

ARE YOU PROVIDING CABLING SOLUTIONS TO RESIDENTIAL PREMISES? IF YES, THIS HANDBOOK IS FOR YOU.



smartwired®



INSTALLER CABLING HANDBOOK FOR RESIDENTIAL WIRING

Planning and Installing cabling for Residential Technology Services

2010

COPPER
Copper Development Centre • Australia Ltd

PREFACE

INSTALLER CABLING HANDBOOK FOR RESIDENTIAL WIRING

The objective of this Handbook is to provide a how to guide for the INSTALLER to install the **minimum cabling requirements** to support residential services including those required for energy management. These will ultimately be represented by the following symbols below.

This handbook does not specify the technologies that enable those services but provides a step by step guide for the Installer to meet the specification given by the end user the consumer and meet the recommendations as outlined in the “CODE OF PRACTICE FOR HOME WIRING”

The following Services are covered by this handbook

- Communications
- Entertainment
- Residential Energy Management
- Security
- Digital Home Health
- Age & Assisted Living
- Lighting & Power.

The handbook sets out what is considered to be best practices in the installation of the cabling infrastructure. The handbook requires that all cabling be installed and tested in accordance with existing standards as detailed in the Code of Practice for Home Wiring.



Communications



Entertainment



Energy
Management



Security & Safety



Digital Home
Health



Age &
Assisted Living

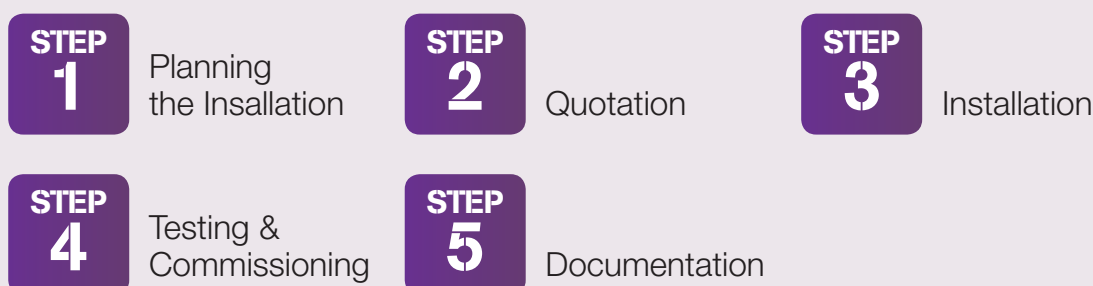


Intelligent Lighting
& Power

FLOW CHART OF PROCESS

This handbook sets out a step by step process from request for quotation through

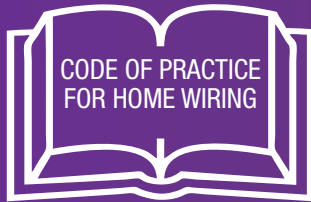
to testing and commissioning. The steps to follow are:



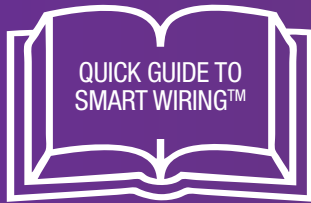
Flow chart 1 Installation process

MORE READING

Visit www.smartwiredhouse.com.au to download your other copies in this series



This document sets out the building cabling platform standards to be complied with.



This document is designed for the consumer to easily communicate to the installer what services they want without the need to have detailed knowledge of each technology area.



This document provides details to the installer of the cabling required to meet the consumer expectations and comply with the standards

CONTRIBUTORS

The handbook was developed with the support of the following organisations:



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STEP 1

PLANNING FOR THE INSTALLATION

SYMBOL	SERVICE REQUIRED	MINIMUM REQUIREMENTS
	Communications	A minimum of two outlets and associated cabling must be installed in each living area to support telephone and internet services plus one outlet located for the installation of a Wireless Access Point.
	Entertainment	A minimum of two outlets and associated cabling must be installed per living area for television (Free to air and Pay TV).
	Energy management	A minimum of one RJ45 outlet and associated cabling must be installed next to the hot water system, air conditioning units, pool pump and the electricity meter.
	Security	Sufficient movement sensors to detect an intrusion into the home, plus a code pad at the front door. Smoke detectors installed and functioning.
	Digital Home Health	Data outlets and associated cabling must be installed to allow for the installation of a Wireless Access Point to be configured at a later stage and a Power Point, if not already installed under communications.
	Age & Assisted Living	Intercom connection points and associated cabling must be installed from the front door to the main living areas and main rooms. Assistance call button connection points must be installed in bathrooms and main living areas. Power points and light switches installed at a height easily accessible to people with physical disabilities.
	Intelligent Lighting & Power	A minimum of one light fitting and one power point is wired to allow for the connection to a management system in each living area.

Table 1 Definition of Service and minimum requirements

STEPS TO PLANNING THE INSTALLATION

Using the specification provided by the client or if one is not available use the “Quick Guide to Smart Wiring™” document found at: www.smartwiredhouse.com.au/trades as a working document when consulting with the client.

NOTE: you may need to augment any electrical schedule or plans developed by the architect or builder to ensure sufficient power points and circuits are installed to meet the requirements of this handbook and provide the functional level of infrastructure.

1. Convert the customers spec into a technical specification
2. Count the number of devices/outlets
3. Determine the size of the home distributor
4. Determine the location for:
 - a) Home distributor
 - b) Carrier lead-in facilities
 - c) Security system
 - d) Electrical switch board and sub board
5. Determine cable pathways
6. Prepare a quote for the customer.

CONVERT THE CUSTOMERS SPECIFICATION INTO A TECHNICAL SPECIFICATION

Sample customer Specifications:

Please provide a quotation for the supply and installation of the following cabling system

Your name: Mr. and Mrs Brown
 Address of project: 27a Whimpoor Cres Narandrer NSW 2067
 Phone: Mr. John Brown Mobile: 0404 040 040

SERVICE NAME	TO BE PROVIDED ☒	PERSONAL NOTES:
 Communications	☒	
 Entertainment	☒	
 Energy management	☒	
 Security	☒	
 Digital Home Health	☒	
 Age & Assisted Living	☒	
 Intelligent Lighting & Power	☒	

Please find: (tick box ☒)

☐ A This form and list of services selected above that will be supported by the cabling being specified
☐ B Marked up house plans
☐ C Unmarked plans

All cabling must be supplied and installed in compliance with:

- Code of Practice for Home Wiring
- Installer Cabling Handbook for Home Wiring

(These documents can be downloaded from www.smartwiredhouse.com.au/trade/)

Please provide the quote to: Mr. and Mrs Brown
 Name quote should be addressed to: 127 Woodbine Ave, Date when required: 30/06/2011
 Address to be delivered: Northcott NSW 2234

IMPORTANT:
 At the completion of the cabling work the compliance label should be completed by the installer and placed in the home distributor with the applicable services marked and all details completed.
 Compliance label references the Code of Practice version. For the latest version go to www.smartwiredhouse.com.au



A. Completed
Quote Request Form

B. Marked Up
House Plans

C. Unmarked House Plans

With reference to the specification provided by the customer identify which of the services has been selected by the customer. Now convert the customer's specification into a technical specification one service at a time:

The following section is based on the "Sample customer Specifications" as shown in the diagram above

1. Communications
2. Entertainment
3. Energy management
4. Security
5. Health
6. Age & Assisted living
7. Lighting & Power.

