / IEC 24702:2007	Telecommunications installations - Generic cabling - Industrial premises

I. SYSTEM OVERVIEW – KEY COMPONENTS AND ARCHITECTURE

24. The objective of this section is to introduce the key functional and architecture components of a Generic cabling system as may be used in ~~an Intelligent Home or~~ a residential, SOHO or multi-dwelling Wiring installation.

25. System objectives

25.1. An objective of any ~~Intelligent Home~~residential Wiring system is for all outlets (Telecommunications Outlet) to be general purpose. Telecommunication Outlets (TO) can support a range of applications, depending upon the appliance plugged into it and the service the TO is patched to at the Home Distributor. A TO is therefore an "access point" used to access common network and in-home applications, including:

a) Telephony services - PSTN, VOIP, Fax;

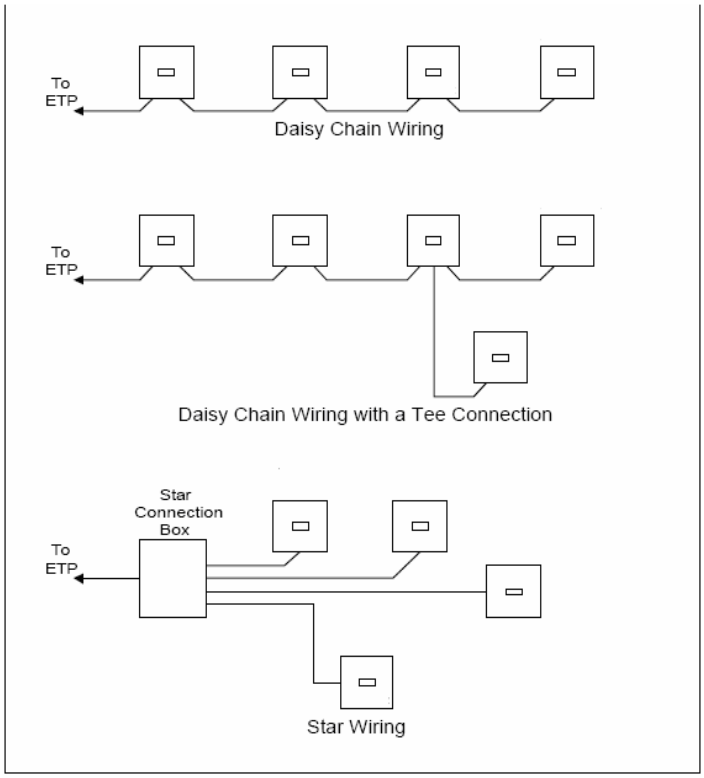
b) Wireless Services - Wireless (DECT) Telephones as well as WiFi;

c) Local Area Networks - 10Mbits/sec - 10Gbits/sec Ethernet~~;~~.

26. Wiring Architecture

26.1. The recommended wiring for ~~Intelligent Home~~a residential Generic Cabling Systems is a star-wired architecture using high performance cables and TO sockets. This is significantly different from traditional analogue telephone wiring which in many cases is wired in a daisy-chain fashion using voice-grade cabling and outlets. The differences in architecture are illustrated by ~~the following figure.~~Figure 2 below.

Figure 2: Wiring Topology Types



26.2. The data cabling will use the star configuration to enable each Telecommunication Outlet to be connected to a separate port on the Residential Gateway or router.

26.3. Cabling that is used for connecting telephones, will use a Telephone Hub at the star connection box (refer Figure 2 above) to allow all the telephones to access a single incoming PSTN line. The Telephone hub may also provide suitable outlets for providing line grabbing functions for fire and burglar alarms (refer to clause 38).

27. Major System Components

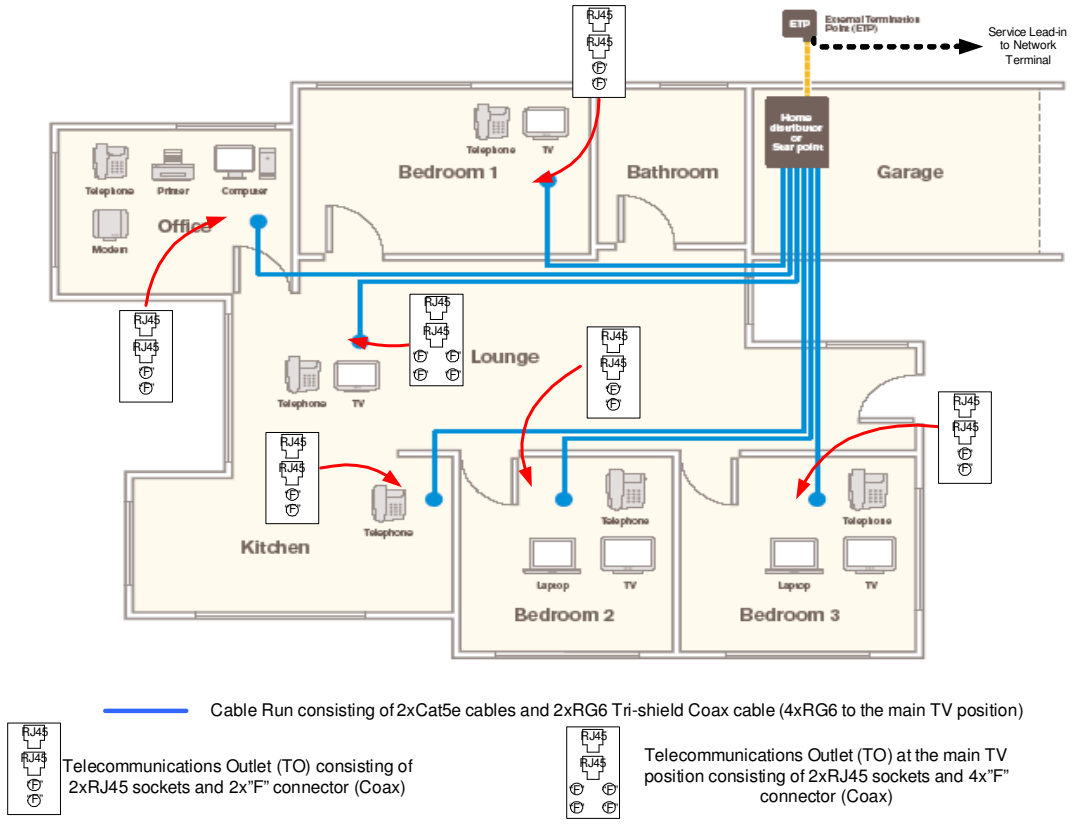
27.1. The key functional elements of an intelligently wired home are outlined by the following figure and discussion.

27.2. To summaries the key functional elements are:

- Prescribed elements:
  a) Service Lead-In - the connection to an Access Network Provider; ~~and~~
  b) External Termination Point (located outside the premises~~).~~); and
  c) Demarcation Points.

- Discretionary elements:
  a) Home Distributor including patch cables;
  b) Power supplies;
  c) Internal premises Cabling;
  d) Ducting; and
  e) Telecommunications Outlet - RJ45 & coaxial F connectors.

Figure 3: Generic Cabling System Components



27.3. Service Lead-In

27.3.1 The connection between the premises cabling and an Access Network Provider's ~~(ANP)~~ network. This connection may take the form of a physical aerial or underground cable, a cable linking to a satellite dish or RF aerial, or a wireless connection that terminates within the premises. Typically, an ~~ANP~~Access Network Provider may provide up to four network lines, although there is no fixed limit.

27.4. External Termination Point (ETP)

27.4.1 The point at which an ~~ANP~~Access Network Provider service lead-in cable connects to the internal building wiring. The purpose of which is to:

a) ~~Provide~~For a copper lead-in cable, provides a physical demarcation point between an ~~ANP's~~Access Network Provider's lead-in cable and the premises wiring~~; and~~, or;

b) Provide a test point for faults diagnoses without requiring access to the premises; though some faults may still require access in to the premises.

27.4.2 Ideally the ETP will be a box mounted on the exterior of a building by the ~~ANP~~Access Network Provider providing services to that premises, though in some older installations it may be located just inside the building.

27.4.3 The ETP for residential and single dwelling units is functionally equivalent

to the Building Entry Facility (BEF) referred in AS/NZS15018.

27.4.4 The same ETP can be used for both the fibre optic cable entry and the copper cable entry provided that the fibre optic cable bending radiuses are complied with.

27.5. Demarcation Point

27.5.1 The demarcation point between the Access Network Provider and the Premises Owner will vary depending on the type of lead-in cable that is used and is subject to the Access Network Provider's distance limitations.

a) For a copper lead-in cable, the demarcation point will be either:

- the External Termination Point (ETP); or
- where there is no termination point external to the premises, either the first jack on the premises wiring or, where appropriate, the building distribution frame.

b) For a fibre optic cable lead-in in a single dwelling unit, the demarcation point will be either:

- The SC/APC plug on the end of the lead-in cable that plugs directly into the ONT; or
- Where the lead-in is terminated onto a distribution frame, the plug on the end of the pigtail (spliced onto the lead-in cable) that is plugged into the SC adapter.

c) For a fibre optic cable lead-in in a MDU, the demarcation point between the Access Network Provider and premises wiring will be either:

- As per a single dwelling unit where each unit of the MDU has a separate lead-in cable; or
- the plug on the end of the pigtail that is plugged into the SC adapter located on the distribution frame that services the MDU.

d) For a MDU, the demarcation between the Building Owner's wiring and the unit's wiring shall be the in the unit's Home Distributor as defined for a single dwelling unit installation.

e) For Wireless or Satellite connections, the demarcation point will be the plug that plugs into the wireless modem or satellite dish.

27.6. Home Distributor

27.6.1 The Home Distributor (HD) is the central point at which all internal premises wiring terminate and branch out from. It is also the location at which cross connections can be made to external (broadband) or in-home (LAN) services. Refer to ~~Figure 4~~ Figure 4 below "Service Lead-in & Premises wiring overview".

27.6.2 The home distributor typically houses:

a) A separate cable to each TO on the premises. Looping (Daisy-chain) to subsequent TOs is neither a common nor desired practice;

b) Commoning and cross-connection facilities, including patch cords;

c) Test access point;

d) Other relevant communication, control and networking hardware e.g. router, modem, alarm, hub, etc;

e) Records needed for the effective management and operation of the installation;

f) A point for delivery of voice, video, and data services and applications; ~~and~~

g) Home Optical Network Termination (H-ONT) devices and residential gateway for fibre~~.~~ optic cable provision; and

h) Power distribution facilities where Power Over Ethernet (POE) devices are used through the premises.

27.6.3 Since an ONT may contain a port that acts as a radio frequency transceiver (e.g. a WiFi port), it is recommended that the home distributor house such equipment in such a way as to facilitate radio transmissions through the premises.

27.7. Power supply

27.7.1 Services delivered to End Users using technologies other than the copper based PSTN may rely on a power source being available at all times to sustain the delivery of voice services, and other solutions dependant on voice services, such as monitored and medical alarms. Therefore it is recommended that an Uninterrupted Power Supply (UPS) device with surge protection is installed to provide power backup during power outages, and ensure service continuity for telephones, alarm systems and other home mission critical services. A UPS operates like a backup battery and typically lasts for one or two hours. The Service Provider is the first point of contact for information on UPS installations, as it must comply with the overall solution provided.

27.8. Cabling

27.8.1 A typical installation may make use of a range of technologies and practices, including:-

a) Cat 5e or higher UTP cable and RJ45 connectors, primarily for telephony and data, but also capable of supporting other services, such as audio and video, home control, etc;

b) For television requirements all RG6 cabling should be dual cable. RG6 coaxial cable and "F" connectors for TV baseband applications, including free to air services (i.e. Terrestrial broadcast & pay TV)For satellite TV, see Appendix No. 3;

c) For Multi-dwelling Units consideration should be given for the installation of a fibre-optic cable distribution system between the primary Home Distributor and the secondary Home Distributor. This system should terminate in a common area with

dedicated fibres to each unit, a minimum of two fibres per unit is recommended;

d) Other types of cable for control systems for lighting, heating control, entertainment and security, though these are not part of this code; and

e) Cabling to devices to provide Wireless services, such as WiFi and cordless telephones.

27.8.2 A Generic cabling system~~,~~ is a cabling system that is designed ~~conforming~~to conform to a set of rules providing support for multiple applications, and is typically a system based high performance coax and 4-pair UTP cable wired in a star wiring configuration.

27.8.3 The performance characteristics of UTP cabling commonly used in residential and commercial communications applications is expressed by its design or UTP Category (Cat) rating, the most common being:

a) Legacy < 2Mbps/sec telephone and control applications.

b) Cat-3: performance to 16MHz to support 10Mbits/sec Ethernet networks.

c) Cat-5e: performance to100MHz to support 1Gbits/sec Ethernet networks~~.~~ over a distance of 100 metres. This allows for 90 metres of fixed cabling and an allowance of 10 metres for terminations and patch cords.

~~d)~~ Cat-6: performance to 250MHz to support 1Gbits/sec Ethernet~~.~~
d) , with a maximum allowed length of 100 meters. This consists of 90 meters of cabling plus and an allowance of 10 metres for terminations and patch cords.

e) Cat-6a: performance to 500MHz to support 10Gbits/sec Ethernet with a maximum allowed length of 100 metres. This consists of 90 meters of cabling with an allowance of 10 metres for patch cords and terminations.

Note: All cabling systems coax, fibre optic cable and Twisted Pair needs to be correctly installed and maintained if prescribed performance levels are to be realised over the installation's planned life.

27.9. Ducting

27.9.1 Common in commercial buildings ducting is a new concept for residential homes. Ducting involves the installation of purpose designed and installed pipes (ducts) to aid the reticulation and installation of new or replacement of wiring in and around a premises.

27.9.2 During the planning phase of any cabling installation serious consideration should be given to the installation of ducts to areas that would prove difficult or impossible to install cables once the building is finished. The marginal cost of installing ducts may prove a valuable investment considering:

a) The financial and aesthetic costs of installing cables to difficult to reach locations once the building is completed;

b) The ability to replace cable as a result of damage or change of

requirements;

c) The inconvenience costs to homeowners and occupiers of not being able to utilize services in room and locations they wish;

d) The insulation, sound proofing and moisture blocking integrity of building systems (walls) may be compromised if improper cabling practices are used in a retrofit situation.

27.10. Telecommunications Outlet (TO)

27.10.1 Telecommunication Outlets are essentially “general purpose” and may support a range of services, depending on how they are connected at the Home Distributor. Each TO can provide a connection point for the transmission and/or reception of information, depending on the type of equipment connected to it~~,~~.

J. SYSTEM DESIGN CONSIDERATIONS

28. The objective of this section is to introduce the key design and planning principles for each functional element of a Generic cabling system that may be used in an Intelligent Home or SOHO Wiring installation

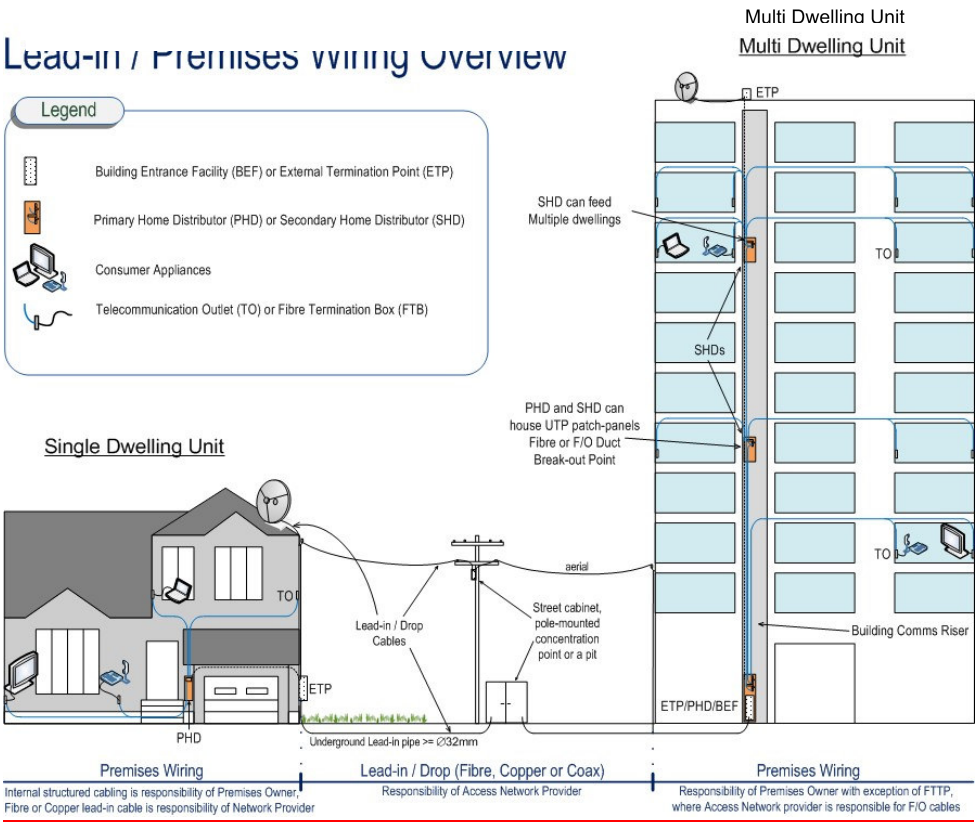
29. The key functional elements:

- Service Lead-In - the connection to an Access Network Provider;
- External Termination Point (located outside the premises of single dwelling units);
- Home Distributor including patch cables;
- Power supplies;
- Internal premises Cabling;
- Ducting; and
- Telecommunications Outlet - RJ45 & coaxial F connectors.

29.1. Service Lead-ins

29.1.1 Building owners and developers are advised to consult local Access Network Providers (ANPs) to determine the optimum service lead-in option. Options may include: copper, fibre or coaxial lead-in cables; aerial or underground; the position for the ETP and other special requirements that may need to be addressed.

Figure 4: Service Lead-in & Premises Wiring Overview
(the MDU example is one of many variations for Premises Wiring)



29.1.2 The ~~ANP~~Access Network Provider may provide aerial and underground lead-ins; however any such investment will depend upon the circumstances of each case and must be confirmed with each provider.

29.1.3 Trenching for underground lead-in cables

a) The provision of suitable trenching for all services is the responsibility of the ~~premise~~premises owner or building contractor acting on the Premises ~~Owner's~~owner's behalf. It is strongly recommended that the contractor or his agent ~~is to consult~~ consults with the Access Network/Service Provider and the ~~premise~~premises owner to determine the most appropriate point on or in the building to fit the Network Termination (typically an External Termination Point or "ETP") and the route for the trench.

b) Lead-in cable or pipe ~~can~~may share a common trench with other services, subject to adequate protection against hazards or damage. Requirements for trenching are fully defined in Appendix ~~2~~5 for both urban and rural installation. ~~–~~Note that for MDUs a larger lead-in pipe may be required.

c) Where a gate entry system is to be installed for a new building, especially if it has a long driveway, the recommended approach is to co-ordinate the lead-in and gate entry cable installation with other building services work. This allows the several services concerned to share the lead-in cable trench, which is paid for by the customer. The gate control installation contractor can then run the necessary control and communication wiring before the trench is closed. AS/NZS3000 restrictions on the sharing of trenches, specifically separation distances (depths), must be observed. It may be preferable to have separate trenches.

d) The building owner or building contractor acting on the owner's behalf is responsible for back-filling the lead-in trench, ensuring there is at least 300mm cover over the lead-in pipe.

e) In most suburban cases, the Network access point is located on alternate section boundaries at the road frontage and the lead-in cable is run across the Premises Owner's land to the ETP.

f) In the case of back-sections, without a public road frontage, it may be necessary for the lead-in to pass over or under land owned by parties other than the property owner concerned. In such cases, those parties will be required to formally agree to such crossings before any installation work can begin.

g) ~~This~~Neighbours crossings will usually require a formal easement to be written into land records, so subsequent owners of the land cannot demand the cable is removed or hinder access to it for maintenance, replacement or upgrade purposes.

h) MDUs may require individual lead-ins to each unit (e.g. low rise MDUs) whereas a high-rise MDU is likely to only require a single larger lead-in pipe. Consult with the Access Network Provider to determine how the individual units are going to be connected. (Refer to AS / NZS 3084)

29.2. External Termination Point (ETP)

29.2.1 Typically the ~~ANP~~Access Network Provider will supply the ETP and the

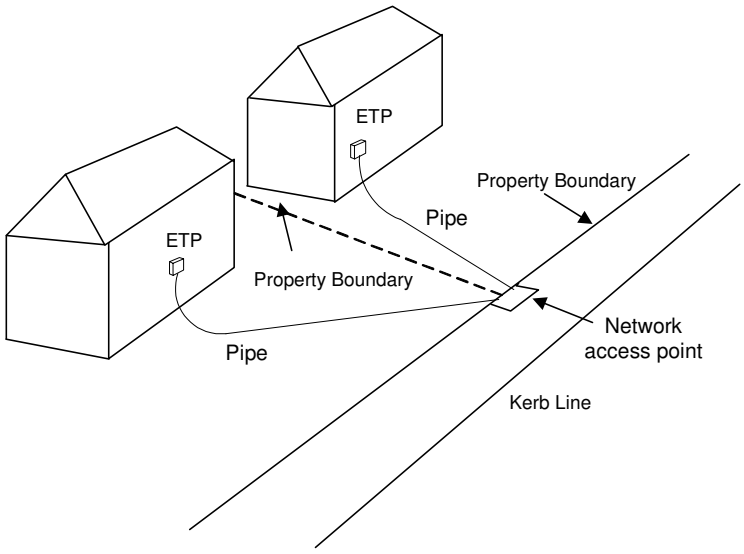
connectivity within.

29.2.2 For new premises, a suitable entry point location for connection of the Premises ~~Owner's~~owner's wiring and access route to the PHD/Home Distributor must be selected. The general location is normally arranged with the developer for new sub-divisions, and is usually obvious from adjacent properties in the area. In cases of doubt, the ~~Network Provider~~ANP will provide guidance on receipt of advance application for service from the Premises Owner.

29.2.3 If not already provided, the Access Network Provider or Service Provider can arrange installation of an individual lead-in cable and ETP, or a distribution point for premises requiring a larger number of connections. For ~~residential~~ buildings where each unit has a street frontage, the ETP location will generally be on the wall facing the street or on a side wall close to the corner with the front wall, with clear access to the Network Access Point on the road frontage. If the ETP is provided by ~~access network provider~~Access Network Provider the size of the ETP will be determined by the ~~access network provider~~Access Network Provider.

29.2.4 If the ETP is provided by building owner and developer then the ETP should be a minimum of 200mm x 300mm and have an interface to the lead-in pipe installed by the developer (refer to Appendix ~~3~~5).

Figure 5: Service Lead-in and ETP termination



29.2.5 The ETP must be mounted between 300mm – 1500mm above the finally intended ground level for underground lead-ins or on a gable or fascia board for aerial lead-ins.

29.2.6 The ETP should not be located below and close to a hose tap, where it could be subjected moisture or mechanical damage.

29.3. Connection of single dwelling unit premises wiring to the ETP

29.3.1 Three 4-pair Cat 5e or higher performance cables should be extended from the Home Distributor to the location of the ETP. 1m tails should be left at this point. These cables will be connected to the lead-in cable by the Access Network Provider/Service Provider.

29.3.2 ~~The cabling installer should liaise with the Network or Service Provider in respect to the timing of cabling and termination work to avoid unnecessary complications for either party.~~Where a fibre cable service is later required, it is anticipated that one of the Cat 5e cables may be used as a draw wire to pull the fibre optic cable into the premises. Where there is only one copper cable present then a replacement copper cable of similar quality must be pulled through with the fibre-optic cable.

~~26.3.3 Special cases - Network Demarcation Point~~

~~a) Fibre termination - The demarcation point for copper networks is typically at the ETP. With fibre networks the demarcation point is the connector at the end of the fibre located within the Home Distributor.~~

29.3.3 The cabling installer should liaise with the Access Network Provider or Service Provider in respect to the timing of cabling and termination work to avoid unnecessary complications for either party.

29.3.4 Special cases - Network Demarcation Point

a) Customer Located Network Equipment & Service Delivery Points - although the access network physically ends at the network demarcation point, there will be situations that require network equipment to be installed within the Premises Owner's premises to support network services. Whether or not such equipment is connected via customer-owned wiring to the ETP, the Premises Owner's side of this equipment is termed a "Service Delivery Point".

b) Where necessary, the Access Network ~~or Service~~ Provider(s) may define the type of network equipment and its location (Service Delivery Point) according to the service's application. In most cases, such equipment is supplied, installed and commissioned by the Provider as an inherent part of providing the service concerned.

c) Depending on the type of equipment concerned and the space available, such customer-located network equipment may be housed within the Home Distributor, with the relevant service delivery point(s) then connecting into the home cabling system via patch cords.

29.4. Multi Dwelling Unit (MDU)

29.4.1 The following paragraphs refer to MDUs that utilize a common lead-in facility. Where MDUs have separate lead-in facilities, they shall be treated as SDUs.

29.4.2 General Scenarios for MDU's: There are 4 general network cabling scenarios;

a) Access Network Provider(s) cables and demarcation in a common area in the MDU with customer owned building distribution cable feeding each dwelling unit.

b) Access Network Provider(s)' cabling and demarcation on each floor of the MDU with customer owned building distribution cable feeding each unit.

c) Combination of the two above.

d) Access Network Provider(s)' cabling on each floor of the MDU and feeding a Home Distributor in each unit that contains the Access Network Provider's ONT and demarcation point.

29.4.3 MDU Principals

a) Access Network Provider demarcation must be installed, the purpose of this demarcation is to separate the premises distribution cabling from that of the Access Network Provider's network.

b) Demarcation point, located within the primary Home Distributor, will be either a copper Network Termination or distribution frame, or it may be a fibre optic patch panel (refer clause 27.5).

c) There will be ability to patch circuits from the Access Network Provider demarcation to the premises distribution.

d) The premises distribution cabling will have termination points on each floor (SDH), and these termination points will provide connection to premises cable feeding each unit. The secondary Home Distributor will either be the Home Distributor for all units on that floor or provide a cable to each unit's separate Home Distributor. For those Units with their own Home Distributors, this cable from the secondary Home Distributor is in effect the service lead as described in this document, (refer clause 29.1). Each unit will have this service lead connected in the unit's Home Distributor to the appropriate patch panel or active device.

29.4.4 MDU Cable Ownership

a) The Access Network Provider will own and maintain the network cable and the demarcation point.

b) The building owner/customer will own the premises distribution cable from the primary Home Distributor to the secondary Home Distributor and to the Unit's Home Distributor if required.

29.4.5 Common Areas

a) Common areas for housing the demarcation points and distribution cabling will sited such that there is access to suitable ducting to the street to provide for installation of the Access Network Provider cabling and will have easy access to the building service riser or cable way.

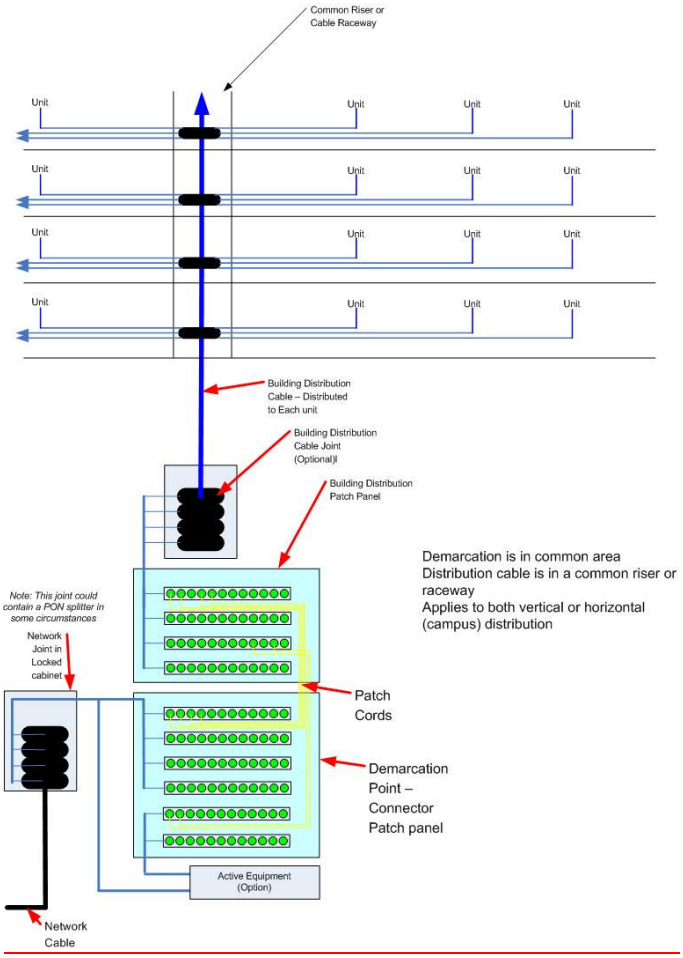
b) Common area must have suitable space for the installation of the demarcation point and termination of the distribution cabling.

c) AS/NZS 3084:2003 provides guidance and sizing for common areas.

29.4.6 Suitable access ducting

a) Access ducting from the street into the MDU common area should be decided in consultation with the Access Network Provider(s). Consideration may need to be given to multiple lead-ins from different network access points for the purpose of redundancy. This ducting will generally be 50mm or 100mm duct.

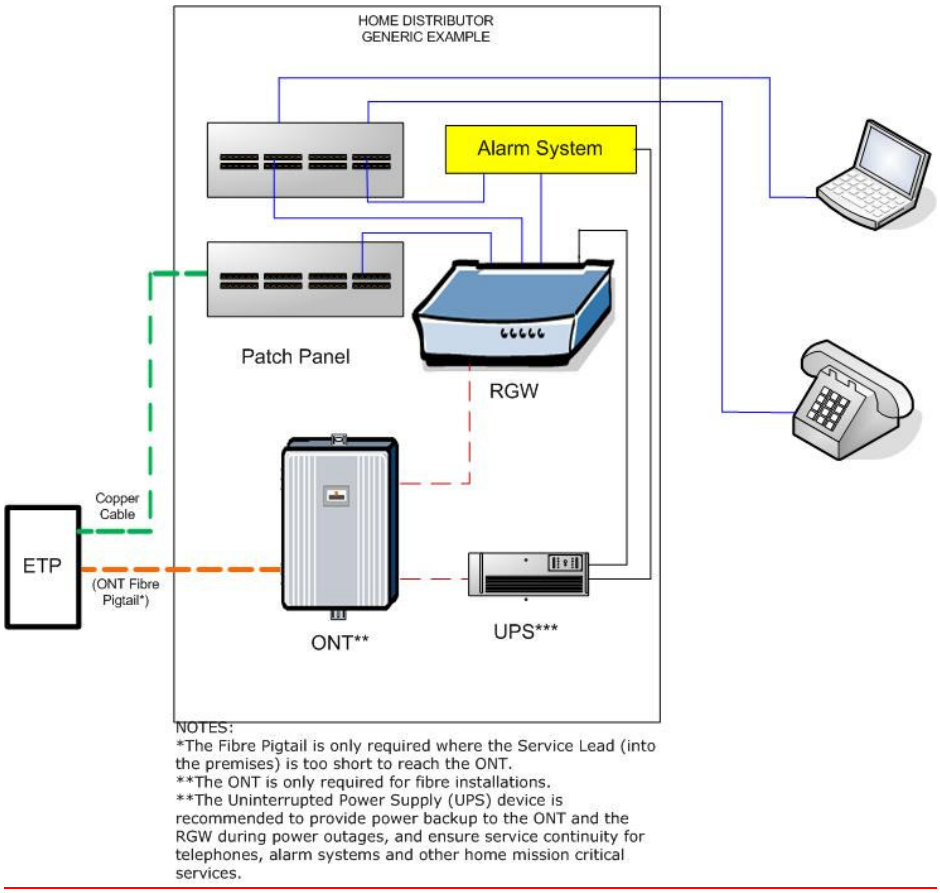
Figure 6: MDU for Multi-dwelling Units



29.5. Home Distributor

29.5.1 Planning for the Home Distributor

Figure ~~67~~: the Home Distributor



29.5.2 The home distributor is essentially a cabinet, mounted in or on a wall, or a cupboard in which the cable termination hardware and other components are housed. Equipment within such a cupboard may be wall or rack mounted.

29.5.3 Home distributors installed in the wall cavity should be at least 700mm (high) x 350mm (wide) x 80mm (deep). While standalone or surface wall mounted Rack (19") rack mounted distributors should be least 700mm high and 300mm deep.

- It is recommended that a larger cabinet be installed when ever it is practical to do so.

29.5.4 It is recommended that a home distributor be installed in all new homes and any existing premises undergoing major refurbishment.

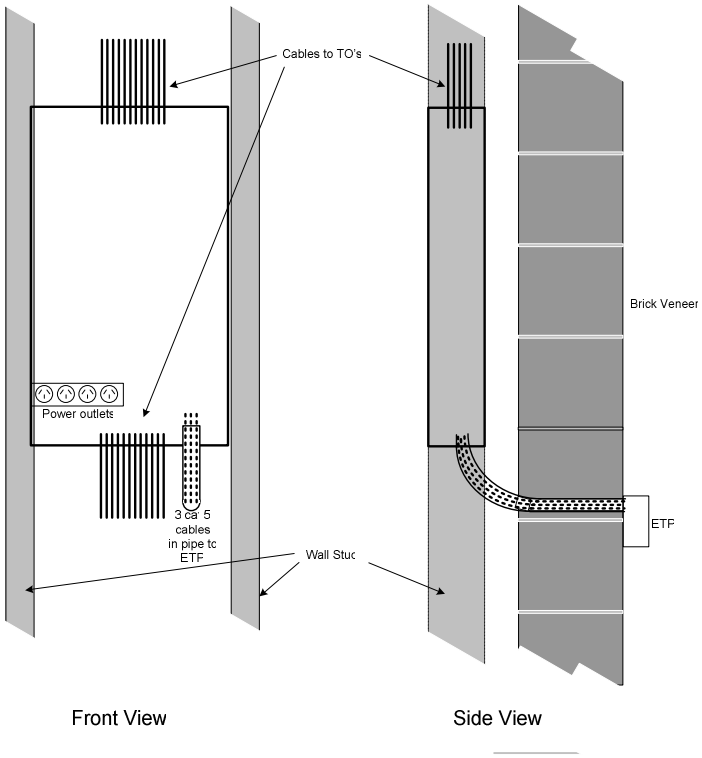
29.5.5 It is envisaged that existing homes and SOHO premises will transition, through a series of stages, to a full home distributor over an extended period of time. Refer to Appendix 1.

29.5.6 The first stage may be as simple as installing a multi-point faceplate from

which traditional PSTN and new UTP Cat5e cables radiate out from and to which modems, network hubs and gateways connect to deliver service.

29.5.7 The home distributor cabinet in all new premises installations should ideally be mounted on an inside wall immediately behind and above the ETP ~~on the inside of the wall.~~position. The location of the ETP should be discussed with the chosen Access Network Provider ~~or providers change.~~.

Figure ~~7~~8: Location of Home Distributor



29.5.8 In existing homes, where access to the wall behind the ETP is not practical, the ~~home distributor~~ Home Distributor should be mounted as close as possible to the ETP (on an inside wall), or arrangements made to shift the location of the ETP.

~~26.4.9 In larger premises secondary Home distributors may be installed to facilitate cable reticulation and service management. In multi-dwelling complexes each apartment must have its own separate Primary Home Distributor (PHD).~~

29.5.9 The Access Network Provider may have a maximum distance that the home ~~distributor~~distributor can be from the ETP before it is classified as a non-standard install and therefore may incur additional installation charges. Consult with the Access Network Provider on the maximum internal distance between the ETP and the Home distributor.

29.5.10 In larger premises secondary Home Distributors may be installed to facilitate cable reticulation and service management. In Multi-dwelling complexes each unit must have its own Unit Primary Home Distributor (UHD). "UHD" means unit Home Distributor, which, in a multi-dwelling

unit, connects to external network services and provides connections to outlets in an individual dwelling unit

29.5.11 The Home Distributor should not be located in an area subject to condensation such as a bathroom, kitchen or laundry.