CONVERSION OF SYMBOLS

SYMBOL	SERVICE	SYMBOL ON PLAN	TECHNICAL SYMBOLS	PLAN
	Communications		Double RJ45 Outlet	Comms/Ent
	Entertainment		Double F connector outlet	Comms/Ent
	Energy management		Single RJ45 Outlet	Comms/Ent
	Security		Movement detector  Smoke detector  Code pad  CCTV 	Security
	Digital Home Health		Single RJ45 Outlet	Comms/Ent
	Age & Assisted Living		Single RJ45 Outlet	Comms/Ent
	Intelligent Lighting & Power		Light fitting  Power Point 	Electrical

Table 2 Technical symbols needed to meet the services needs

Where ever you install an entertainment outlet you must also have a communications outlet and a GPO as a minimum. Ideally any outlet location should consist of what is known as a Smart Wired™ outlet. A Smart Wired™ outlet consists of two RJ45 and two F connectors on one face plate.

At the completion of this exercise you should end up with a set of plans titled:



PLAN	SERVICE TO BE INCLUDED
Communications/ entertainment	Communications, entertainment, energy management and Age and assisted living
Security	Security
Electrical	Electrical

STAGE 1 – DIRECT CONVERSION FROM THE MARKED HOUSE PLANS

The conversion of the customer's plans means translate the customer's squiggles into a drawing showing the engineering symbols. This applies for:

- Communications
- Entertainment
- Energy management

Transfer the communications, entertainment and energy requirements onto the blank plans.

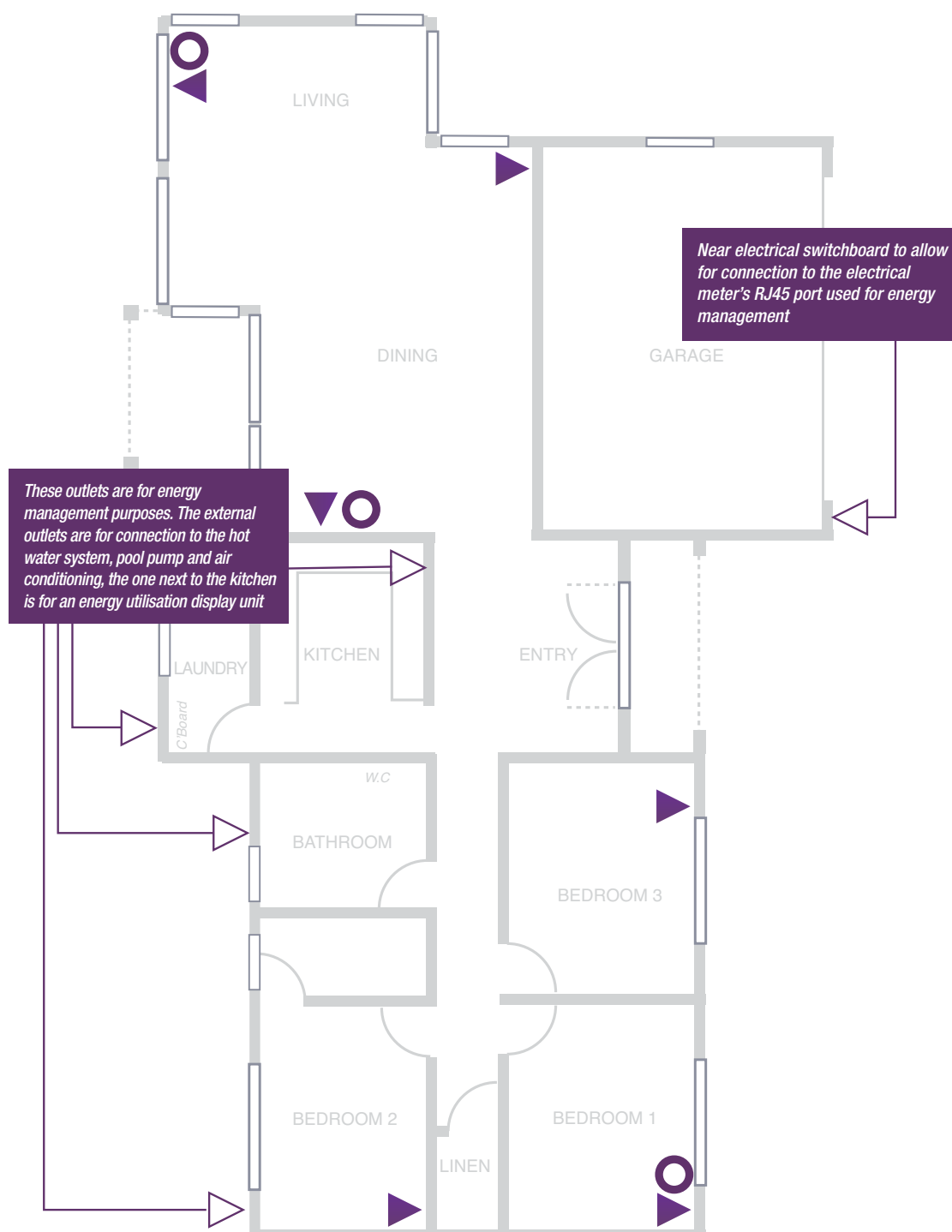


Figure 1 Develop the communications and entertainment plan

STAGE 1 – DIRECT CONVERSION FROM THE MARKED HOUSE PLANS

(continued)