~~26.4.11 At least one 230V outlet should be provided within the home distributor cabinet.~~

~~a) Power outlets in the PHD or Secondary Home Distributor (SHD) must as a requirement of AS/NZ3000, be able to be isolated for service safety.~~

~~b) It is recommended that there should be space for either a multi-outlet power board or at least four 230V outlets.~~

~~c) A fully equipped home distributor may contain an xDSL modem, a Router or Ethernet switch, an Analogue Terminal Adapter, a Video distribution amplifier, and an optical network termination unit all requiring a separate power supply.~~

~~d) Consideration should be given to accommodating Power over Ethernet or PoE technologies in the Home Distributor. PoE is a convenient means of distributing DC power (48v,15w) to low-powered remote devices such as wireless access points, IPods, VoIP Phones, IP cameras etc.~~

~~The DC power shares the same cable and TO as the Ethernet signal to and from the remote device.~~

~~Power over Ethernet is an increasing common feature of consumer devices as it breaks the dependency to locate the device close to a 230 VAC power outlets~~

~~e) It is recommended that an Uninterrupted Power Supply (UPS) device with surge protection is installed to provide power backup during power outages, and ensure service continuity for telephones, alarm systems and other home mission critical services.~~

29.5.12 The Home Distributor must have adequate ventilation or forced cooling to allow for the continuous operation of any installed electrical equipment.

29.5.13 An adequate level of lighting should be provided to maintain the Home Distributor and there should be at least 1m clear space in front of the ~~home distributor~~Home Distributor to facilitate maintenance and user access.

29.5.14 All ~~home distributors~~Home Distributors must allow for the isolation of ~~premise~~premises wiring from external networks. This enables simple tests to determine whether a fault or possible performance issue is in the external network or the premises.

29.5.15 Provision should be made for a connection point so that either an xDSL splitter may be installed where DSL Broadband and traditional telephone (PSTN) services are delivered over the same copper pair, or a Gateway device installed where broadband and voice services are delivered via the xDSL (Naked DSL) circuit.

29.5.16 The~~re is a requirement for the~~ Home Distributor ~~to~~shall include provision for connecting a "Line Grabbing" alarm system between the NID and the

PSTN commoning strip. A typical implementation is shown in Figure ~~7~~14.

29.6. Home Distributor general requirements

29.6.1 An installation should bear a label issued by a qualified installer that the entire wiring system complies with this Code of Practice and AS/NZ 15018. Refer Section ~~J.~~L. Installation Testing.

29.6.2 The quality of the components installed will impact future performance and life expectancy of the system. It is strongly recommended that only components that have been independently certified by a recognised body, such as the Underwriter's Laboratories (UL), be used.

29.6.3 Some cabling components, such as telephone hubs, have been granted a Telepermit. This indicates they have met requirements for the relevant class of device and may be connected to Access Network Provider's network such as Telecom New Zealand's network. ~~All~~For example, all equipment directly connected to the Telecom Access Network must have a Telepermit. Downstream equipment does not require it. Access ~~Network~~Network Providers as well as Service ~~providers~~Providers should be consulted before connecting any devices to their network.

29.7. Cabling termination hardware within the Home Distributor

29.7.1 RJ45 patch panel hardware should be used. It is strongly recommended that only patch panel hardware and patch cables supplied by recognised telecommunications cabling industry manufacturers and independently certified by a recognised body such as the Underwriter's Laboratories (UL) be used. Similarly, the recommendations of suppliers for the installation, testing, use and management of this hardware should be followed.

29.7.2 Only certified "multi use" Insulation Displacement Connectors (IDC) RJ45 sockets should be used.

29.7.3 Fibre optic sockets should contain SC/APC type connectors that are housed in a purpose built enclosure that incorporates a shutter that provides a high level of laser safety.

29.8. Cross-connections

29.8.1 For consumers with little technical knowledge patch cords are a practical approach to forming cross connections, as no special tooling is required and cross-connections are easily carried out so long as connection points are clearly marked.

29.8.2 For long-term reliability it is strongly recommended that RJ45 patch cables be factory-terminated and of such a length that there is plenty of flexibility for movement, but it is not necessary to coil up surplus within the Home Distributor.

29.8.3 While it may initially be cheaper to terminate appropriate short lengths of cable "on-site", such connections can prove unreliable in the longer term. In particular, the use of solid conductor cable as patch cords often proves unreliable where the patch cords are subject to movement during the service life of the installation.

29.8.4 Flexible factory assembled patch cords should preferably be used to ensure that subsequent movement during re-connection work will not result in failed connections.

29.8.5 Where cables or cords are “on-site” terminated, it is important that the correct type of plug and crimping tool is used. Plugs intended for use with flexible cords are not suitable for use on solid core cable, nor are those intended for solid core cable suitable for flexible cords.

29.8.6 Where a service lead is not terminated directly onto the Optical Network Terminal (ONT) but to the fibre socket the connection will be with a SC/APC to SC/APC patch cord.

29.9. Hardware for other services within the Home Distributor

29.9.1 The Home Distributor may also house a router for home Local Area Network (LAN) operation, along with its power supply; television distribution hardware (coaxial cables, amplifier, splitter and power supply); infra-red remote controls for the AV system; a security system or medical alarm connections.

29.9.2 There is no constraint on what hardware is fitted within the Distributor. To facilitate ease of operation the cabling should be installed in a tidy and uncluttered manner, with adequate clearance between components to ensure electrical interference is minimised.

29.9.3 xDSL splitters are expected to be available for generic cabling applications. Where these are fitted within the Home Distributor, there is flexibility to associate the xDSL modem within the same cabinet or connect it at any remote TO.

29.10. MDU Additional Requirements

29.10.1 In a MDU, the primary function of the primary Home Distributor is to provide a demarcation point and reticulate to the secondary Home Distributors.

29.10.2 Provision of space shall be made to accommodate the common services telecommunications requirements. Such requirements may include space for equipment to support the following:

- Building alarm connections;
- Lift telephones;
- Building HVAC monitoring;
- CCTV security monitoring; and
- Building access control.

29.10.3 The Access Network Provider may have additional requirements for a primary Home Distributor such as the installation of optical splitter equipment so enable each Unit to be served by its own direct fibre service. Alternatively the Access Network Provider may install a larger rack mounted ONT that serves all the Units within the building. It is recommended to consult the Access Network Provider on the requirements of the primary Home Distributor.

29.10.4 If fibre is reticulated from the primary Home Distributor to the secondary Home Distributors, the Access Network Provider may install a single shared ONT on each floor to serve a number of Units or if fibre is available to each Unit, install a dedicated ONT within each Unit.

29.11. Power Supplies

29.11.1 At least one 230V outlet should be provided within the home distributor cabinet. It is recommended that there should be space for either a multi-

outlet power board or at least four 230V outlets.

29.11.2 Power outlets in the primary Home Distributor (PHD) or Secondary Home Distributor (SHD) must as a requirement of AS/NZ3000, be able to be isolated for service safety.

29.11.3 It is recommended that a dedicated power circuit be provided to the UPS/Home distributor (and to each PHD and SHD in MDUs) to eliminate faults on other power outlets (e.g. overloading due too many electric heaters) from affecting the telecommunications service.

29.11.4 A fully equipped home distributor may contain an xDSL modem, a Router or Ethernet switch, an Analogue Terminal Adapter, a Video distribution amplifier, and an optical network termination unit all requiring a separate power supply.

29.11.5 Consideration should be given to accommodating Power over Ethernet or PoE technologies in the Home Distributor. PoE is a convenient means of distributing DC power (48v,15w) to low-powered remote devices such as wireless access points, IPods, VoIP Phones, IP cameras etc.

- The DC power shares the same cable and TO as the Ethernet signal to and from the remote device.
- Power over Ethernet is an increasing common feature of consumer devices as it breaks the dependency to locate the device close to a 230 VAC power outlets.

29.11.6 It is recommended that an Uninterrupted Power Supply (UPS) device with surge protection is installed to provide power backup during power outages, and ensure service continuity for telephones, alarm systems and other home mission critical services.

29.12. Ducting

29.12.1 When deciding to use ducts, careful consideration should be given to the number of cables to be installed in the duct and the impact that future installations may have on the capacity of those ducts. A duct in a straight run is considered to be at capacity when 50% occupied. If there are two bends up to 90° radius in the duct pull length, then it is considered to be at capacity when 40% occupied.

29.12.2 Consideration should be given to installing excess ducts or a larger bend radius to allow for future cabling. For example, the bending radius required for optical fibre cable is greater than that required for twisted pair cable.

29.12.3 Conduits, ducts and trunking may be made of plastic, aluminium or galvanized steel. (Ferrous metal construction will give superior protection from EMI, provided that continuity is maintained).

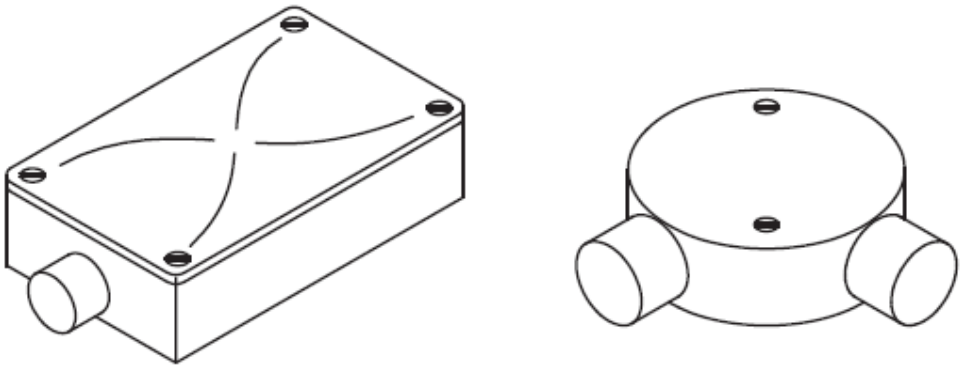
29.12.4 Mechanical continuity must be maintained through joints in metallic conduits, ducts and trunking. This enables electrical continuity to be maintained as the conduit, duct or trunking system must be earthed in accordance with AS/NZ3000.

29.12.5 Conduits and trunking should have all sharp edges removed from their

internal surfaces. (This minimizes the risk of damage to the cable sheath).

29.12.6 Conduit runs in indoor situations should contain draw boxes (see Figure ~~8~~9) at distances of ≤30metres. If distances between draw boxes exceed 30 metres, a larger sized duct should be used for the runs. The draw boxes must be large enough to permit the minimum bending radius of the largest installed cable to be maintained. (These requirements are to allow for ease of installation. They also allow for drawing through additional cable at a later date and minimize the stress on the cables during the installation. Maintaining the minimum bend radius specified by the cable manufacturer is a mandatory requirement).

Figure ~~8~~9: an Example of Draw Boxes



29.13. Internal Premises Cabling

29.13.1 All cables, TO's and hardware used in wiring a residential premises should be compliant with the relevant industry standards and carry a recognised international independent assessment body of quality and safety e.g. Underwriters Laboratories (UL) or an equivalent New Zealand body.

29.13.2 Unshielded Twisted Pair (UTP)

a) Cable should be 4-pair of Cat5e or higher performance for both residential and commercial wiring, since this is now the recognised minimum "industry standard". All such cable should have nominal 0.5mm diameter conductors and its sheath should bear an industry-recognised certification mark and performance rating in accordance with international standards.

b) All cable runs should be continuous without joins. In order to maintain performance the entire cable run must be replaced if it is damaged.

29.14. MDU Fibre Optic Distribution Cable

29.14.1 Fibre-optic distribution cabling within a MDU should be distribution type with and either sufficiently robust construction or sufficiently well protected to withstand physical damage. The fibre should conform to the Standard ITUT G.657A (Bend insensitive). This outer sheath should be of a Low Smoke Zero Halogen (LSZH) type.

29.14.2 These cables are excellent for indoor use. They do not provide the best moisture and environmental protection and therefore are not recommended for outdoor applications.

29.15. Cable used for wiring outdoors should be purpose made "external" cable.

29.15.1 Typical outdoor Cat5e cables are either drycore water blocked (using water blocking yarns) or Gel filled cables and have solid (not stranded) conductors. "Buried" and "self supporting aerial" types are available.

29.15.2 Whilst the use of UTP is typical standard practice, shielded twisted pair (STP) types may be used in conjunction with shielded sockets and other shielded components where shielding is the basis of a commercial design and all components are installed by suitably trained and skilled staff.

30. Coaxial and Screened Cable

30.1. The objective of this section is to ensure that delivery of radio frequencies over coaxial cable to most rooms of the home will be done in a cost effective but technology neutral manner wherever possible. The coaxial cable wiring and connectors should be suitable for the delivery of all TV and data service providers using RF as the carrier. The current situation with different cabling methods and types force Service Providers to re-run appropriate coax to suit their products. A standard high quality coaxial system will avoid this.

30.2. General

30.2.1 Coaxial cabling for television and other radio frequency applications is usually wired separately and independently of the telecom and data wiring within the premises. However, when any consideration is given to the cabling of new homes, the needs for reticulating free to air cable TV and satellite television should not be overlooked. With a modern home, the UTP and coaxial cabling can form an overall "integrated network" linking the various items of equipment, such that more or less any service is available at any location - as long as suitable remote control facilities have also been provided.

30.2.2 With new construction the coaxial cables connect from the home distributor, to every room where in-house TV wiring is required whether it be cable TV, or a Satellite TV, or a closed circuit TV system. Consideration could be given to running two cables to each outlet position. This configuration forms a star topology. A multiport splitter is located at the centre of the star. At times an amplifier will be inserted between the video source and the multiport splitter to raise the signal level if several rooms are cabled. This will compensate for the signal losses caused by branch splitting.

30.2.3 Information on television cabling is covered in the Appendices, ~~as~~ and is explained below. It is recommended that specialist contractors be approached for more detailed information on the design of television distribution and remote control facilities.

30.2.4 It is recommended that dual RJ45 TO's be provided at each proposed television set location for either connecting the SKY decoder or, in future, the equipment needed for television delivery over Ethernet. The most convenient approach in a new home is to make use of a four-way faceplate to house 2 x "F-connector" and two RJ45's. Refer to ~~Figure 3~~

Figure 3 above.

This is easily accomplished with the various makes and styles of modular faceplates used for electrical installations. These replaceable modules also avoid the need to replace a complete assembly should one or other parts fail in service.

30.2.5 High performance 4-pair screened cable using screened TO's and other components rated at Cat6 or Cat7, may be used for television, video and audio distribution, as well as for data and telephony. Where these components are used, the relevant manufacturer's recommendations are to be followed.

30.3. SKY Digital, Freeview and Baycity service[4]

30.3.1 Further information on specific requirements set by SKY Network Television Ltd, Freeview and Baycity for cabling between a satellite dish and their decoder(s) is given in Appendix 2, 3 and 4 of this Code of Practice. These requirements extend to the connectors used for the antenna feed.

Note: The signal bandwidth used by SKY for its satellite service extends to 2.2 GHz. As such, cable, splitters, amplifiers and connectors needs to be rated for the applications they will be used for. All splitters/containers used must be 2150MHz or greater.

30.3.2 Consideration should be given to the likely placement of a decoder and whether or not it might be re-located in the future. Where there are potentially multiple locations, the use of dual RJ45 TO's, SKY-approved cables and two or more SKY-approved "F-connectors" at all of these locations should be considered.

~~27.4. VHF/UHF Television services~~

~~27.4.1 The New Zealand UHF band extends to 806 MHz and most good quality coaxial cable and general purpose "F-type" coaxial connectors are suitable for these frequencies.~~

~~27.4.2 General information on television distribution via coaxial cable is given in Appendix 1.~~

30.4. TelstraClear CATV services

30.4.1 TelstraClear delivers CATV services on fibre to the node then coax to the home in Wellington and Christchurch. The frequency bands are from 5 MHz to 55 MHz on the uplink and 75MHz to 750MHz on the downlink. 750MHz Coaxial cable is often installed in the home for new connections to ~~it's~~its network if the existing coax cabling is high loss or has poor shielding. In fact TCL will only use RG6 triple shielded cable to ensure that electrical interference from household equipment does not slow down the HFC network for broadband internet services. TelstraClear are transitioning to 5MHz to 85MHz for the uplink and 110MHz to 750MHz on the downlink in the near future.

30.5. AV and audio distribution

30.5.1 These services can be distributed around the home via coaxial, STP and UTP cable. Where the UTP cable is used, suitable connectors are required

[4] The requirements for SKY Network Television Ltd, Freeview and Baycity were up-to-date at the time of publication.

to adapt between the equipment concerned and the RJ45 TO. Since these items are not part of the fixed cabling, they are not covered by this Code of Practice.

30.6. Remote control facilities

30.6.1 The infrared remote control units used with most television and audio/video products are usually restricted to operation in the same room as the associated equipment. However, there are various means of providing for control from any location in the home. Both wireless relay devices and equipment for passing the control signals over coaxial or UTP cable are available. Since these items are not part of the fixed cabling, they are not covered by this Code of Practice.

30.7. Security cameras

30.7.1 These too can be cabled over both coaxial and UTP cable with the appropriate connectors. With suitable modulators the signals from the security cameras can be mixed with the other television services such that they are allocated to otherwise unused UHF channels and can be monitored via any television set on the home network and set to those channels.

30.8. Coaxial cable recommendation

30.8.1 In summary, the requirement on coaxial cable performance varies from the lower bandwidth requirements of security cameras to 750Mhz on TelstraClear to 800Mhz on UHF to 2.5Ghz Sky digital services. To satisfy all service provider requirements within the home, a high performance cable with connectors is needed. The highest frequency used is Sky Digital which is 2.~~5Ghz.~~2Ghz. Coaxial cable must dual shield, trishield and quadshield for RG6. Since interference from other sources affects upstream Internet speeds and TV quality a triple shield RG6 coaxial cable is recommended for all wiring. This will meet all service provider requirements.

Note: For further information on planning coaxial cabling systems refer to AS/NZS 1367.

31. Telecommunications Outlets (TO)

31.1. Recommended provision of TO's

31.1.1 The total number of TO's that may be installed in any premises is not restricted. ~~—~~The installation of TO's on a lavish basis is encouraged as a way of meeting unplanned future requirements, and at a minimum, consideration should be given to having at least two TO's a room to provide for more than one option for the placement of communication/television equipment~~. —~~.

31.1.2 The number of outlets recommended has been based on the following requirements at a typical TO location (e.g. Bedroom):

a) The telephone service will be provided using a VoIP phone. These phones are typically powered over the Ethernet cable and therefore use all 4 pairs in the cable;

b) A computer may be plugged in requiring one pair of the second Ethernet cable while the second pair could be used (if a RJ45

data/voice splitter is used) for a printer, IP TV or similar; and

c) One "F" connector would be used for TV services such as may be provided by Sky or a similar centrally located decoder for IP TV.

31.1.3 It is recommended that two RJ45 sockets be installed at each TO location, with the following regarded as the minimum number to be installed in any new home:-

a) at least one set of two in every room normally used by the occupants on a daily basis (kitchen, lounge, rumpus room, study, etc, other than "wet rooms" such as bathrooms, shower rooms, or laundry);

b) at least one set of two in every room that is intended as a bedroom;

c) one set of two located within 1 metre of each television antenna outlet location;

- Combining the two RJ45 TO's with a coaxial "F" connectors on the same faceplate is recommended for maximum flexibility.

- With Power over Ethernet installed, these TO's can also be used to provide power to the associated equipment, whether it be telecommunications network-related or quite separate items such as security cameras and building control devices. This avoids the need for every TO to be located close to a 230 V power outlet.

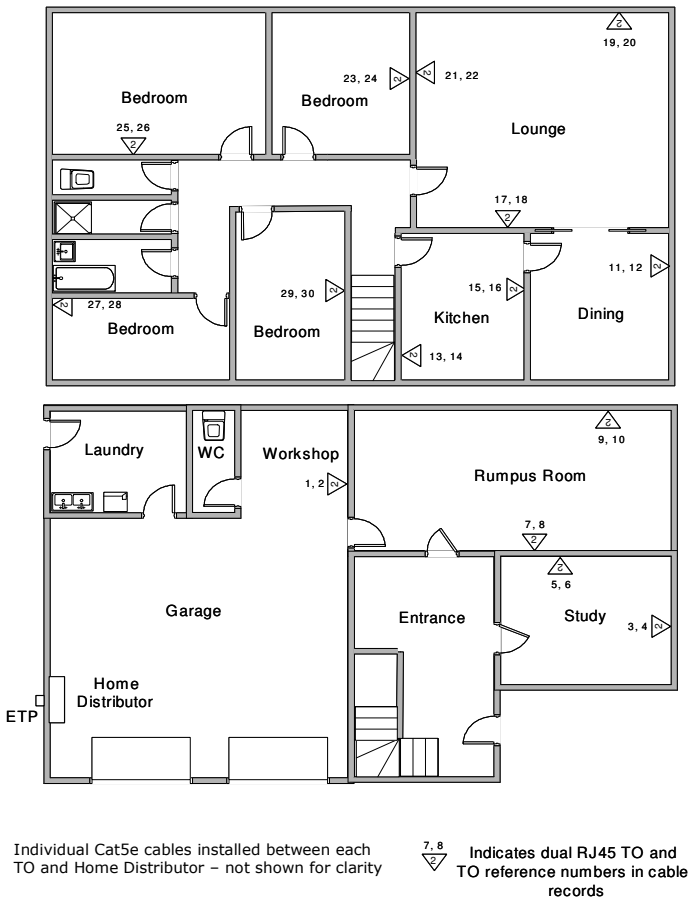
d) It must be stressed the above is regarded as the minimum provision of TO's. It is recommended that due regard be given to the likely needs of the consumer, especially in larger rooms, to avoid long equipment cords, and for those rooms where additional access points are likely to be needed at more than one location. For example, there may be two or more "likely locations" for the television set and/or personal computer in the main family rooms. Location of an access point within 1 metre of a television outlet permits the installation of a SKY Digital Decoder at any likely television set location.

e) These TO's may also include provision on the same faceplate for one or more co-axial connectors, antenna or audio connectors, or other Extra Low Voltage services.

31.2. Communication of requirements.

31.2.1 The following diagram illustrates how TO's should be marked up on a plan for communication to builders, system designers and cabling installers.

Figure ~~9~~10: TO's Illustrated on a Plan



31.3. Hardware Type

31.3.1 The socket assemblies used in TO's should meet Cat5e or higher performance requirements and be marked with the relevant Category rating.

31.3.2 Any brand or model of RJ45 socket, whether assembled into individual modules with associated IDC connectors, or made up complete with faceplates, may be used as long as such sockets comply with a recognised industry standard and are marked accordingly.

31.3.3 Standard "Keystone" format socket assemblies are recommended where the installation is not wholly based on some proprietary socket system using other than keystone sockets.

31.3.4 The associated IDC connectors must be certified "multiple use" type.

31.3.5 Unshielded TO's are regarded as standard practice, but shielded types may be used in conjunction with shielded cable and other shielded components where this is the basis of a commercial design and installed by suitable skilled staff.

31.3.6 Where it is likely that subsequent jackpoint installation work will be carried out by Premises Owners not having the appropriate special insertion tools, TO's with "tool-less" IDC terminations are recommended.

31.3.7 Requirement to connect to Local Access Provider's Network an installation should bear a label issued by a qualified installer that the installation complies with this Code of Practice and with AS/NZS 15018. Refer testing and labelling.

Only a certified cabling system should be connected to ~~a network~~an Access Network Provider's access network (Section 106 of the Telecommunications Act 2001).

31.4. Labelling and identification

31.4.1 All TO's should be individually labelled, with the same identification at the cable termination in the Home Distributor, so that both cable and TO termination can be clearly associated when connecting new services.

31.4.2 Many faceplates and TO modules do not provide an actual label holder and it detracts from the overall appearance to mark the faceplates. It is recommended that either hardware with removable cover plates be used (e.g. HPM and PDL 600 series faceplates), so that markings can be made on the underlying switch plate; or that a simple convention be used to identify individual TO's on a dual or multi-way switch plate in association with a building layout plan. For example, numbering all TO's from left to right or top to bottom in a consistent manner.

K. INSTALLATION GUIDELINES

32. The objective of this section of the Code is to provide best practice recommendations and a set of minimal requirements for premises wiring installations.

33. ~~Premise~~Premises wiring installers should meet the minimum requirements prescribed in this Code. For the benefit of the consumers, the Installers are urged to follow the recommendations provided in the Code, rather than just meeting the minimum requirements.

34. All recommendations and requirements provided in this Code are generic, and neutral to any specific vendor or hardware. Where specific vendor or product requirements exceed the requirements stated in this Code, the former should be met.

35. Safety Requirements

35.1. General

35.1.1 All cabling work should be undertaken safely by installer and others. Safe electrical industry working practices should be followed.

35.1.2 The purpose of the Code is not to be an all-encompassing safety manual; therefore a full compliance with all relevant safety standards is required from the installers and other stakeholders.

35.1.3 Any potential hazards should be identified and mitigated prior to starting each aspect of the work.

35.1.4 Special care should be employed where changes to existing installations involve work in dark ceilings, wall cavities and other areas containing power cables, gas and water pipes.

35.2. Hazardous Voltages

35.2.1 Under normal conditions no hazardous voltages are applied by an Access Network Provider to telecommunication lines. Nevertheless, it is possible for lines to become hazardous at any time from earth potential rise, power distribution system faults, lightning activity, or contact with power wiring within the Premises Owner's own premises or equipment. The Installer should check for hazardous voltages before carrying out any work on premises wiring.

35.2.2 All the internal wiring should be completed before finally connecting to the incoming line.

35.2.3 IDCs should be used wherever possible throughout the cabling installation. This is to prevent the consumer and installer from the direct contact with bare conductors and minimising a risk of shock from non-hazardous network voltages, such as ringing. The reflexive action to a LV electrical shock can lead to adverse outcomes, such as person losing balance and falling etc.

35.2.4 To comply with AS/NZS 3000, any metal cabinets used for the Home Distributor must be earthed and LV cabling should be enclosed in a separate compartment to that which houses the ELV or TNV cabling.

35.3. Under NO circumstances shall Low Voltage (LV e.g., 230 V) sockets, switches or modules be mounted on the same faceplate as TNV or ELV components (voltage levels at which telecommunications and data services operate). The joint Australia/New Zealand Wiring Rules (AS/NZS 3000) require that all faceplates

comply with AS/NZS 3112, clause 3.2 of which prohibits mixing of these voltage levels on the same faceplate.

35.4. For home use, where small children are present, there is the possibility of a child inserting a finger or a conductive object into an open socket. Although TNV3 (with typical voltages in 42.4V - 90V) is not regarded as "hazardous", the child could receive a shock when ringing voltage is applied to the outlet.

35.5. If no CPE is connected to the outlet located within children's reach, it is recommended:

- that the TO patch cord is removed at the distributor; or
- A shuttered socket is used in the TO; or
- A "dummy" plug is inserted into the wall socket to close off the aperture.

36. Wiring Practices

36.1. Generic home cabling uses the same components as commercial building cabling, which is designed to provide the required performance with cable runs of up to 90 metres.

36.2. Accepted industry practices should be complied with in order to maintain the cable performance. This includes the following:

36.2.1 Cable should not be deformed prior to, during, or following installation to maintain high frequency transmission performance characteristics.

36.2.2 During installation cable should not be jerked or pulled such that the tension exceeds 110 N (approx 11 kg).

36.2.3 There should be no kinks or twists in the installed cable.

36.2.4 Bend radius of the installed copper cable should not be less than 4 times the cable diameter. Typically no sharper than 25mm. If installing fibre optic cable, refer to the manufacturers requirements for the bend radius specifications and if not specified then the minimum bend radius is 10 x the radius of the cable as specified in the ITUT-G.652D, or in the case of ITU-T G.657A fibre 10mm.

36.2.5 Pairing should be maintained as close as possible to the wire terminations (IDC connections); cable sheath removal is to be limited to less than 12mm for Cat5e.

36.2.6 Cable sheaths should not be crimped or distorted by clipping, stapling or cable tying.

36.3. General Wiring Considerations

36.3.1 The following wiring practices and requirements apply specifically to UTP, STP and coaxial residential and SOHO cabling. Also applies to all optical fibre (glass or plastic)

36.3.2 Cleanliness

a) All cabling hardware should be kept clean during installation, avoiding contact with dirty hands, dust from building operations or other contamination likely to cause premature corrosion.

b) Following their termination, RJ 45 sockets should be protected from dust entry, paint, plaster, etc, until building operations are completed. This can be achieved by protecting an outlet with a plastic cover or wrapping each individual RJ-45 socket in a small plastic bag.

36.3.3 Particular attention should be given to the prevention and control of moisture entering cables through or along their sheaths, which is the dominant cause of wiring faults in typical New Zealand dwellings.

36.3.4 Moisture protection

a) In order to prevent water transported on or within the sheath from reaching the associated terminations and hardware, cables should enter terminating hardware enclosures either:

i) from below the enclosure; or

ii) Only with a drip loop provided if it is not practicable to enter from below the enclosure.

b) For surface mounting boxes, this requires cable entry at a bottom corner of the rear. For flush mounting boxes, cable entry needs to be from the bottom.

Note: While it is obviously not intended, during the life of a building leaks in roofs or wall cladding, around windows, etc, as well as pipe leaks within the building, can lead to water coming into contact with cabling. In some cases, the cable sheath may absorb moisture or provide a path along which it can travel into the TO and result in service failure due to corrosion. This has proved to be a significant cause of service outages in New Zealand's generally damp climate.

This problem is likely to be more serious with generic cabling because of the closer pin spacing in RJ45 sockets and the unprotected design of some TO's that are available, especially where high frequencies are used for enhanced applications and service degradation rather than complete failure could occur.

36.3.5 Two separate cables, clearly labelled at both ends, should be run from the Home Distributor to each TO.

36.3.6 Joints (or "splices") and tee connections should NOT be made within these cable runs. However, it is permitted to terminate a cable at either end with an RJ45 plug designed for connecting solid conductors.

36.3.7 Once installed, the location of TO's is relatively inflexible. Moving an existing jackpoint or providing an additional one, would almost invariably require a new cable run back to the distribution point, because joints are not permitted.

36.3.8 All conductors of cables from TO's should be terminated on either purpose-designed terminations or RJ45 plugs within the Home Distributor.

36.3.9 At least 300mm of cable should be left slack in the wall cavity at both ends of a run following its termination. This should be passed back into the wall cavity to form a "drip loop" such that should any water contact the cable it will not run into the TO.

36.3.10 All 8 conductors of each cable should be terminated, ensuring that pairing is maintained and wire mapping is in accordance with Section ~~K~~L Installation Testing.

36.3.11 For new installations, even where only one line is initially required, three 4-pair UTP cables should be run from Home Distributor to the Building Point of Entry (BEF) with at least 1m of slack at the BEF end.

36.3.12 An accessible cable path should be provided between BEF and the Distributor to allow for future addition of the cables by the access network provider. Such cable path will cater for future installation of Fibre-To-The-Home or an additional UTP or coaxial cables.

36.3.13 Should any part of the cable path between BEF and the Distributor be not directly accessible for cable addition, a duct or a plastic conduit should be provided as part of the initial installation. The minimum recommended duct diameter is 25mm. The duct should have a draw wire installed which should be secured and labelled at either end.

36.3.14 This Code is primarily concerned with the cabling of new homes. As such, the cabling is expected to be carried out at the pre-lining stage of the building. While this makes for easy access to the framing for drilling access holes and running the cable, it does bring the risk of the cables being damaged by other building operations or being obscured if no aperture is cut in the lining. This leads to the following recommendations:

a) To the maximum practicable extent, electrical and telecommunications cabling should be left until the main framing has been completed and weather-protected, and all water and/or gas piping is installed

b) All data cables installed inside the walls should be routed to the TO via direct vertical line. Thus allowing the later addition of extra cabling to the same TO. Any holes drilled though timber framing during the initial installation should have a minimum diameter of 25mm.

c) As a general principle, TO's should be mounted at the same levels as 230 V power outlets so that any cabling obscured by subsequent wall lining operations can easily be retrieved. Marking the flush box locations on the floor (with the height of the flush box centreline above floor level also marked if it is not at the usual level) eases retrieval and ensures that the cabling is not overlooked if it is accidentally obscured by lining material;

d) UTP and coaxial cable should NOT be coiled up in the flush box, but be run past the flush box without unnecessary bending, to be pulled back when it is time to make the terminations.

e) All cables should be clearly and uniquely labelled at both TO and Home Distributor ends.

36.4. Segregation of Services

36.4.1 To avoid the risk of electrical hazard and noise caused by induction, Telecommunications cables must be installed with a permanent separation of at least 50mm from mains power cables in all locations, except where the cables are separated by a rigid barrier, ~~a~~an AS/NZ3000 requirement.

a) Either side of the stud is the preferred method of achieving this separation.

b) To minimise the risk of electrical interference from mains and switching transients or interference generated by appliances, the recommended spacing is at least 300mm wherever it is practicable to do so.

36.4.2 TO's and associated hardware should not be fitted closer than a horizontal distance of 200mm from any fitting on which mains voltage cables are terminated, unless separated by a rigidly fixed barrier. However, there are further restrictions on the use of such barriers, as detailed in clause ~~30~~35.

36.4.3 Complying barriers include wall linings, full depth framing in walls and substantially enclosed mounting boxes. Electrical flush mounting brackets and open type flush boxes are NOT substantially enclosed in the above context. Without a barrier, the minimum 200mm horizontal separation applies to both sides of a wall unless the wall cavity exceeds 200mm depth.

36.4.4 To minimise the risk of noise by induction, telecommunications cable should not be run closely spaced and parallel to wiring of other services. Where it is not practicable to completely avoid such parallel runs, any length where spacing is close to the minimum of 50mm, should not exceed 3m.

36.4.5 Telecommunications cables should cross LV cable at right angles, maintaining the necessary separation by means of securing or by an insulated barrier.

36.5. Wiring under Floors

36.5.1 Cables should be run clear of potentially wet surfaces, such as the ground, along areas at the bottom of outside walls, bathrooms, showers, water tanks, laundries, and any other areas where unintended water leakage or dampness may occur; unless the cable is specifically rated for this purpose.

36.5.2 Connections to cables should be made only in readily accessible locations and using purpose-designed terminating hardware.

36.5.3 The cable should be secured at changes of direction and at intervals sufficient to prevent undue sag and potential contact with subsequent groundwork or snagging during other under-floor operations.

36.5.4 Closely spaced clipping along timber should be avoided, unless this is necessary for appearance purposes when the cable is exposed to regular view.

36.5.5 Cables should be secured with plastic saddles not by clipping or stapling to avoid metallic short circuits for compression of cable.

36.5.6 Large cable looms should be cable tied to a centenary wire or cable tray, if mounted of surface. Another widely used method of cable management is staple-tying.

36.6. Wiring above Ceilings and Walls

36.6.1 Cables in ceilings and wall cavities should be segregated from power

cables in accordance with clause ~~31.3~~36.4.

36.6.2 Cables in ceilings should be routed clear of areas where potential damage may occur, such as areas used for storage, or around chimneys, flues, heating ducts, water tanks and plumbing.

36.6.3 Cables should be routed along timber above the ceiling joists wherever possible, to avoid exposure to any water retained by the thermal insulation used between the joists.

36.6.4 Cables above cathedral ceilings and horizontal runs in outside wall cavities should be avoided wherever it is practicable to do so.

36.6.5 In any roof areas where the height exceeds 600mm, cable should be laid below or clear of surfaces likely to be stood or knelt on, and should be secured to prevent snagging during later operations.

36.6.6 Cables should not be clipped or otherwise secured in wall cavities or other inaccessible areas.

36.7. Wiring Within a Concrete Wall

36.7.1 Cables should not be laid directly into concrete walls, floors or ceilings. Where it is necessary for cabling to pass through or be carried within a concrete structure, it should be housed within a rigid plastic pipe. Any such pipes should be laid on a slope such that any water running down external walls does not run into the building.

36.8. Surface Mount on a Concrete Wall

36.8.1 The installation should facilitate later removal and replacement of the cables, if required. Draw-wires should be installed in all ducts. The duct should be direct strait run. Any given length of duct should not have more than two bends or elbows.

36.8.2 Internal building cable should not make direct contact with concrete surfaces, particularly those of outside walls and ground retaining walls. Where exposed surface wiring cannot be avoided, separation from the concrete should be provided by enclosing the cable in conduit or Trunking, or by securing it to a timber batten with plastic saddles, not by clipping.

36.9. Surface Wiring

36.9.1 As a matter of good trade practice, surface wiring should be limited to those few situations where there is no other option. Since this Code of Practice is intended primarily for new homes, the Premises Owner's requirements should be included in building plans, and there should be little need for surface wiring.

36.9.2 In particular, surface wiring should be avoided in areas subject to potential damage, including within 50mm of floors. Wherever possible, surface cables should be protected from inadvertent physical damage by running them along the edges of skirting boards, scotia's, architraves, or window and door frames.

36.9.3 Any surface wiring should be enclosed in a plastic duct or capping with a recommended minimum size of 16mm x 25mm

36.10. Wiring Between Buildings on Same Site

36.10.1 Where the cable can be run entirely within a fully enclosed access-way, it is deemed to be inside wiring.

36.10.2 Inside cable may be run in conduit only where the cable run is relatively short, above ground, sheltered from weather, and the conduit can be supported over the full distance on a convenient surface. Such installation should provide for later removal and replacement of the cable, if required.