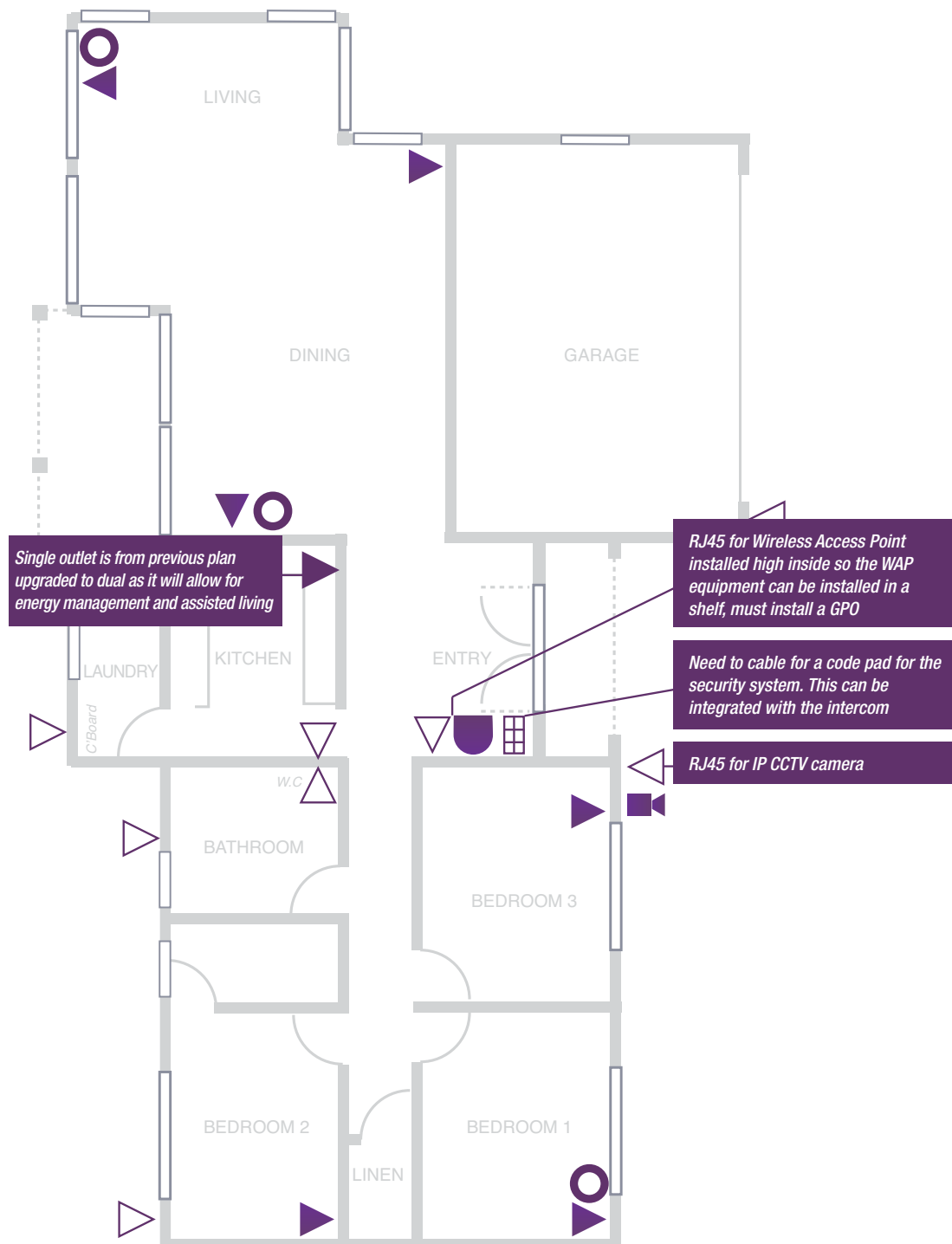


Figure 2 Add the requirements for Age and Assisted Living and Digital health to the communications and Entertainment plan

STAGE 2 - DEVELOP A SECURITY PLAN

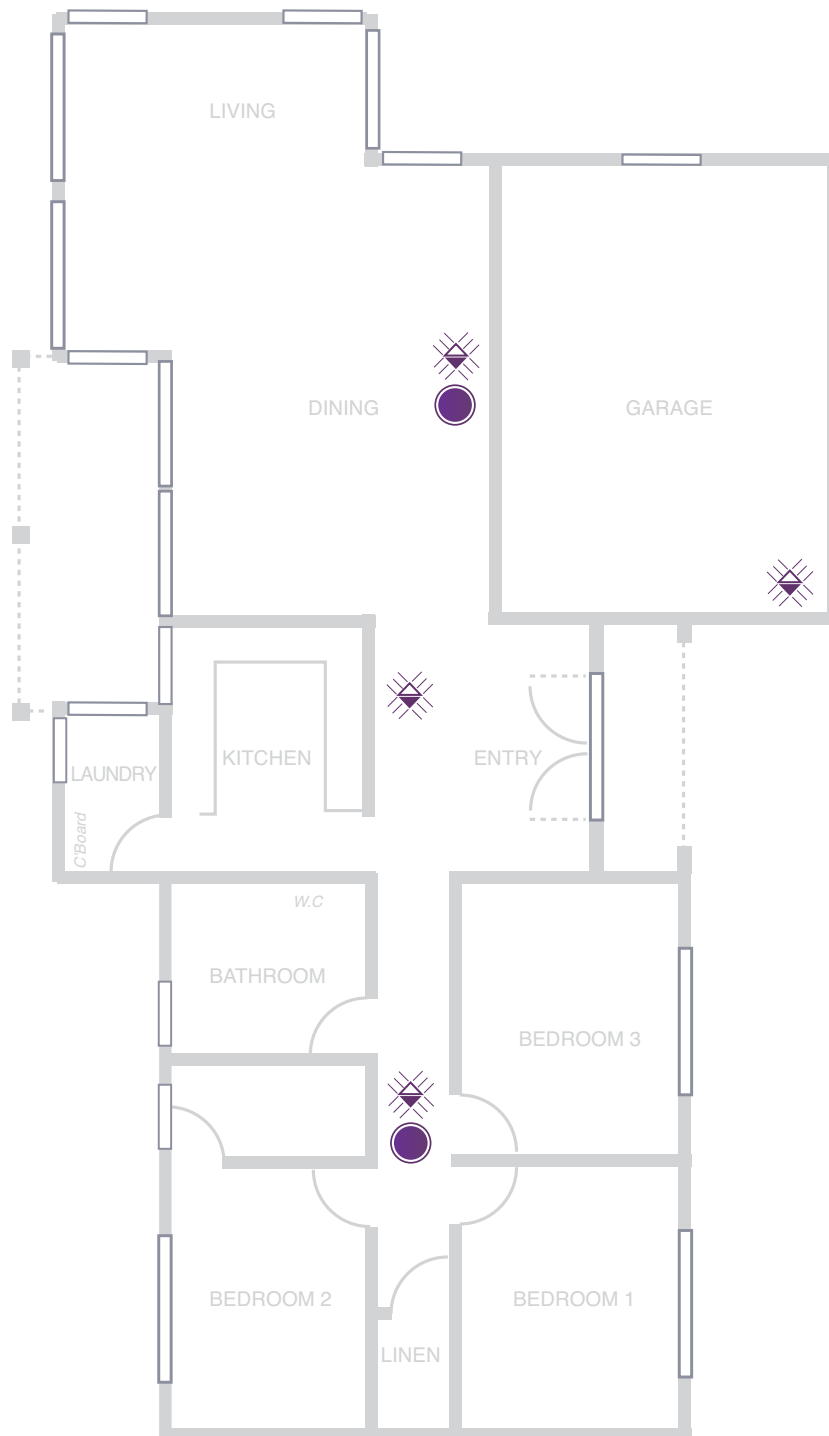


Figure 3 Stage 2 Developing the plan for security

STAGE 3 - DEVELOP THE ELECTRICAL PLAN

For clarity the plan has been reduced to a section of the home and divided into two parts:

- Part I. Cabling to the managed device
Eg light fitting (bank of lights), power points, and pool pumps.
- Part II. Cabling of the data bus for the installation of control devices which are commonly light switches.