36.10.3 External cable, as specified in clause ~~31.4~~29.15, should be used in above-ground locations exposed to weather, and should be attached to a structural surface or adequately supported by a self contained or separate bearer wire. The route should be clear of potential hazards and potential damage. Any poles used should adequately support a ladder to facilitate maintenance. To facilitate later removal and replacement of the cable, if required, external cable used for underground runs should be installed in a buried conduit which extends at least 300mm above the floor within an indoor location at each end.

36.11. Wiring to Equipment Exposed to the Weather

36.11.1 Where equipment and its associated cabling and wiring are exposed to the weather, all such components should be of a design suitable for this purpose.

36.11.2 Standard TO's should not be located outdoors unless housed in industry standard housings of the appropriate IP rating.

36.11.3 All elements of a data cable system exposed to the direct sunlight should be UV rated.

37. Cross-connections and Commoning of TO's for traditional analogue Telephone service

37.1. For telephony and voice-band data services, the Home Distributor will usually incorporate some form of commoning hardware to allow several TO's to access the line concerned. There is no limit on the number of TO's that may be connected to the same line.

Note: that the total number of Customer Premises Equipment (CPE) items which will operate correctly on a single analogue line is limited by the sum of the Ringing Numbers (RN) assigned to each CPE item connected to that line. Reliable ringing detection is achieved by ensuring the sum of the individual CPE "RN' does not exceed five.

38. Connection of line-grabbing devices

38.1. Alarm Devices

38.1.1 Fixed wiring of CPE is limited to those devices, such as security and medical alarms, whose primary purpose would be defeated, if connected at any general purpose TO. Line grabbing CPE, such as security diallers, should be directly connected at the Home Distributor. Such connections may be via jumpers, patch cords or direct hard-wired connections.

38.1.2 Connection of alarm wiring should be terminated and connected in the home distributor. Such connections maybe via jumpers, patch cords or direct hard-wire connections.

38.1.3 Where the building has a monitored fire alarm system that also uses a PSTN connection, the fire alarm system shall be connected such that it will grab the line with a higher priority than security systems and similar.

38.1.4 Refer to Appendix 1 for an example of how line grabbing devices are wired into the telephone wiring.

39. Connection of Broadband services

39.1. Connecting xDSL

39.1.1 With a Home Distributor and star wiring throughout the premises, the Home Distributor should be used to house an xDSL splitter such that:

a) Any TO can be used to connect the xDSL modem; or preferably;

b) The Home Distributor houses a modem with an integral router or the modem and a separate multi-port router, such that any TO's can be used to connect PC's and other equipment with an Ethernet interface; and

c) Where a central xDSL splitter is mounted within the Premises Owner's premises, it should be of a network access provider approved type and should be connected on the network side of all other premises cabling, including line-grabbing devices.

39.2. Connecting Fibre to the Premises (FTTP)

39.2.1 Given that the high speed broadband services are likely to be delivered to premises via a fibre optic cable, the home distributor need to cater for this type of installation.

39.2.2 The Home Distributor enclosure should be of sufficient size to be able to accommodate an incoming duct with fibre cable and connector. It should also be of sufficient size to be able to accommodate a standard size Home-Optical Termination Unit (H-ONT). For further information please refer to section ~~26.4~~27.6 on the Home Distributor.

39.2.3 The Home Distributor should be located as close as possible to the point where incoming communications cabling enters the building. This is to minimise the amount of work and costs associated with an addition of the new services, such as FTTP based broadband. Refer to clause 29.5.

40. Mounting Hardware

40.1. Where the TO is not designed to provide a reasonable level of protection against dust and dirt within the wall cavity, boxes used for mounting TO's and other terminating hardware should preferably be of substantially enclosed construction.

40.2. The sides, top and bottom of surface mounting type boxes should be continuous with provision for cable entry at the lower rear.

40.3. The sides, rear and top of flush mounting types should preferably be continuous except for small holes, and the bottom should contain a cable entry hole not exceeding 30mm diameter

40.4. TO mounting hardware should be securely fixed in position. If not screwed to

timber framing, it should be rigidly fixed to wallboard using suitable fasteners.

41. Faceplates and socket orientation

41.1. Standard 230 V style rectangular faceplates matching those of the other electrical fittings in the home are recommended for aesthetic reasons. Those providing for separate modules to be fitted facilitate later replacement of any faulty or damaged modules without replacement of the complete assembly.

41.2. Faceplates may be installed “horizontally” (landscape) or “vertically” (portrait), but in all cases the RJ45 socket should be oriented such that the plug latch will be on the underside. This ensures that the contact springs are at the top of the socket and less susceptible to dust or dirt settling on them.

41.3. Dual RJ45 TO's should be installed as the standard provision at each location. A larger capacity (four way or six way) modular faceplate allows for the fitting of 2 coaxial "F" connectors at any locations where a television set is likely to be used. Where the main television device is located provision should be made for 4 coaxial "F" connectors. Consideration could be given to multiple extra UTP/RJ45 outlets at the main TV position to facilitate distribution of HDMI over UTP.

42. Copper Cable termination

42.1. Wires should be terminated on TO’s, cables, commoning and cross-connect facilities only with the correct purpose-designed tool for the hardware concerned. IDC terminations should be used wherever possible.

42.2. All four pairs are to be correctly terminated; the wires of a pair should be kept together and should be untwisted to the minimum practicable extent consistent with sufficient length for terminating them.

42.3. The following requirements apply to wiring terminations in insulation displacement connectors:

42.3.1 Only strip as much sheath from the cable as is required to terminate the paired conductors (maximum 25mm), leaving the sheath intact as close as practicable to the actual terminations.

42.3.2 Insulated wires should be inserted into the slots with the insulation undamaged in the vicinity of the actual connection.

42.3.3 They should be inserted individually from the correct direction, specified by the hardware manufacturer.

42.3.4 No attempt should be made to terminate wires of types other than those which are specified for telecommunications wiring.

42.4. For shielded cable, whether foil or screened, the appropriate type of terminating hardware should be used in accordance with the manufacturer’s recommendations.

43. Fibre Termination

43.1. The Access Network Provider’s fibre may be terminated in a variety of methods depending on the cable and terminating practices of the Access Network Provider, namely terminated onto a termination point or terminated in a flexible fibre pigtail that can be plugged directly into the ONT. Provision should be provided for both methods of termination.

43.2. The Access Network Provider may provide a standard flexible cable or a high bend radius cable from the home distributor to the ETP. The Home Distributor shall be laid out to accommodate a standard flexible cable with the larger bending radius.

43.3. A termination or distribution frame, suitable for the insertion of a minimum of two SC/APC adapters, shall be provided. Multi dwelling units may require additional adapters and the number required should be discussed with the Access Network Provider.

43.4. The fibre adapters should be located so that when the external cable is installed, the connector does not face upwards in order to minimise dust collection within the adapter and it shall not face outwards from the cabinet to prevent optical injury to those working on the cabinet. It is desirable to use adapters with inbuilt shutters to prevent optical injuries.

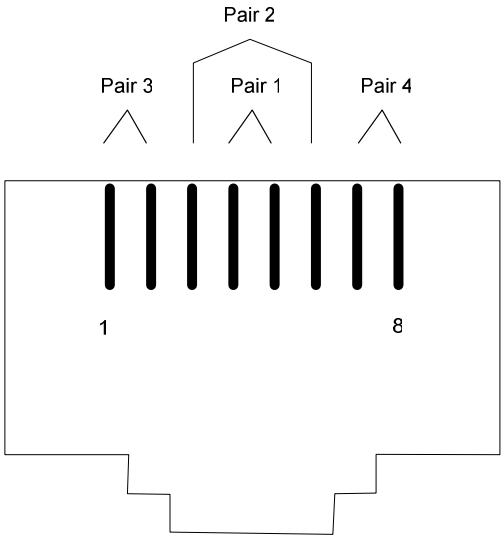
43.5. Multi dwelling units may require a lockable fibre distribution frame to prevent tampering of the external fibre cable terminations. The Access Network Provider can provide further guidance of their requirements and they would hold the keys to the lockable frame. [splice tray]

43.6. Provision for Splice trays shall be provided to enable the lead-in cable to be terminated onto a connector with a pigtail. A minimum of two splices is required for a SDU. The number of splices for a MDU will depend on the size of the lead-in cable.

44. Wire mapping

44.1. There are two standard pin-out options available, commonly referred to as “568A” and “568B”. The 568A option is the preferred option in Australia and New Zealand. This option should be used unless there is some specific reason why this is not practicable. Premises Owners should exercise caution when purchasing equipment (CPE) particularly from international sources as it may be wired to the 568B standard and therefore result in an incompatibility issue.

Figure ~~10~~11: RJ45 Contact Spring Numbering



RJ45 Contact Spring Numbering
viewed from front

NOTE: Actual wire terminations on IDC strips will vary from one manufacturer to another

44.2. Note that many RJ45's will show both options usually marked simply as "A" and "B", with the relevant colours shown against terminals and no apparent references to the actual pins connected. The wire to pin allocation for 568A is shown in Table 1.

Table 1: Pin-out Arrangement for the 568A Wiring Option

Pair Number	Insulation Colours	Abbreviations	TO Pin Connection
Pair 1	White - Blue Blue	WH - BL BL	5 4
Pair 2	White - Orange Orange	WH - OR OR	3 6
Pair 3	White - Green Green	WH - GR GR	1 2
Pair 4	White - Brown Brown	WH - BR BR	7 8

44.3. Whether the 568A or 568B option is used, the same option should apply throughout the installation. During later cabling additions, the installer should check the existing wiring standard at the patch-panel before any additional TO's are terminated.

44.4. To avoid problems when additions are made, where the 568B option is used, this

should be clearly marked on the Home Distributor and in any user instructions or cable records.

45. CPE Connection to Copper Wire Network/Service Provider lines

45.1. Connection Options

45.1.1 Almost all telephones and related CPE now in service and new equipment being offered for sale uses the 6-way plug to BS 6312 adopted by Telecom in 1983.

45.1.2 Where cabling is installed to this Code of Practice, it will generally be necessary to either use a suitable adapter to connect such equipment to the RJ45 TO's or have the line cords of CPE concerned re-terminated with RJ45 plugs. This decision is left to the Premises Owner.

45.1.3 Where any older 3-wire connected telephones are still in use, these will require a "mastering" adapter with integral 1 microfarad capacitor to provide their ringing function.

45.1.4 All CPE must be approved by service or network providers before being connected to that provider's network.

46. Earthing

46.1. There is no provision for an earth connection to CPE via TO's. CPE is deliberately isolated from earth as a safety measure.

47. Earthquake Protection

47.1. In order for the premises cabling to be used for lifeline service, such as (e.g. calling emergency services) after an earthquake, the installation should be built to earthquake resistant standards.

47.2. Equipment, particularly within the Home distributor shall be restrained so that it does not move and damage itself or adjacent equipment.

47.3. Power packs that are plugged into 230V outlets shall be secured so that they do not all out during the earthquake movement.

L. INSTALLATION TESTING

48. The objective of this section is to provide guidelines on recommended testing requirements that should be undertaken during the installation and commissioning of the Generic Cabling installation.

49. Additionally to provide guidance to the home owner as to what test certification and compliance documents they should expect to receive~~.~~, to ensure the installation is fit for purpose.

50. Installer's obligations

50.1. Before handing any new or altered wiring installation work over to the premises owner, such work must be thoroughly tested to ensure that all wiring is correctly terminated in accordance with the type of jackpoint and termination hardware used. Pair integrity should be maintained. Any defective cables should be replaced and termination faults remedied before handover to the Premises Owner.

50.2. The installer should ensure conformance to the following:

- visual examination of the cabling;
- verification testing of the cabling;
- qualification testing of the cabling; and
- producing a report of results.

50.3. Where problems arise, the installer should ensure that all necessary remedial action is taken.

Note: In view of this Code of Practice being aimed primarily at new home cabling installations, the Consumer Guarantees Act 1986 applies as to the installer ensuring that the installation is suitable for its intended purpose.

51. Damage

51.1. Telecommunications cabling (e.g., voice, data, video, security, audio, control) can be damaged during the construction phases of framing, gib board installation, and even during the cladding of the exterior. Many of these damaging faults result from causes such as nails and staples penetrating the cable, severe kinks in the cable where the cable was pulled through a drilled hole in a stud or joist, or a cable tear where the cable sheath and conductors are damaged from pulling the cable.

52. Visual Inspection

52.1. A visual inspection of each cable run should be made after the cable has been installed, but prior to installation of insulation and gib board.

52.2. This visual inspection may include but is not limited to:

- obvious damage to cable (condition and workmanship);
- separation from Electro Magnetic Current (EMC) i.e. power and radio sources of interference;
- incorrect bend radii; and

- noticeable excessive cable length.

53. Verification

53.1. Verification testing is performed after cable placement and prior to the installation of insulation and gib board and must be performed to ensure proper end-to-end connectivity.

53.2. Coaxial cable must be verified to ensure connectivity to the remote end with an absence of shorts between the centre conductor and the outer shield.

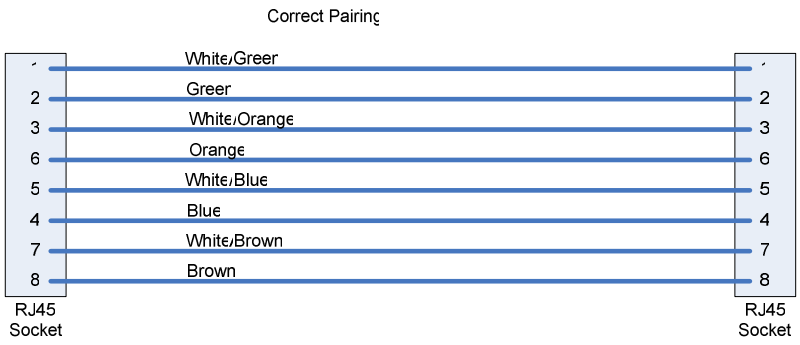
53.3. Twisted pair cabling verification tests must include:

- continuity to the remote end;
- length;
- shorts between any two or more conductors;
- crossed pairs;
- reversed pairs;
- split pairs; and
- any other ~~mis~~miss-wiring.

53.4. Refer to Figure ~~11~~12 for an illustration of correct pairing and Figure ~~12~~13 for several examples of incorrect pairing.

53.5. Verification testing to ensure proper end-to-end connectivity is performed after cable placement. Twisted pair cables, such as those used for data and voice, may be terminated on both ends for verification testing and subsequently placed in temporary housings for later finish-out of the cabling.

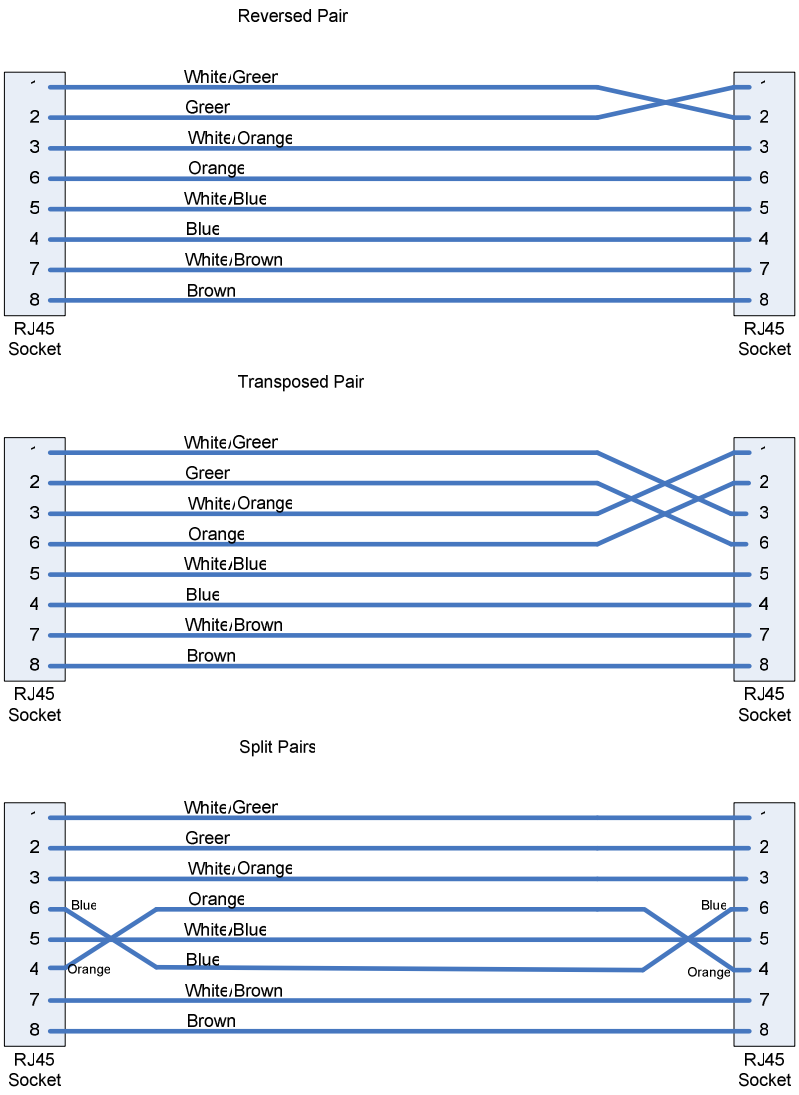
Figure ~~11~~12: Correct Pairing for an Unshielded Twister Pair Cable



53.6. A reversed pair occurs when the polarity of one wire pair is reversed at one end of the link (also called a Tip/Ring reversal). See Figure 12 for an illustration of a reversed pair.

53.7. A transposed pair occurs when the two conductors in a wire pair are connected to the position for a different pair at the remote connection. See Figure 12 for an illustration of transposed pairs.

Figure ~~12~~13: Examples of Incorrect Pairing



53.8. Examples of cable where they may not be terminated at both ends with an 8-position modular jack are:

- cable used for powering video cameras, IR targets or IR emitters;
- audio cable for speakers and volume controls; and
- Cable for control systems.

53.9. The physical length of the cabling is defined as the sum total of the physical length of the cabling between the defined reference planes. The physical length may be determined by measuring the lengths of the components that make up the cabling. The length of cable segments may be determined from the length markings on the cables. The length can also be estimated from an electrical length measurement. The electrical length is derived from the propagation delay of signals and depends on the twist helix and dielectric material.

53.10. The maximum lengths of the home cabling are specified in AS/NZS ISO/IEC 15018:2005 "Information technology - Generic cabling for homes".

53.11. In general terms the maximum cable run should not exceed 90m.

54. Qualification Testing

54.1. Qualification testing ~~determines~~should be carried out to determine whether the ~~cabling~~ installation is fit for purpose and will support certain network technologies (e.g., 1000BASE-T, 100BASE-T, FireWire). For example, two cabling runs (cable A and cable B) pass the verification test. A qualification test may show that cable A is only capable of supporting 10BASE-T, while cable B is able to support Gigabit Ethernet.

54.2. Qualification testers provide confidence that specific applications will work.

54.3. The qualification tests must be summarized within a documented report generated by the test instrument. A copy of the test results summary must be provided to the ~~owner~~Premises Owner and/or Tenant of the home as well as placed in the distribution centre.

55. Qualification Test Instruments

55.1. Qualification test instruments must be ~~cable~~capable of performing verification testing (wire mapping and connectivity) and qualification tests.

55.2. Field test measurements of installed home cabling designed in accordance with this code of practice to support AS/NZS ISO/IEC 15018 should be performed as follows:

55.3. Wire mapping

55.3.1 A conductor map test is intended to verify correct pin termination of the 8-pin connectors at each end of twisted pair cabling and to check for installation connectivity errors. For each of the conductors in the cable, and the screen(s), if any, the conductor map indicates:

a) continuity to the remote end;

b) shorts between any two or more conductors/screen(s);

c) transposed pairs;

d) reversed pairs;

e) split pairs; and

f) any other connection errors.

55.3.2 Correct connectivity of telecommunications outlet/connectors is defined in AS/NZS ISO/IEC 15018 (or equivalent), and is illustrated in Figure 11 (for four pair cables).

55.3.3 A reversed pair occurs when the polarity of one wire pair is reversed at one end of the link (also called a Tip/Ring reversal). See Figure ~~12~~13 for an illustration of a reversed pair.

55.3.4 A transposed pair occurs when the two conductors in a wire pair are

connected to the position for a different pair at the remote connection. See Figure 11 for an illustration of transposed pairs. Transposed pairs are sometimes referred to as crossed pairs.

55.3.5 Split pairs occur when pin-to-pin continuity is maintained but physical pairs are separated. See Figure 12 for an illustration of split pairs.

55.4. Qualification Test

55.4.1 The field test equipment must be capable of reporting minimum summary information for each cable run:

a) Cable ID;

b) Date;

c) Time;

d) Length;

e) Wiremap;

f) Network technologies supported;

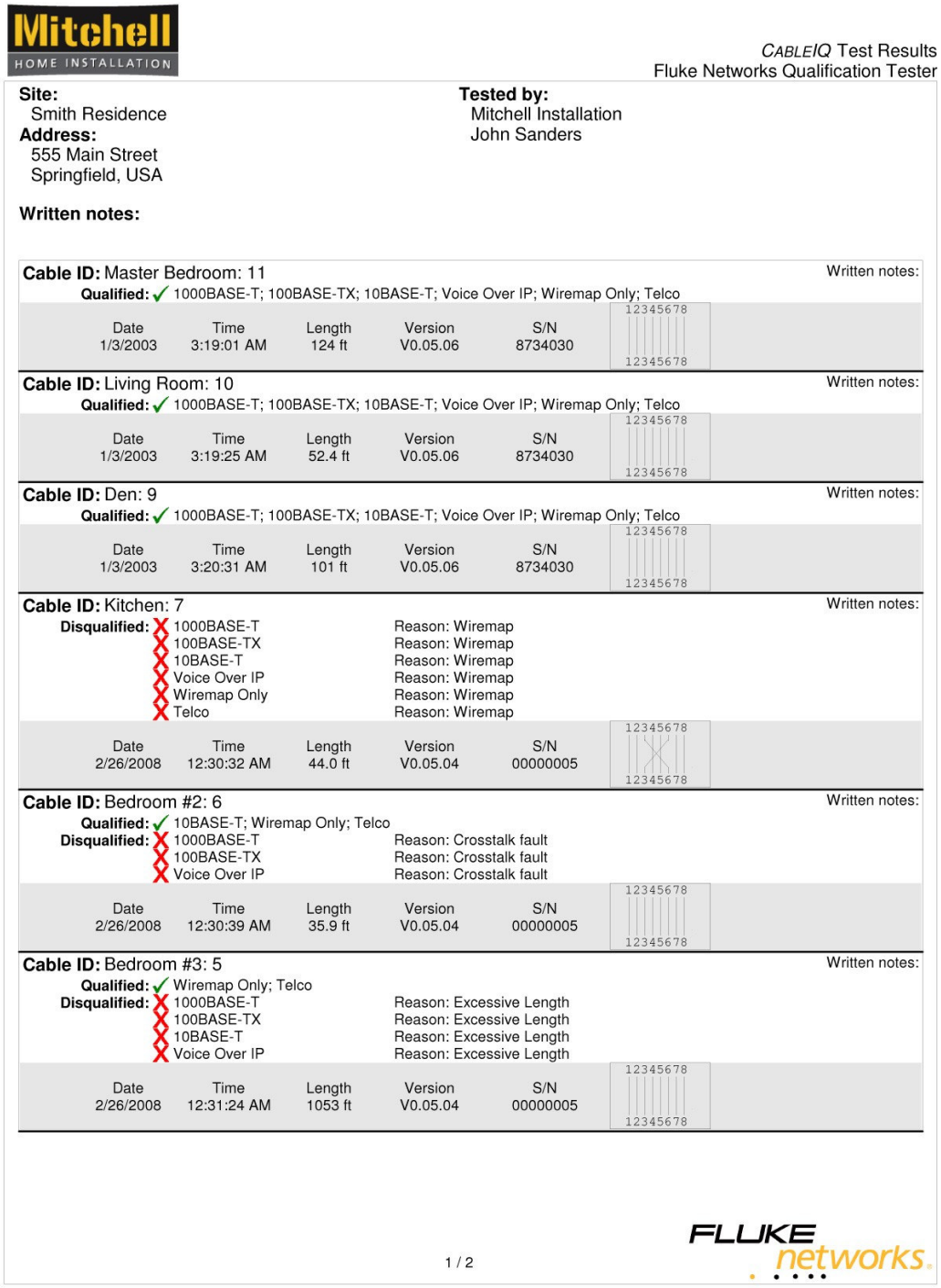
g) Network technologies unsupported;

h) Test instrument serial number; and

i) Test instrument use.

55.4.2 Qualification tests analyse the network capability of cable by injecting signals and analysing their responses, including any interfering signals that are within its field of influence. The resulting analyses of these signals are then compared to known network technology requirements. The result can then be saved to the test instrument for producing documentation.

Figure ~~13~~14: Example of Test Instrument Produced Qualification Summary Report



Mitchell HOME INSTALLATION

CABLEIQ Test Results
Fluke Networks Qualification Tester

Site:
Smith Residence
Address:
555 Main Street
Springfield, USA

Tested by:
Mitchell Installation
John Sanders

Written notes:

Cable ID: Master Bedroom: 11 — Written notes:
Qualified: ✓ 1000BASE-T; 100BASE-TX; 10BASE-T; Voice Over IP; Wiremap Only; Telco

Date	Time	Length	Version	S/N
1/3/2003	3:19:01 AM	124 ft	V0.05.06	8734030

Cable ID: Living Room: 10 — Written notes:
Qualified: ✓ 1000BASE-T; 100BASE-TX; 10BASE-T; Voice Over IP; Wiremap Only; Telco

Date	Time	Length	Version	S/N
1/3/2003	3:19:25 AM	52.4 ft	V0.05.06	8734030

Cable ID: Den: 9 — Written notes:
Qualified: ✓ 1000BASE-T; 100BASE-TX; 10BASE-T; Voice Over IP; Wiremap Only; Telco

Date	Time	Length	Version	S/N
1/3/2003	3:20:31 AM	101 ft	V0.05.06	8734030

Cable ID: Kitchen: 7 — Written notes:
Disqualified:

1000BASE-T	Reason: Wiremap
100BASE-TX	Reason: Wiremap
10BASE-T	Reason: Wiremap
Voice Over IP	Reason: Wiremap
Wiremap Only	Reason: Wiremap
Telco	Reason: Wiremap

Date	Time	Length	Version	S/N
2/26/2008	12:30:32 AM	44.0 ft	V0.05.04	00000005

Cable ID: Bedroom #2: 6 — Written notes:
Qualified: ✓ 10BASE-T; Wiremap Only; Telco
Disqualified:

1000BASE-T	Reason: Crosstalk fault
100BASE-TX	Reason: Crosstalk fault
Voice Over IP	Reason: Crosstalk fault

Date	Time	Length	Version	S/N
2/26/2008	12:30:39 AM	35.9 ft	V0.05.04	00000005

Cable ID: Bedroom #3: 5 — Written notes:
Qualified: ✓ Wiremap Only; Telco
Disqualified:

1000BASE-T	Reason: Excessive Length
100BASE-TX	Reason: Excessive Length
10BASE-T	Reason: Excessive Length
Voice Over IP	Reason: Excessive Length

Date	Time	Length	Version	S/N
2/26/2008	12:31:24 AM	1053 ft	V0.05.04	00000005

1 / 2

FLUKE networks

56. Testing and Certification of coaxial connections

56.1. All coaxial connections at outlets and within the Home Distributor must be tested for continuity, ensuring there are no contacts between the screen and the central conductors, and that there are no unwanted earth loops.

M. RECORDS MANAGEMENT

57. Cabling Management

57.1. The installer should provide written advice to the end Premises Owner on the basic management and operation of the cabling system. Such advice may be in the form of standard information published by the supplier of the cabling hardware or a Premises Owner-specific document drawn up by the installer.

57.2. In particular, the user information should include:-

57.2.1 a simple means of indicating the terminations within the Home Distributor that correspond with each TO and clearly explain the means of making and recording the necessary cross-connections; and

57.2.2 a clear explanation of how to use the disconnect house wiring from the network and test house wiring functions.

57.3. The overall aim is that information and installation records prepared by the installer should be such that a typical "Premises Owner" can understand how the system is set up and have a reasonable chance of being able to make cross-connections when service "add, moves or changes" are needed.

57.4. Unless it is completely clear from inspection of the Home Distributor cabling and cross-connections, all Generic Cabling installations should be provided with clear installation instructions and facilities for recording the service connected to each jackpoint.

Note: The use of appropriate colour coding schemes and clear labelling of all components may be such as to obviate the need for a "paper record", especially where the installation is small and few services are connected. The aim is to ensure that the information available is such that an average Premises Owner or service person will not have undue difficulty in determining what service is connected to any TO.

Table 2: Example of Test Instrument Produced Qualification Summary Report

TO/HD DESIGNATION	Connected to	Service	Comments
1	Line 2 telephone		Family phone line
2			
3	Line 1 telephone		Home business line
4	Colour Laser printer		
5	Router Port 1	Home LAN	
6	ADSL Modem	Broadband	
7			
8			
9	Router Port 2	Home LAN	
10			
11			
12			
13			
14			
15			
16	Line 2 telephone		DECT base station
17			
18			
19			
20			
21			
22			
23			
24			
25	Line 2 telephone		Family phone line
26	Router Port 3	Home LAN	
27			
28	Router Port 4	Home LAN	
29			
30			
Coaxial 1	SKY antenna		
Coaxial 2	Free to Air antenna		
Coaxial 3	Infra-red target for Video		
Coaxial 4	VCR AV input		
Coaxial 5	Bedroom TV		
Coaxial 6			
Coaxial 7	Front security camera		
Coaxial 8	Rear security camera		
Coaxial 9			
Coaxial 10			

57.5. A typical example of a cable record is where every TO cable is terminated on an RJ45 socket using the same designation within the Home Distributor. Coaxial outlets and locations are not defined and are shown only as “reminders”.

58. Installation records

58.1. The installer should provide a basic record system relevant to the cabling and hardware installed~~.~~ in a format that the Premises Owner and subsequent service staff may annotate changes to the records (e.g. an outlet is used for another purpose).

58.2. The actual format of this record is left to the installer to agree with the Premises Owner. However, it is suggested that this be based on a floor plan of the premises showing TO locations and identification details for each TO as shown in the figure 12.

Note: With a simple numbering system used for the TO's, these numbers should align with the termination numbers used at the Home Distributor end of the TO cables. Any record is then a simple case of stating what services are connected at each TO and showing any TO that is not in current use. This avoids the risk of Premises Owners thinking a TO is faulty when it is simply not connected at the TO.

58.3. An example of a simple cable record is shown above. Note that this record can become far more complicated if the TO and Home Distributor ends have different identification numbers or designations.

59. Compliance Statement Documentation

59.1. Following testing and any necessary remedial action, the installer should provide a written statement of compliance showing the extent of the testing carried out, the name and associated company of the person conducting those tests and the date on which the installation was deemed to be compliant.

Note: It is recommended that this statement of compliance be housed within the Home Distributor cabinet.

N. SPECIAL SITUATIONS

60. The objective of this section is to present information and make recommendations on the installation of Premises Wiring to support out of the ordinary applications that can occur.

61. Door and Gate entry control systems

61.1. Special requirements apply to any systems which make use of the premises wiring to carry entry authorisation or gate control signals. All wiring should comply with this Code of Practice

Note: Typically, such systems use a telephone, located at the gate or outside door, which directly rings the internal telephones. After ensuring that the caller is genuine, the occupant simply enters a code via the telephone keypad to unlock the gate or door.

61.2. All gate and door entry control system equipment intended to be connected to an ~~ANP's~~Access Network Provider's network must meet the ~~ANP's~~Access Network Provider's requirements for connection of Premises Owner owned equipment to their network. In all cases the owner should contact and discuss requirements with their chosen Network provider or providers. Relevant equipment granted an appropriate Telepermit for this class of device and carrying the granted Telepermit label may be connected to Telecom New Zealand's network.

Note: This not only ensures that the equipment is compatible with the ~~ANP~~Access Network Provider network and other equipment connected to the same line, but also that it is electrically safe.

61.3. Gate entry systems must be connected on the Premises Owner's side of the network demarcation point. It is not permissible to divert and use the network provider's lead-in cable between the network cable terminal on the road frontage and the network demarcation point at the building entry point, for this purpose

Note: Where a gate entry system is to be installed for a new building, especially if it has a long driveway, the recommended approach is to co-ordinate the lead-in and gate entry cable installation with other building services work. This allows the several services concerned to share the lead-in cable trench, which is paid for by the Premises Owner. The gate control installation contractor can then run the necessary control and communication wiring before the trench is closed.

61.4. Where the door or gate entry control system is common to more than one consumer, it may be necessary to divert those consumers' lines into the gate entry system in order for those consumers to jointly use the system. Suitable arrangements need to be put in place to ensure that such cable diversion does not impact on the reliability of Telecommunication services for those consumers or on the ability of Access Network Providers to overcome any faults that arise in their cable network.

Note: This arrangement may arise at such locations as blocks of flats or retirement villages housing a number of individual Premises Owners, where each Premises Owner has independent control of the door or gate security.

O. EXPIRY, REVOCATION AND AMENDMENT OF THE CODE

62. The expiry, revocation or amendment of this Code is subject to the Telecommunications Carriers' Forum's Operating Procedures Manual. Any Forum Member may put a Project Proposal to the Forum Board (at any time) for the amendment, replacement or revocation of the Code.

APPENDIX

Appendix 1: Interim Steps for Legacy Wiring

63. The wiring schemes shown in this appendix may be used as initial transition steps towards migrating legacy wiring in existing homes and business towards becoming compliant with this code.

64. Network Interface Device (NID)

64.1. A NID should be fitted.

64.2. The NID enables support of NGN services in premises with legacy wiring.

~~59.3. The incoming line should be terminated on pins 4 and 5 of an RJ 45 socket and labelled "External".~~

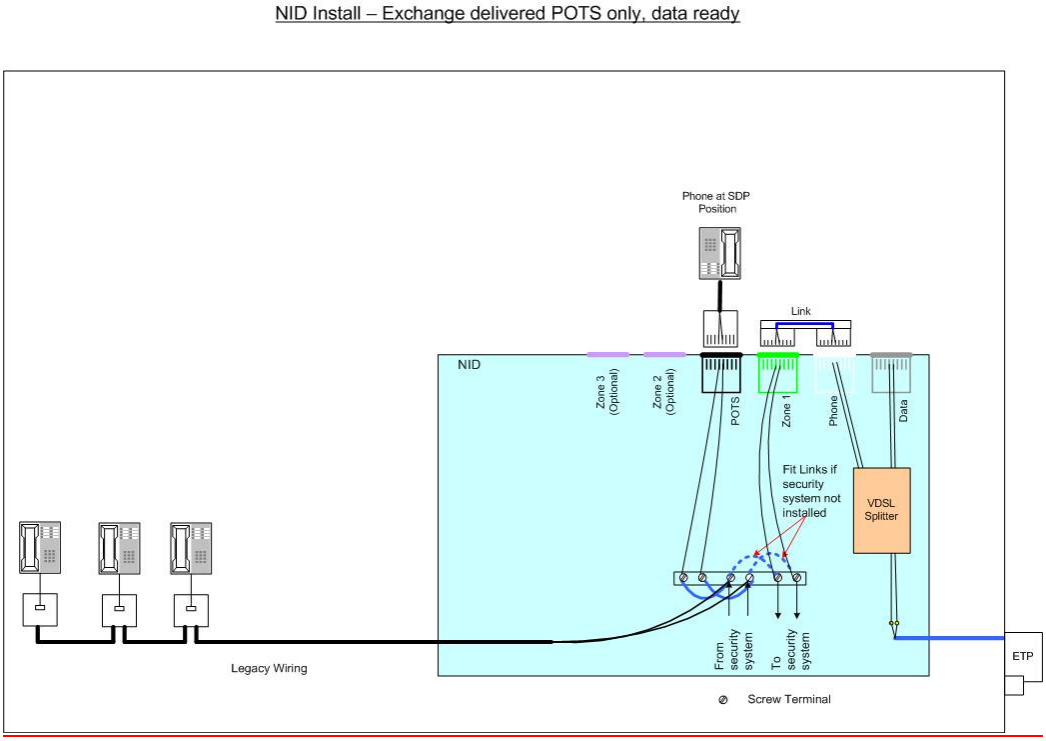
64.3. Termination should be as per fig 14, the cable terminates on pins 4 and 5 of the RJ45 sockets. Where a splitter is not installed, the incoming line is terminated directly on the RJ45 socket.