PART I – CABLING TO THE MANAGED DEVICES

This is the cabling from the light fitting (bank of light fittings) and power points that are to be individually controlled.

NOTE: This diagram shows the TPS electrical cabling from the device(s) being managed back to the electrical sub-board where the management system is to be installed. In each room there will need to be a power point as well as the bank of lights wired back to the board to be deemed compliant. This diagram shows only one as an example

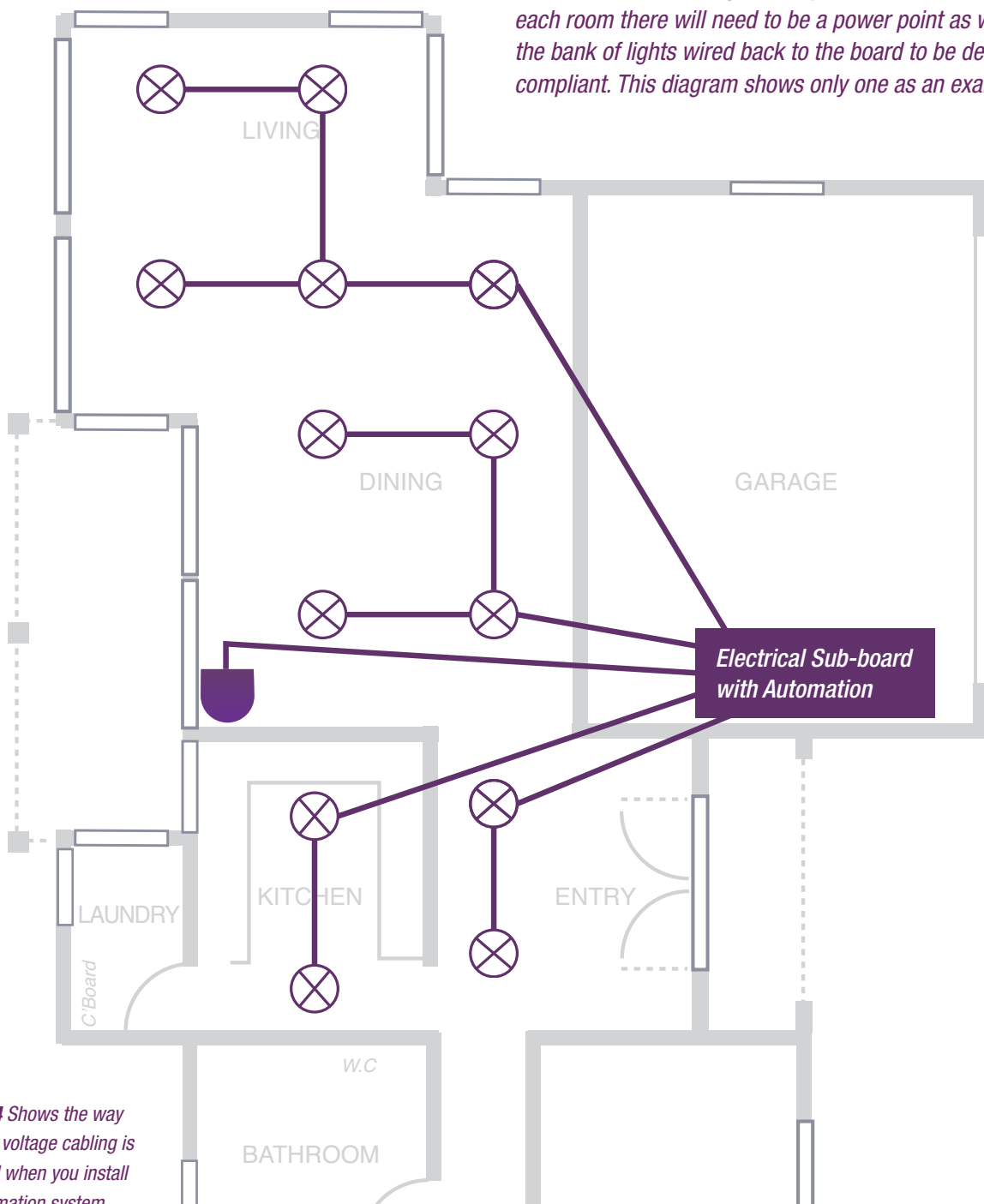


Figure 4 Shows the way the Low voltage cabling is installed when you install an automation system

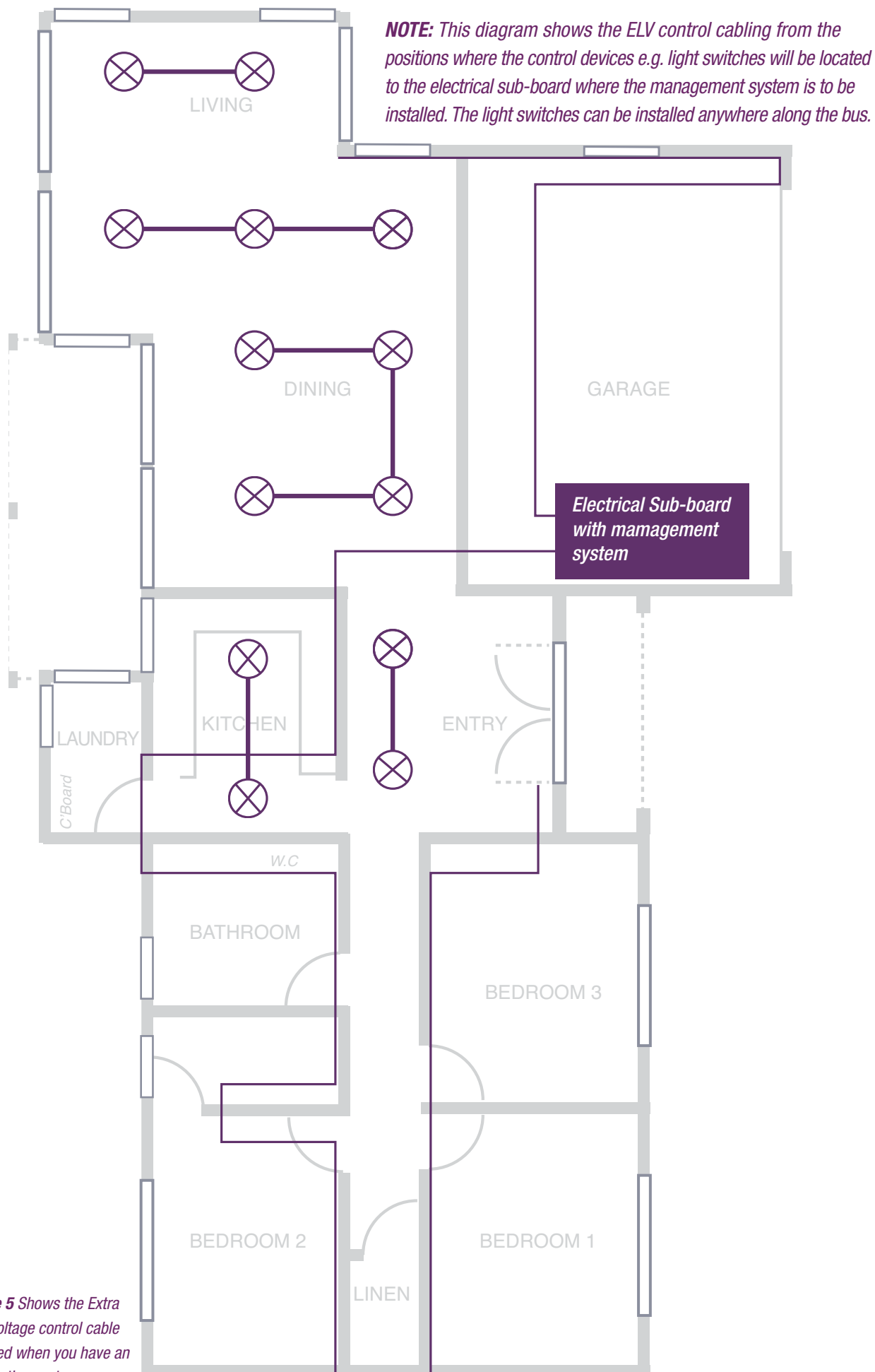


Figure 5 Shows the Extra Low Voltage control cable installed when you have an automation system

STAGE 4 - HOME DISTRIBUTOR AND SECURITY MAIN EQUIPMENT



Figure 6 Stage 3 Home Distributor and Security systems location

WHERE TO LOCATE: HOME DISTRIBUTOR, SECURITY SYSTEM CARRIER LEAD-IN FACILITIES, FREE TO AIR ANTENNA AND PAY TV ENTRY FACILITY

The location of these will need to take into account the type of dwelling the cabling is being designed for, there are two types of dwelling:

- SDU
- MDU

Home distributor (HD)

Home Distributor is the focal point for the following cabling:

- A.** Communications cabling
- B.** TV
- C.** Security system can sometimes be incorporated in the HD or be stand alone.

The location of the home distributor should be a central location with easy access for maintenance purposes. In the case of an SDU such as the house plan used in this document it is probably best to have the home distributor located in the garage. In the case of an MDU the location will need to be identified with the architect or designer and take into consideration the location of the FTA, Pay TV and Carrier services riser or pathways. The HD should be located within the private dwelling to allow for ease of access by the residents.

Security system

The location of the security systems is either in the HD or a stand alone system. Again the best location for the security system is in the garage but it may vary when the architecture of the home is taken into consideration.

Carrier lead-in facilities

Like electricity, water and sewerage provision has to be made for the installation of the cabling for communications. We can divide the carrier service facilities into two main types:

1. Copper lead-in
2. Fibre lead-in

Copper

Copper cabling can be divided into two types

1. Aerial
2. Underground

Aerial

Telecommunications network will be extended into the dwelling from a pole in the street and attached typically to the fascia of the dwelling and then extended into the network boundary point.

Underground

Telecommunications network will be extended into the dwelling from a pit in the street onto a point typically near the electrical switch board on the dwelling and then extended into the network boundary point.

Network boundary

The network boundary can exist in any of the following forms:

- I.** First Telecommunications Outlet
- II.** Network Termination Device (NTD)
- III.** Main Distribution Frame (MDF)

Telecommunications outlet (common in SDU)

The network boundary is the first telecommunications outlet when the telecommunications outlet is connected directly to the lead-in cable and there is no NTD or MDF. A carrier may install a box to convert from the outdoor cable to the indoor cable but this is not a network boundary point.

Network termination device (NTD)

Network termination device is a box typically installed near the electrical switch board and it is clearly marked "NTD" or "NETWORK TERMINATION DEVICE".

Main distribution frame (MDF) Common in MDU

Main Distribution Frame (MDF) is a box typically installed inside the premises and provides for cross connection between the carrier cable and the customer cabling in the dwelling.

In all of the above cases it is necessary to run a cable to extend the carrier services from the Network Boundary point to the Home distributor.

Fibre

In the case of fibre being run into the home the carrier's cabling is extended from a pit in the street to the dwelling and connected to an Optical Network Termination (ONT) device which is a Network Termination Device and therefore the Network Boundary. The ONT is installed either near the electrical switchboard or inside the dwelling near the Home Distributor.

NOTE: the HOME DISTRIBUTOR is not a NETWORK BOUNDARY.

In such a case it is recommended to install a Smart Wired™ Universal Interface (SWUI) or equivalent adjacent to the ONT, see Appendix A – Smart Wired™ Universal Interface for details.

Once the Universal interface is installed it will be necessary to extend all services on the Universal Interface to the Home Distributor, this will mean:

1. Install twisted pair to extend the POTS. This is easily achieved with the installation of one cat 5 or 6 cable from the SWUI to the HD.
2. Install four Cat5 or 6 cables from the SWUI to the HD for Data
3. Install RG6 quad shield cabling from the SWUI to the HD.

For details on who does what when installing the carrier lead-in cable, see section titled Appendix B Carrier/Carriage Service provider lead-in facilities

Free to air Antenna

In an SDU RG6 quad shield cabling needs to be installed from the location where the antenna will be installed to the HD.

In and MDU RG6 quad shield cabling needs to be installed from the location where the antenna's MATV access point is located to the HD.

Pay TV entry facility

There are three options:

1. Satellite
2. Copper cable
3. Fibre.

Satellite

- **SDU** -Install four RG6 quad shield cables from the north facing roof to the HD.
- **MDU** -Install four RG6 quad shield cables from the back bone cabling installed for Pay TV services.

Copper cable

- **SDU** -Install one RG6 quad shield cable from the location where the pay TV operator will bring the street cable in, this is typically near the electrical switchboard.
- **MDU** -Install one RG6 quad shield cables from the back bone cabling installed for Pay TV services.

Fibre

- **SDU** -See Appendix A – Smart Wired™ Universal Interface.
- **MDU** -See appendix A – Smart Wired™ Universal Interface.