~~59.4.~~ The outgoing line~~ should be terminated on pins~~, zone 1~~ and 2 of the same socket and also pins 4 and 5 of a second socket labelled "Internal".~~

64.4. ~~The outgoing line~~, should be connected to an arrangement to which a line grabbing alarm system may be connected.

64.5. Where there is more than one incoming line, the alarm connection arrangement may be limited to one line.

Figure 14 the Wiring Arrangement for the NID

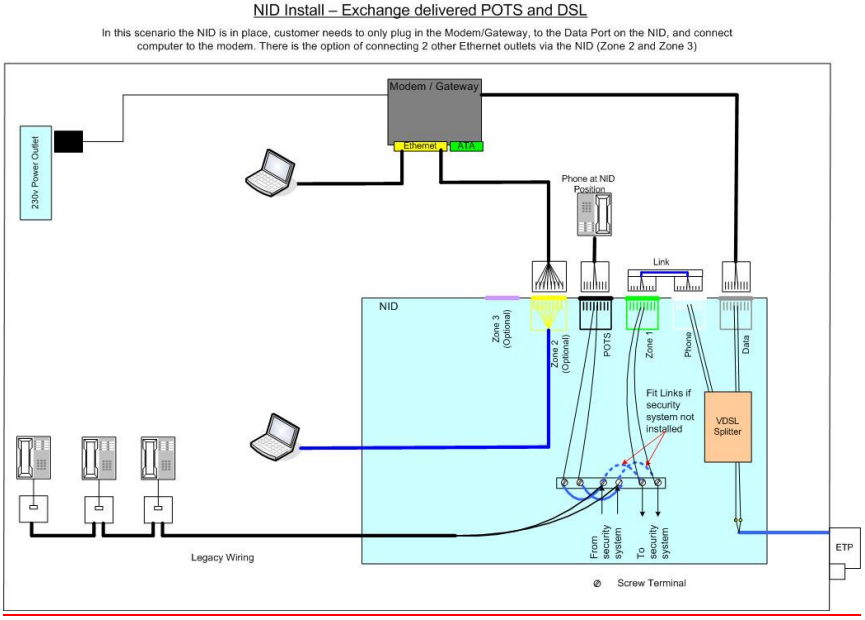


64.6. Connection arrangement for security system is only mandatory on line 1 in multi-line installations.

64.7. The circuit between the external network and internal premises wiring can be completed with either a ~~single RJ45 plug with pins 1 connected to pin 5 and pin 2 connected to pin 4~~link, or a standard Cat5e/RJ45 patch cable~~.~~, see Figure 14

64.8. The Security Industry typically use stranded cable hence screw terminals are shown. This is a recommendation and is not mandatory.

Figure 15 shows how a DSL ~~Splitter~~Service is Connected at the NID



Notes:

- The splitter can be patched, via RJ45 patch cord, to one of the ~~TO's~~zone sockets, allowing the modem to be located anywhere in the premises. This ~~would~~may be necessary if the modem/computer connection was via USB.

- Alternatively for modems with Ethernet interfaces, the Ethernet port could be patched to a TO directly or to multiple TO's via a hub or router ~~located in the home distributor cabinet~~.

Figure 16 shows connection of ATA POTS circuit at NID

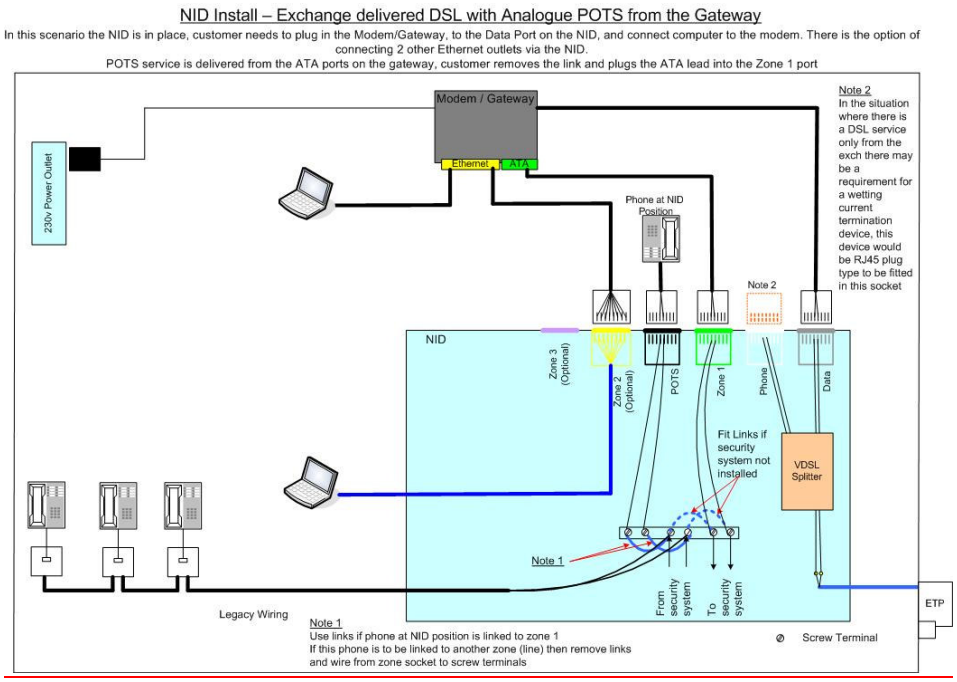
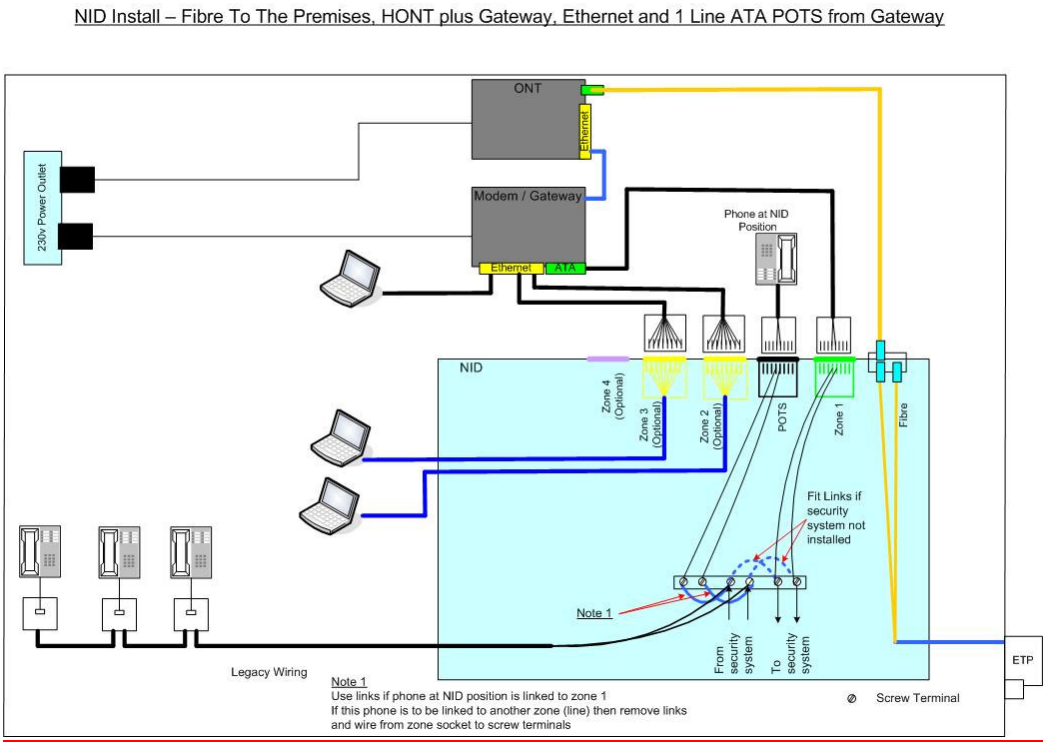


Figure 17 shows Fibre to the Premises (FTTP) HONT and Residential Gateway at NID



Notes:

- The Residential Gateway will also have Ethernet Ports which can be patched directly to

TO's or patched via a hub/router to TO's.

- The RG must be located at the NID, it cannot be located remotely at a TO.

Appendix 2: SKY Network Television Requirements[5]

65. Standards

65.1. This appendix provides guidelines for the installation of domestic wiring relating to use by SKY TV. System design and installation is expected to be in accordance with AS/NZS1367:2007.

65.2. AS/NZS1367:2007 refers to two "grades" of equipment "Basic-grade" and "High-grade". Please use the "High-grade" reference when installing for SKY TV.

65.3. These are the SKY TV requirements, not a "how to design" a suitable MATV system. You will need to refer to AS/NZS1367:2007 for required installation standards.

66. Background

66.1. All SKY TV (and Freeview) services are currently broadcast using (H-Pol) transponders on the Optus D1 satellite (Orbital location 160 degrees East). Sky will expand into equivalent capacity on the Optus D3 satellite (Orbital location 156 degrees East).

Note: Unlike the older B1 satellite, the D1 satellite is capable of covering New Zealand on both polarities. It is therefore imperative that the LNB skew angle is accurately aligned for minimum cross pole interference.

66.2. In preparation for access to the D3 satellite, SKY TV now requires that all future installations be pre-wired with a minimum of two RG-6 cables to each and every outlet plate.

66.3. In the future, this may also require appropriate switching devices to be installed in the Home Distributor. Therefore, all currently unused cable ends should be accessible and of adequate lengths for future installation of multi-switches, repeater amplifiers, splitters, etc.

66.4. These devices will be required to be adequately earthed, and will be located as close as possible to the nearest Communications Earth Terminal (CET). Refer to AS/NZS 1367:2007.

66.5. All currently unused cables should be terminated, pre-tested and marked as such on the 'as built' drawing, according to their respective labelling.

66.6. All aspects of the installation (including all equipment used) must meet the requirements of AS/NZS 1367:2007.

[5] Disclaimer: SKY NETWORK TELEVISION reserves the right to change part or all of this specification without notice.

67. Installation Components

67.1. All system components, including cables, active devices (amplifiers, multi-switches) and passive devices (splitters, taps, diplexers, etc) must be capable of supporting frequencies: from 45 MHz to 2150 MHz. All components must use "F" connectors and the cable F connectors must be a Sky approved waterproof compression type fitting.

67.2. Amplifiers and any other mains powered devices will be required to be adequately earthed to the nearest Communications Earth Terminal (CET). Refer to AS/NZS 1367:2007.

67.3. All passive and active components will be installed at an easily accessible location and in accordance with AS/NZS 1367:2007 regarding proximity to other non MATV related equipment and earthing etc.

68. Satellite Dish Location

68.1. Master receive dish to be minimum of 60cm in size. Sky will supply and install the required dish and LNB for its customers.

68.2. A minimum of 2 cables are required to be run from the central Home Distributor to the dish location, although for new installations it is recommended to run 4 cables to the dish.

68.3. The satellite dish needs to be installed at a location on the house which allows clear visibility skyward (at an Elevation between 35 and 47 degrees) when pointed in a NW direction. Care should be taken to avoid the satellite signal being obscured by roof overhangs, trees, adjacent buildings, etc.

68.4. Azimuth (mag): Optus D1

- Between 311 and 327 degrees (depending on installation location within New Zealand)

68.5. Elevation: Optus D1

- Between 35 and 47 degrees (depending on installation location within New Zealand)

Table 3 Satellite Dish Location

Location	Elevation	Azimuth (mag)
Auckland	44.4	316.9
Hamilton	43.4	316.0
Taupo	42.1	314.7
Gisborne	41.4	311.8
Wellington	39.9	316.3
Christchurch	38.2	318.8
Te Anau	37.1	325.5

69. Wall Plates

69.1. Must be no greater than 2 metres from designated set top box position.

69.2. Must provide a minimum of 3 "F" type connectors and be appropriately labelled (Sat 1 - Sat 2 - VHF/UHF):

- Minimum of 2 Satellite Outlets – (D1H and D3H)
- TV Outlet – (VHF/UHF)

69.3. For VHF/UHF distribution there are two options.

- A third cable to every outlet, or
- An alternative option is to diplex the VHF/UHF signals with one of the satellite cables, but particular attention must be paid to the levels and balancing of all signals if this method is employed. If the VHF/UHF signals are present in one of the SAT feeds (D1 and/or D3) it must be diplexed out ~~on the system side of the wall plate, not the customer side.~~

69.4. Telephone Outlet/Broadband Outlets

- 2 x RJ45 socket cabled with Cat 5e or better

69.5. Ideally, all outlets above will be located on the same wall plate (3 x "F" type connectors (D1 and D3) and VHF/UHF, 2 x RJ45).

69.6. If the outlet location is likely to be the connection point of a Home Entertainment system, a third cable (4th 'F' connector) should be provided to allow signals to be fed back to the Home Distributor for reticulation to other outlets in the house.

69.7. It is common for the furniture layout of the main entertainment viewing area to change over time and therefore provision should be made for more than one outlet plate to be available in this area.

69.8. All outlets should be cabled back to the central Home Distributor and labelled accordingly.

70. Cables

70.1. The cable used in an installation plays a vital role in the overall performance of the system. Sky requires a minimum of Sky approved dual shield cable (minimum of 60% braid, 100% foil) to be used for all domestic installations. Although not covered by this document, Quad shield cables (and/or RG-11) should be used in larger installations, i.e. MDU systems, high rise buildings, designs with long cable runs, areas with possible interference problems, etc.

70.2. SKY TV has approved the following cables for use on Sky installations;

70.2.1 Times Fiber Communications (TFC):

a) RG-6 Single/Dual Shield
- T10 series RG-6 (No 32360)

b) RG-6 Twin/Dual Shield
- T660SIAM-LTVB-DBS BK
- T660SIAM-LTVB-DBS BWH

c) RG11 Single/Dual Shield
- RG-11 (No 32362)

70.2.2 Belden

a) RG-6 Single/Dual Shield

- RG-6 (No 1829AC)

b) RG-6 Twin/Dual Shield
- B1829AC-Dual YR53172 010 (Black)
- B1829AC-Dual YR53172 009 (White)

c) RG-11 Single/Dual Shield
- RG-11 (No 1525A)

70.2.3 CommScope

a) RG-6 Single/Dual Shield
- SAT-660BV-S-B (Black)
- SAT-660BV-S-W (White)

b) RG-6 Twin/Dual Shield
- SAT2-660BV-S-B (Black)
- SAT2-660BV-S-W (White)

~~65.2.4 Digimatch~~

~~a) RG-6 Single/Dual Shield~~
- ~~RG-6 - Dual shield - 06MM-E6SKYB (Black)~~
- ~~RG-6 - Dual Sheild - 06MM-E6SKYW (White)~~

~~b) RG-6 Twin/Dual Shield~~
- ~~RG-6 - Dual Shield dual (Siamese) - 06MM-E6SSB (Black)~~
- ~~RG-6 - Dual Shield dual (Siamese) - 06MM-E6SSW (White)~~

~~c) RG-6 Single/Quad Shield~~
- ~~RG-6 - Quad shield single - 06MM-E6Q~~

~~d) RG-6 Twin/Quad Shield~~
- ~~RG-6 - Quad shield dual (Siamese) - 06MM-E6QS~~

~~e) RG-11 Single/Quad Shield~~
- ~~RG-11 - Quad shield - 06MM-E11Q~~

70.3. Installation of cable should be within the manufacturers' guidelines for the purpose. Also refer to AS/NZS 1367:2007 for more information.

70.4. The minimum recommended bend radius (for RG6) is 50mm.

71. Signal Requirements Guidelines (at Input Connector of Set Top Box)

71.1. L-Band

71.1.1 The IF/L-Band frequencies currently used (and to be used in future) by SKY TV, are as follows and quoted in Megahertz (Two figures given, for 11300/10750 LNB'S).

Note: D3 will use the same transponder layout.

Table 4 Signal Requirement Guidelines

NZ9L	968 / 1,518	NZ12L	1,156 / 1,706	NZ15L	1,344 / 1,894
NZ9U	995 / 1,545	NZ12U	1,183 / 1,733	NZ15U	1,371 / 1,921
NZ10L	1,031 / 1,581	NZ13L	1,219 / 1,769	NZ16L	1,407 / 1,957
NZ10U	1,058 / 1,608	NZ13U	1,246 / 1,796	NZ16U	1,434 / 1,984
NZ11L	1,094 / 1,644	NZ14L	1,281 / 1,831		
NZ11U	1,121 / 1,671	NZ14U	1,308 / 1,858		

71.2. Bit Error Rate (pre Viterbi – also known as Channel BER):

- 1 x 10E-4 or better. This is expected on each and every SKY Stream.

Note: BER may be difficult to measure accurately on NZ10L+U due to the use of DVB-S2/8PSK modulation techniques.

71.3. Signal Level:

- No less than 60 dBµV and not to exceed 82 dBµV, with no more than 2 dB of slope or ripple across any one transponder.

71.4. Carrier/Noise Ratio:

- 15 dB or better on each Carrier.

71.5. The above requirements are based on clear SKY TV conditions and apply to all SKY TV satellite carriers and for all outlets.

71.6. VHF/UHF

FM Radio:	45 dBµV ± 3 dBµV
VHF:	70 dBµV ± 3 dB Refer to AS/NZS 1367:2007 for slope and intermod etc
S Band and Hyper Band:	70 dBµV ± 3 dB Refer to AS/NZS 1367:2007 for slope and intermod etc
UHF:	70 dBµV ± 4 dB Refer to AS/NZS 1367:2007 for slope and intermod etc
Digital Terrestrial:	Refer to AS/NZS 1367:2007

Appendix 3: Freeview Requirements[6]

72. Full requirements for Free-to-air digital broadcasting are available in the 'New Zealand Free-to-Air Digital Broadcasting Antenna System Specification' document version 1.1 October 2008.

73. The following are minimum requirements for domestic aerial cabling and connectors for reliable reception of digital broadcasting services.