STAGE 5 - PLAN CABLE PATHWAYS

Planning and installing cable pathways is considered best practices as it allows for all cabling associated with the delivery of services to the home to be well supported, secured and complying with the separations as dictated by standards.

To ensure the separation required between ELV and LV as well as allow for ease of maintenance it is strongly recommended to identify cable pathways and install:

- Cable tray
- Catenary
- Conduits

This will allow for the proper segregation to be met, additional cabling to be installed and access for maintenance purposes.

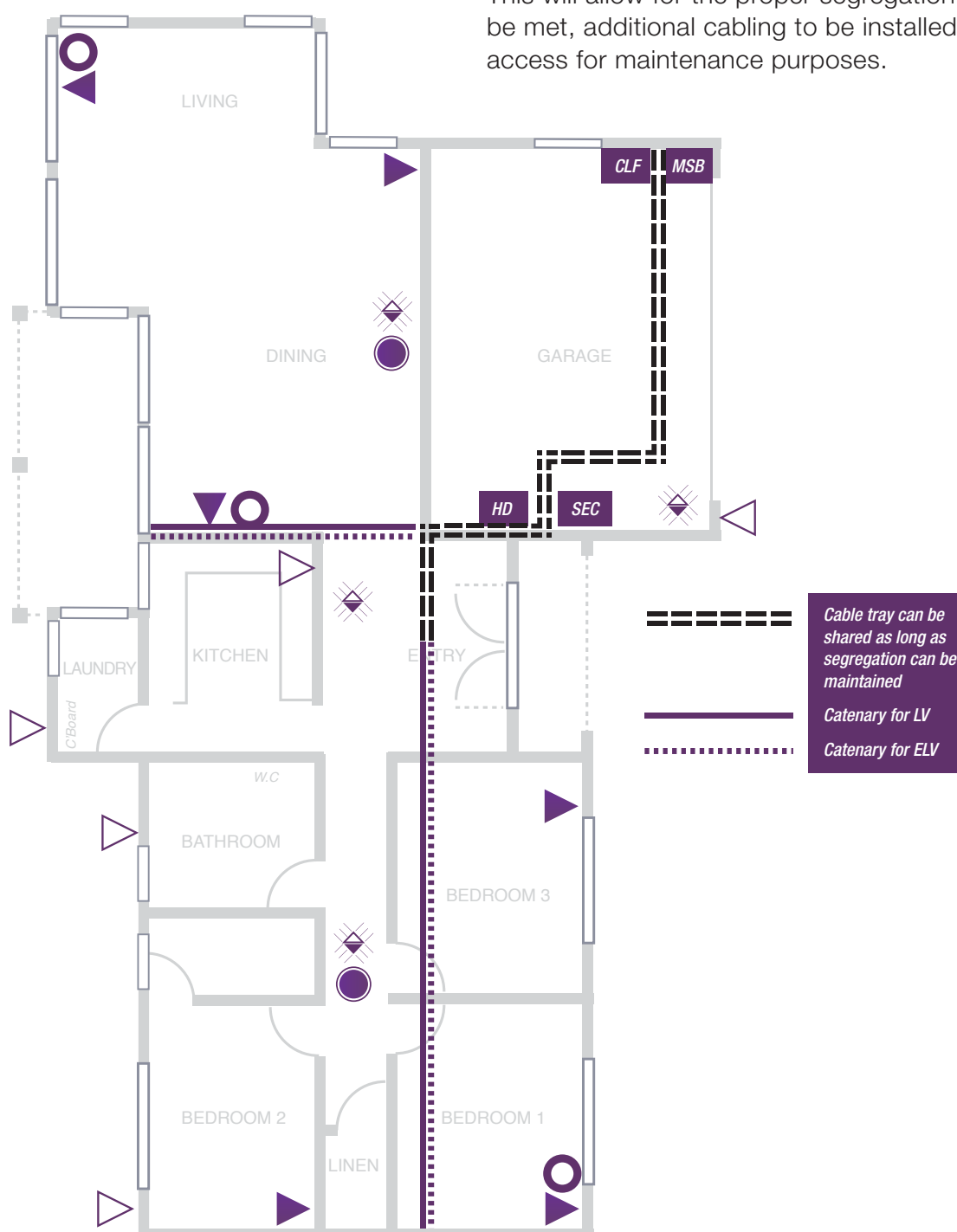


Figure 7 Location of cable pathways

COUNT THE NUMBER OF DEVICES/OUTLETS

Now count the number of devices/outlets as this will be important in determining the size of switchboards, home distributors, security system and also cable pathways.

Device count should be recorded on a table as follows:

COMMS / ENT	RJ45 Outlets					
	INTERNAL		EXTERNAL		F CONNECTORS	
	Single	Double	Single	Double	Single	Double
HOUSE						
Garage						
Covered Port						
Dining						
Kitchen						
Family						
Lounge						
Corridor						
Entry						
Rumpus Room						
bedroom 1						
bedroom 2						
bedroom 3						
bedroom 4						
Veranda						
Laundry						
Powder Room						
Bath						
Energy management						
FRONT YARD						
Garden						
BACK YARD						
Pool						
Garden area						
Entrance Deck						
TOTAL						

Table 3 Preparing for a bill of materials; Comms & Ent

NOTE: Because the outlets for Energy Management, Digital Health and Age & Assisted Living are RJ45 they are included in this table.

SECURITY	SECURITY			INTERCOM	
	PIR	Smoke Detector	Code Pad	Outdoor Sations	Internal Stations
HOUSE					
Garage					
Covered Portico					
Dining					
Kitchen					
Family					
Lounge					
Corridor					
Entry					
Rumpus Room					
bedroom 1					
bedroom 2					
bedroom 3					
bedroom 4					
Veranda					
Laundry					
Powder Room					
Bath					
FRONT YARD					
Garden					
BACK YARD					
Pool					
Garden area					
Entrance Deck					
TOTAL					

Table 4 Preparing for a bill of materials; Security

	Power				Light Fittings or groupings				Light Switches			
	Internal		External									
	Single GPO	Double GPO	Single GPO	Double GPO	1	2	3	4	1 Switch	2 Switch	3 Switch	4 Switch
HOUSE												
Garage												
Covered Port												
Dining												
Kitchen												
Family												
Lounge												
Corridor												
Entry												
Rumpus Room												
bedroom 1												
bedroom 2												
bedroom 3												
bedroom 4												
Veranda												
Laundry												
Powder Room												
Bath												
Energy management												
FRONT YARD												
Garden												
BACK YARD												
Pool												
Garden area												
Entrance Deck												
TOTAL												

Table 5 Preparing for a bill of material; Intelligent Lighting & Power

NOTE: this is a guide only as the type of equipment configuration may vary depending on the installer preference.

Having counted the number of outlets, light fittings, power points, security devices etc. you can now determine the size of the:

- Electrical switchboard or sub-board
- Home distributor
- Security system.

CABLING REQUIREMENTS

This section provides details about the cabling requirements to support:

1. Communication
2. Entertainment
3. Energy management
4. Security
5. Health
6. Age & Assisted living
7. Lighting & Power

SERVICE	TECHNICAL SYMBOLS	CABLE AND CONNECTOR SPECIFICATION
Communications	Double RJ45 Outlet 	Cabling used to each RJ45 outlet is four pair Category 5 UTP cable. All RJ45 shall be Category 5 or better unless fibre is used.
Entertainment	Double F connector outlet ¹ 	Cabling used to each F connector is Quad Shielded RG 6 certified to 2GHz or better ¹ . F connectors should be compression type rated to 2GHz.
Energy management	Single RJ45 Outlet 	Cabling used to each RJ45 outlet is four pair Category 5 UTP cable. All RJ45 shall be Category 5 or better.
Security	Security detector 	Four core multi strand copper cable.
	Smoke detector 	Four core multi strand copper cable or TPS twin & earth.
	Code pad 	Six core multi strand copper cable
Digital Home Health	Single RJ45 Outlet 	Cabling used to each RJ45 outlet is four pair Category 5 UTP cable. All RJ45 shall be Category 5 or better.
Age & Assisted Living	Single RJ45 Outlet 	Cabling used to each RJ45 outlet is four pair Category 5 UTP cable. All RJ45 shall be Category 5 or better.
Intelligent Lighting & Power	Light fitting and Power point	TPS as per the requirements laid out in the Australian standards.
	Control bus	Unshielded Twisted Pair.

Table 6 Cable types

Note 1: Some service providers require the use of approved cable type before they will connect to any home cabling. It is the installer's responsibility to ensure the approved cable type is used. See Appendix D - Sources of information

STEP 2

QUOTATION

PREPARE A QUOTE FOR A CUSTOMER

The quote should list the service requested by the client in their specification:

1. Communications
2. Entertainment
3. Energy management
4. Security
5. Digital Home Health
6. Age & assisted living
7. Intelligent Lighting & Power.

It should detail the total number of devices as identified in the section titled “Count the number of Devices/ Outlets” and provide details of the cabling to bring the carrier services, Free to air TV and Pay TV to the HD.

Sample Quotation form

Residential Building Works / Specialist Work

QUOTATION

Contractor's Name: (As shown on Licence) Number: / /

Address: Suburb: Tel: Email: Fax: Postcode: Date: ABN: Contractors Licence No: Expiry Date: Work Category: Work Location: Site Contact: e-mail: Tel: Fax:

Customer's Name: Address: Suburb: Tel: Email: Fax: Postcode: The described work is based on the contractor's inspection of the worksite or based on the customer's information and instructions as the case may be. The actual extent of the work involved may not be evident before the work commences. In the event of a budget being provided this is done in good faith and does not constitute the final amount payable. The contractor undertakes to advise the customer of unforeseen problems provided suitable points of communication are arranged. The conditions of contract on the back of this form include the statutory warranties in terms of the Home Building Act 1989.

Description of Work and Materials (Attach separate page if insufficient space)

Quotation Price
☐ Fixed ☐ Variable
 Labour Rate (per hour rate): \$ Total Price (including GST) \$
 Material @ Trade Cost Plus: \$ %
 Equipment @ Trade Plus: \$ %

Note 1: **WARNING** See terms and conditions on the reverse side of this document regarding contract price if not known and procedures for variations to the contract.
 Note 2: If the total value of the works (including labour and materials) does not exceed \$1,000 this quotation when signed by both parties shall become a binding contract.
 Note 3: If the value of the works is expected to be above \$1,000 it will be necessary for the parties to enter into a separate written contract.

Terms of Payment
 Cash
 Cheque
 Credit Card

Acceptance of Quotation
 On behalf of the Contractor: Sign: Print: Date Signed:
 On behalf of the Customer: Sign: Print: Date Signed:

Duration of Contract: 5 working days
 Commencement Date: Other period if agreed (days)
 Completion Date: MC VISA OTHER

This quotation is valid until:

Form No. 1 Produced by the National Electrical and Communications Association New South Wales Chapter www.neca.asn.au

White Copy Customer - Yellow Copy Contractor - Blue Copy File

STEP 3

INSTALLATION

This section will provide an installation guide to ensure the cabling platform will support the following technologies:

1. Communications
2. Entertainment
3. Energy management
4. Security
5. Digital Home Health
6. Age & Assisted Living
7. Intelligent Lighting & Power.

LICENSING REQUIREMENTS

Any installation must be done by a competent and licensed person, the table below indicates the level of competency and licensing that is required.

SYMBOL	SERVICE PLANNED	MINIMUM LICENSING REQUIREMENTS
	Communications	Must hold an Open Registration with endorsements for Structured and Coaxial Cabling. If using fibre then the installer must hold the fibre endorsement.
	Entertainment	Must hold an Open Registration with endorsements for Structured and Coaxial Cabling. If using fibre then the installer must hold the fibre endorsement.
	Energy management	Must hold an Open Registration with endorsements for Structured cabling
	Security	Must hold an Open Registration and have a security installer licence if required in the state the dwelling is being built. If using fibre then the installer must hold the fibre endorsement.
	Digital Home Health	Must hold an Open Registration with endorsements for Structured and Coaxial Cabling. If using fibre then the installer must hold the fibre endorsement.
	Age & Assisted Living	Must hold an Open Registration with endorsements for Structured and Coaxial Cabling. If using fibre then the installer must hold the fibre endorsement.
	Intelligent Lighting & Power	Must be a Licensed electrician

Table 7 Licensing requirements

GENERAL CABLING SYSTEM

In general the cabling installed in a residential dwelling can be divided into:

- Extra Low Voltage
- Low Voltage

TECHNOLOGY	EXTRA LOW VOLTAGE	LOW VOLTAGE
Communications	X	
Entertainment	X	
Energy management	X	
Security	X	X
Digital Home Health	X	
Age & Assisted Living	X	
Intelligent Lighting & Power		X

Table 8 Technology related to voltage ranges

All cabling should be:

1. Properly supported ensuring the cabling will not be under any mechanical stress throughout the life of the installation.
2. Ensure minimum bending radius is maintained. A bend radius greater than 8 times the cable diameter.
3. Adequate cable pathways are used to ensure segregation is maintained.
4. Mechanically supported at termination points.
5. Run parallel to the walls of the dwelling.
6. Installed with spare cable length of 300 to 500mm at the termination points to allow for maintenance.
7. Where possible installed in conduit in concealed location.
8. During installation avoiding excessive tension when pulling cables to avoid excessive mechanical stress and avoid any kinks or knots to form in the cable.