Table 5 Cabling and Connectors Profile

Item No.	Resources	Reference/Detail		Notes
1	**Coax Cable**			
	Screen			
1.1	Stranding	Solid		
1.2	Conductor Material	18AWG Copper Clad Steel (O.D. 1.02mm / 0.040")		
1.3	Corrosion Resistance	Belden CoreGuard™ Amphenol TFC LifeTime™		
	Insulation			
1.4	Insulation Material	Gas-injected FPE – Foam Polyethylene		
	Outer Shield			
1.5	Outer Shield Type	Tape/Braid		
1.6	Tape Type	Bonded Aluminium Foil		
1.7	Braid Type	Aluminium		
	Outer Jacket			
1.8	Outer Jacket Material	PVC		
	Electrical Characteristics			
1.9	Characteristic Impedance	75Ω		
1.10	Max attenuation	At 500MHz	6.5dB/30m	Operating Sweep Test to minimum 3.0GHz
		At 1450MHz	8.5dB/30m	
1.11	Max Operating Voltage	300V RMS		
1.12	Colour	Optional		
1.13	**Freeview Type Approved Cables**	Belden RG6 (1829A-C series). Belden Cable Part Number: • YV50797-9 White or • YV50797-10 Black Amphenol TFC D32391-FV RG6 White Amphenol TFC D32360-FV RG6 Black		
2	**Connectors**			
2.1	Type	F Type		

[6] Disclaimer: Freeview reserves the right to change part or all of this specification without notice.

Item No.	Resources	Reference/Detail	Notes
2.2	Crimp Type	Radial	
2.3	Characteristic Impedance	75Ω	
2.4	Corrosion Resistant	Required	
2.5	Water Resistant	Required	
2.6	Internal Sealing	Required	
2.7	External O-Ring	Required	
	Electrical Characteristics		
2.8	Insertion Loss at 700Mhz	Less than 0.3dB	
2.9	Return Loss at 700Mhz	Greater than 30dB	
2.10	Freeview Type Approved Connectors	F Conn Industries BICM K Conn RG6 WRO Gilbert USA – Ultraseal GF-US-6 PPC EX6	

Appendix 4: Baycity Network Broadband Requirements[7]

74. Standards

74.1. This appendix provides guidelines for the installation of domestic wiring relating to use by Baycity installers. System design and installation is expected to be in accordance with AS/NZS1367:2007.

74.2. AS/NZS1367:2007 refers to two "grades" of equipment "Basic-grade" and "High-grade". Please use the "High-grade" reference when installing for Baycity New Zealand.

74.3. You will need to refer to AS/NZS1367:2007 for required installation standards.

75. Background

75.1. Ipstar broadband signals receivable in New Zealand are broadcast using the Thaicom 4 satellite (Orbital location 119 degrees East).

75.2. All aspects of the installation (including all equipment used) must meet the requirements of AS/NZS 1367:2007.

[7] Disclaimer: Baycity New Zealand reserves the right to change part or all of this specification without notice.

Appendix 5: Service Lead Diagrams

Clearances

- Power: See table 1
- Gas pipelines: (Pressures 420 – 2000 Kpa)
  - Crossings: 300mm minimum
  - Parallel: 450mm minimum
- Sewer, Stormwater, Water etc: 150mm minimum

Mechanical Protection

Mechanical protection is installed to give protection to the power cable from any future digging activity.

Examples are:

- 50mm thick (or greater) concrete slab.
- 25mm thick (or greater) ground contact treated timber.
- Tough plastic slab of minimum dimensions 10mm thick x 150mm wide x 750mm long
- Mechanical protection installations are detailed in Fig 3.

Power Cable Voltage	Power Cable Type is	With Mechanical Protection Installed	Minimum Separation is
Up to and including 650 volts	Neutral screened or armoured	No	150mm
		Yes	50mm
	Other than neutral Screen or armoured	No	450mm
		Yes	50mm crossing
			450mm parallel
Exceeding 650 volts	Single core or Multi core	No	450mm
		Yes	150mm crossing
			450mm parallel

Table 1. Clearances between Power Cables and Telecommunication Cables

If a doubt exists on a type of power cable contact your local power company

Contact Phone Number

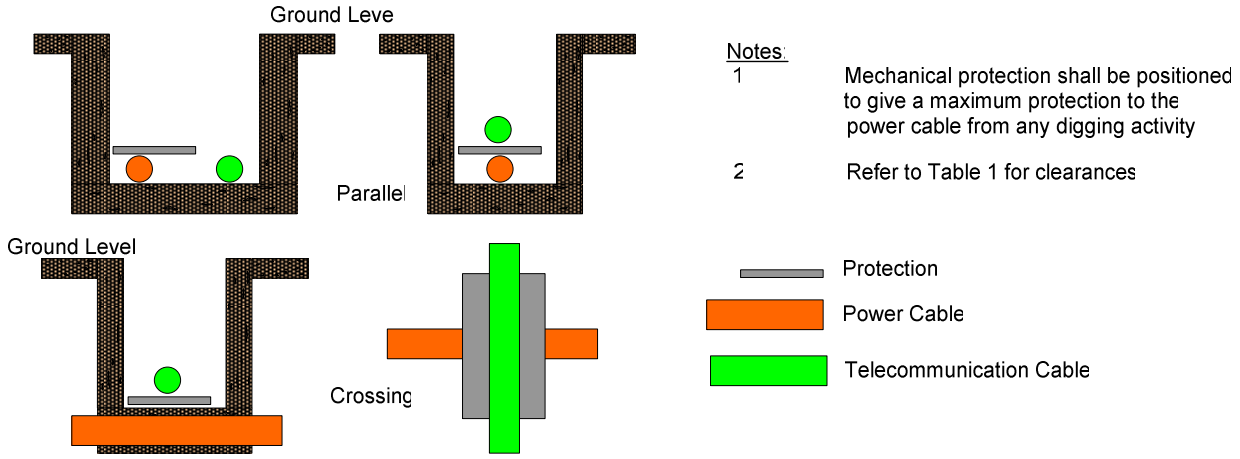


Fig 3. Examples of Installing Mechanical Protection in a Shared Trench

Rural

Installation of Underground Lead-in's for Telecommunications

Contractors Information

Introduction

This information relates to the installation of an underground lead-in on private property, sited on a typical rural property. For larger developments contact your network/service provider

An Underground Lead-In consists of:

- A lead-in pipe.
  If lead-in pipe is provided by access network provider the size of the pipe will be determined by the access network provider, the pipe colour will also be determined by them.
  If lead-in pipe is provided by building owner and developer then the lead-in pipe should be a minimum of 32mm. The pipe colour should be a designated colour for telecommunications.
  A pipe, with associated pre-formed bends, gives protection to the cable and will allow cable to be added, or replaced, with minimal disturbance in the future.
- A lead-in cable.
  A grease filled cable designed for outside use
- An External Termination Point (ETP)
  This houses the connection of the inside cabling to the outside cabling. This should be positioned as close as possible to the front of the building.
  If the ETP is provided by access network provider the size of the ETP will be determined by the access network provider.
  If the ETP is provided by building owner and developer then the ETP should be a minimum of 200mm x 300mm.

Check with the network provider for material supply and ownership details.
Check with the network provider for trenching and installation services
Check with the network provider for installation charges and appointments

Trenching

The following outlines the basic requirements for trenching. If you have any doubts, please enquire, as this can save unnecessary work.

- The route for the trench should only be chosen, and the trench excavated, once the network terminal in the street, and the ETP location at the property have been clearly identified. Where there is no terminal or doubt exists phone your network/service provider.
- The trench should be as straight as practicable avoiding sudden changes in direction or elevation.
- Trench depth should be 450mm below finished ground level. Where the lead-in will be under permanent material, e.g. concrete driveway, the depth can be reduced to 300mm.
- Trenching methods are: open trenching or underground mole.
- The following situations you must install lead-in pipe and not direct bury
  - Under permanent surface such as driveways
  - In unsuitable ground such as rock
  - With developed property, lawns, gardens etc
- Trenching of public footways/roadways requires permission of the local council.
- Special conditions apply to uncovering or trenching in the vicinity of other underground services. Check with the service providers concerned prior to excavating.
- Phone 124 for the location of any Telecom cables.
- Do not dig within 500mm of a network terminal or cable.
- Phone 120 to report any damage to Telecom plant.

Installation

- Direct buried should only be considered in rural environments when the length of the trench is excessive (typically greater than 60m)
- Lead-in cable must be installed in a lead-in pipe.
- Every residence must have an individual lead-in from the network terminal to the ETP.
- Check with the network provider for lead-in material supply and installation.
- Access to and terminating at a network terminal is the responsibility of the network provider.
- A lead-in cable can share a trench with other services, but clearances must be met.
- Telecommunications cables must leave buildings through a separate conduit and is not to be shared with power cables
- Lead-in cable not to exceed 250m. (4 pair lead-in must be used for runs greater than 250m)

Note:
Failure to comply with the guidelines set out in this pamphlet may result in a refusal to connect to the network and the cost of rectifying any sub standard installation will be at the customer's expense.

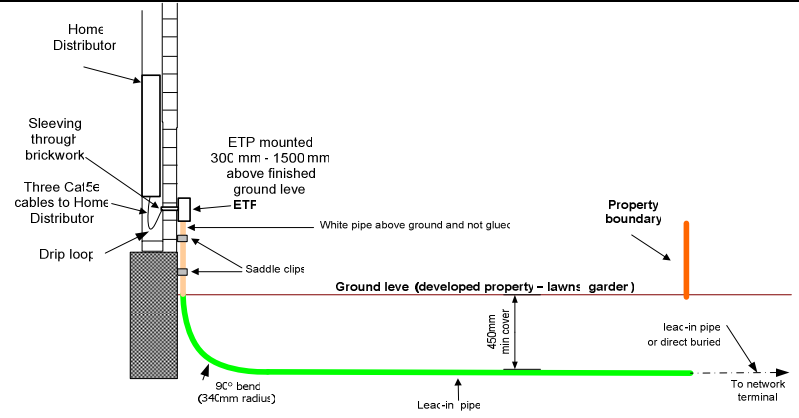


Fig 1 CROSS SECTIONAL VIEW OF A RURAL LEAD-IN INSTALLATION

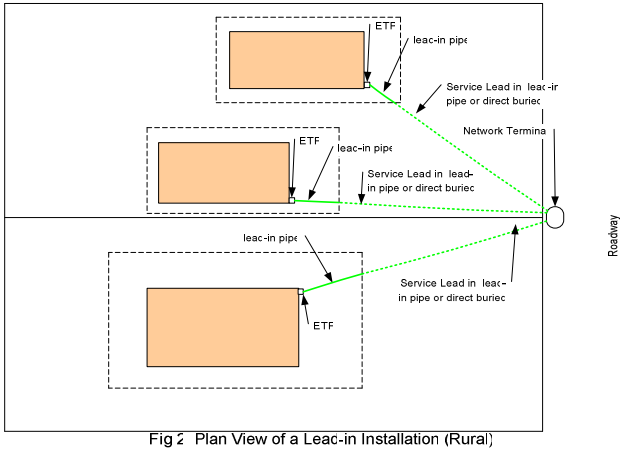


Fig 2 Plan View of a Lead-in Installation (Rural)

- Individual lead-in pipes to each living unit
- Lead-in pipes are to be kept straight
- The ETP is the connection point for internal to external wiring
- One living unit = flat, house etc.

Clearances

- Power: See table 1
- Gas pipelines: (Pressures 420 – 2000 Kpa)
  - Crossings: 300mm minimum
  - Parallel: 450mm minimum
- Sewer, Stormwater, Water etc: 150mm minimum

Mechanical Protection

Mechanical protection is installed to give protection to the power cable from any future digging activity.

Examples are:

- 50mm thick (or greater) concrete slab.
- 25mm thick (or greater) ground contact treated timber.
- Tough plastic slab of minimum dimensions 10mm thick x 150mm wide x 750mm long
- Mechanical protection installations are detailed in Fig 3.

Power Cable Voltage	Power Cable Type is	With Mechanical Protection Installed	Minimum Separation is
Up to and including 650 volts	Neutral screened or armoured	No	150mm
		Yes	50mm
	Other than neutral Screen or armoured	No	450mm
		Yes	50mm crossing
			450mm parallel
Exceeding 650 volts	Single core or Multi core	No	450mm
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			450mm parallel

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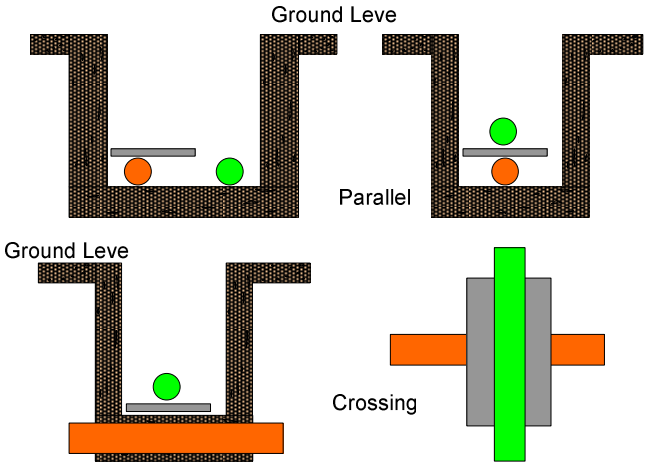

Notes:

1 Mechanical protection shall be positioned to give a maximum protection to the power cable from any digging activity

2 Refer to Table 1 for clearances

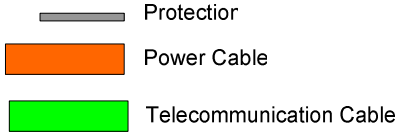

Fig 3. Examples of Installing Mechanical Protection in a Shared Trench

Urban

Installation of Underground Lead-in's for Telecommunications

Contractors In formation

Introduction

This information relates to the installation of an underground lead-in on private property, sited on a typical urban section

An Underground Lead-In consists of:

- A lead-in pipe.
  If lead-in pipe is provided by access network provider the size of the pipe will be determined by the access network provider, the pipe colour will also be determined by them.
  If lead-in pipe is provided by building owner and developer then the lead-in pipe should be a minimum of 32mm. The pipe colour should be a designated colour for telecommunications.
  A pipe, with associated pre-formed bends, gives protection to the cable and will allow cable to be added, or replaced, with minimal disturbance in the future.
- A lead-in cable.
  A grease filled cable designed for outside use
- An External Termination Point (ETP)
  This houses the connection of the inside cabling to the outside cabling. This should be positioned as close as possible to the front of the building.
  If the ETP is provided by access network provider the size of the ETP will be determined by the access network provider.
  If the ETP is provided by building owner and developer then the ETP should be a minimum of 200mm x 300mm.

Check with the network provider for material supply and ownership details.
Check with the network provider for trenching and installation services
Check with the network provider for installation charges and appointments

Trenching

The following outlines the basic requirements for trenching. If you have any doubts, please enquire, as this can save unnecessary work.

- The route for the trench should only be chosen, and the trench excavated, once the network terminal in the street, and the ETP location at the property have been clearly identified. Where there is no terminal or doubt exists phone your network/service provider.
- The trench should be as straight as practicable avoiding sudden changes in direction or elevation.
- Trench depth should be 450mm below finished ground level. Where the lead-in will be under permanent material, e.g. concrete driveway, the depth can be reduced to 300mm.
- Trenching methods are: open trenching or underground mole.
- Trenching of public footways/roadways requires permission of the local council.
- Special conditions apply to uncovering or trenching in the vicinity of other underground services. Check with the service providers concerned prior to excavating.
- Phone 124 for the location of any Telecom cables.
- Do not dig within 500mm of a network terminal or cable.
- Phone 120 to report any damage to Telecom plant.

Installation

- Lead-in cable must be installed in a lead-in pipe.
- Every residence must have an individual lead-in from the network terminal to the ETP.
- Check with the network provider for lead-in material supply and installation.
- Access to and terminating at a network terminal is the responsibility of the network provider.
- A lead-in cable can share a trench with other services, but clearances must be met.
- Telecommunications cables must leave buildings through a separate conduit and is not to be shared with power cables

Note:
Failure to comply with the guidelines set out in this pamphlet may result in a refusal to connect to the network and the cost of rectifying any sub standard installation will be at the customer's expense.

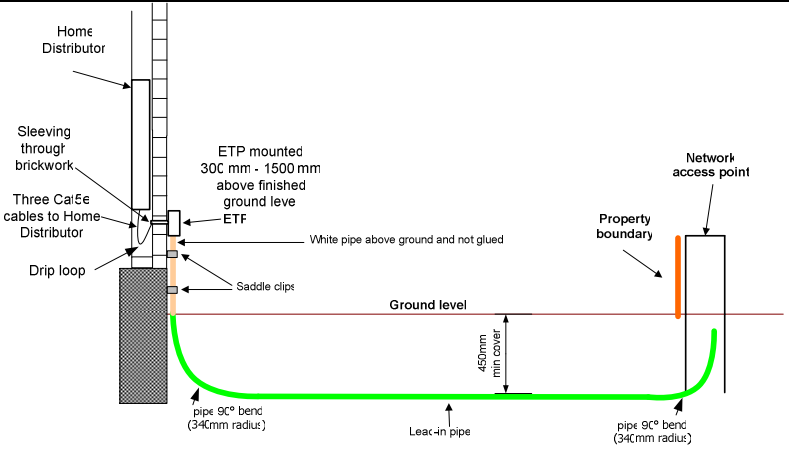

Fig ´ CROSS SECTIONAL VIEW OF A LEAC-IN INSTALLATION

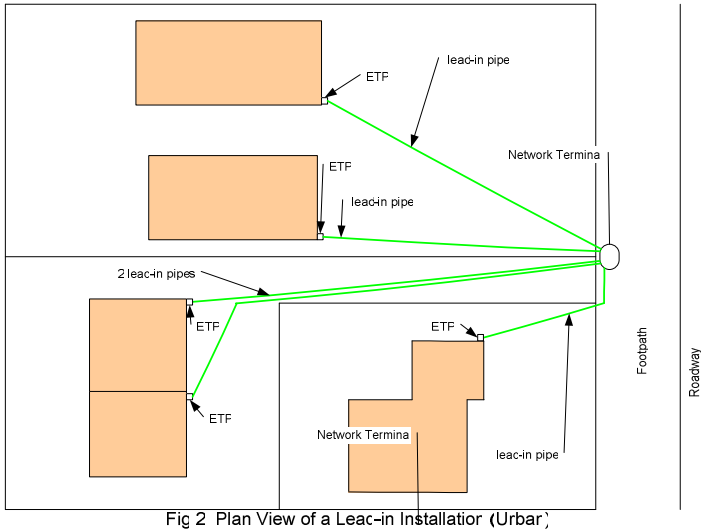

Fig 2 Plan View of a Leac-in Installatior (Urbar)

- Individual lead-in pipes to each living unit
- Lead-in pipes are to be kept straight
- The ETP is the connection point for internal to external wiring
- One living unit = flat, house etc.