9. Not be stapled. If the cable needs to be supported or restrained within a building cavity (e.g. to keep it out of harm's way or to maintain separation from other services), use loose fitting devices such as conduit or conduit saddles. For surface runs on walls, use plastic trunking or conduit to house the cable.
10. Where cable runs are part of a star wired configuration they should be continuous, do not join or splice cables.
11. Cable shall be stripped using strippers designed for the cable.

Outlets should all be:

1. Installed at 300mm above the floor or as required in specific locations
2. Should be carefully placed to ensure they are not in places where furniture will make them inaccessible
3. Should be segregated as per standards
4. Should be installed using a mounting bracket.

Location

The location of equipment will vary from installation to installation and the suggested location is covered in the section titled "Where to locate:" found on page 15. It is important in cases where the active equipment will not be installed at the time of cabling that the location of all the equipment be as close to each other as possible and adequate cable pathways be provided to run cable between them. The rationale for this is based on the possible integration between various systems. An example is where a security system may be integrated with an automation system to control the status of the lights.

COMMUNICATIONS

Cabling for all communications should be:

1. Star wired from the HD
2. Terminated on RJ45 sockets and terminated using either EIA 568A or B pin configuration. Both ends must be terminated using the same configuration
3. Shall maintain the twist of the pair up to the point of termination
4. Cable length shall not exceed 90 metres from the home distributor.

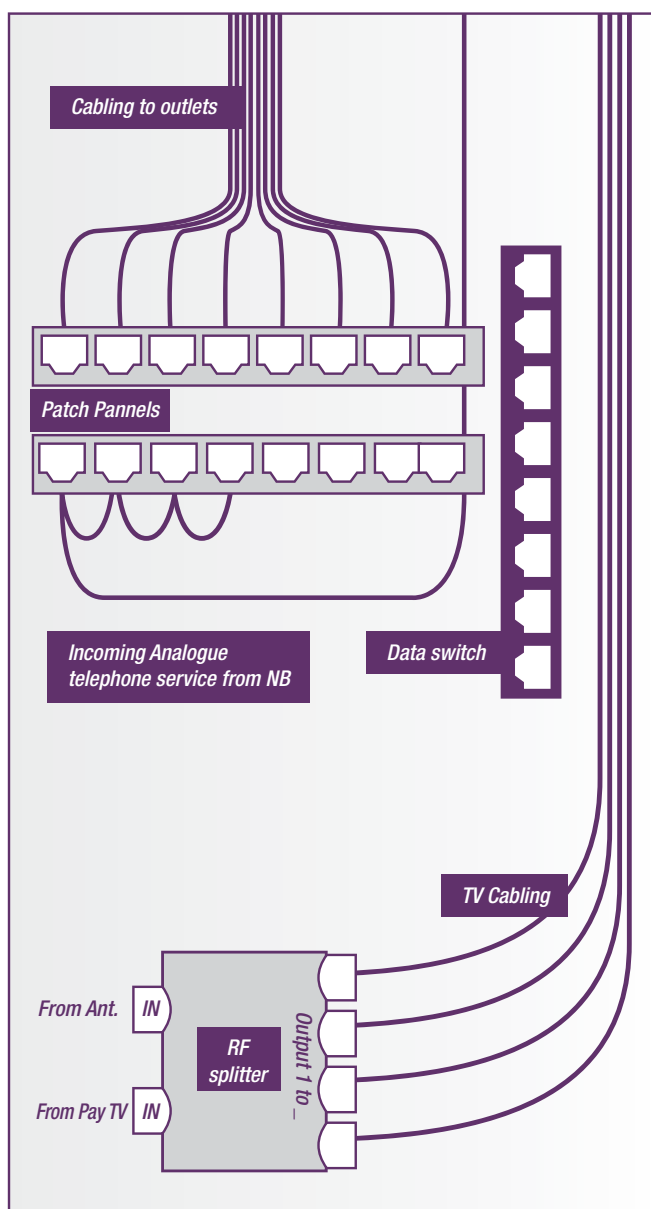


Figure 8 Sample Home Distributor layout

ENTERTAINMENT

Cabling for all entertainment outlets (f connectors) should be:

1. Star wired from the HD
2. Terminated on F type connectors rated at 2GHz compression fitting type connectors.
3. The cables can be arranged onto a patch panel or connected directly to an RF Splitter.
4. A minimum of two coax cables should be run to each outlet location.

All connectors shall be installed using appropriate tools.

ENERGY MANAGEMENT

Cabling for all communications should be:

1. Star wired from the HD
2. Terminated on RJ45 sockets and terminated using either EIA 568A or B pin configuration. Both ends must be terminated using the same configuration.
3. Shall maintain the twist of the pair up to the point of termination.
4. Cable length shall not exceed 90metres from the home distributor.

SECURITY

Cabling should be installed for:

1. Smoke detectors
2. Movement detectors
3. Code pad
4. Back to base connection
5. CCTV

Smoke detectors

If the smoke detectors form part of the security system, the cabling for the smoke detector should be 4 core multi-strand star wired from the security system. (If the smoke detectors are integrated to the security system they must be fully operational and direct mains connected detectors are not necessary).

NOTE: Under the Building Code of Australia (BCA) volume 2 part 3.7.2 the installation of smoke detectors in all new dwellings is mandatory. For more details please refer to the BCA.

Motion detectors

Cabling for the motion sensors should be 4 core multi-strand, star wired from the security system.

Code pad

Cabling for the code pads should be 6 core multi strand wired from the security system.

CCTV

1. Cabling for the CCTV camera should be star wired from the Home Distributor
2. Terminated on RJ45 sockets and terminated using either EIA 568A or B pin configuration. Both ends must be terminated using the same configuration
3. Shall maintain the twist of the pair up to the point of termination.
4. Cable length shall not exceed 90metres from the home distributor.

Digital Home Health

1. Terminated on RJ45 sockets and terminated using either EIA 568A or B pin configuration. Both ends must be terminated using the same configuration.
2. Shall maintain the twist of the pair up to the point of termination.
3. Cable length shall not exceed 90metres from the home distributor.

Age & Assisted Living

1. Terminated on RJ45 sockets and terminated using either EIA 568A or B pin configuration. Both ends must be terminated using the same configuration
2. Shall maintain the twist of the pair up to the point of termination.
3. Cable length shall not exceed 90metres from the home distributor.

Intelligent Lighting & Power

1. All uniquely controlled devices must be star wired from the main or sub board being used to house the automation system
2. Data cabling can be star or bus, the overall length of the bus must be kept to as short as practically possible
3. Termination of the bus cable will vary depending on the manufacturer's equipment used.

LABELLING

The following table details the labelling requirements.

All outlets and cables should be labelled.

All RJ45 and F connector outlets should be labelled so they can be clearly identified in the HD. The labelling can be as simple as a unique number on the outlet reflected in the HD.

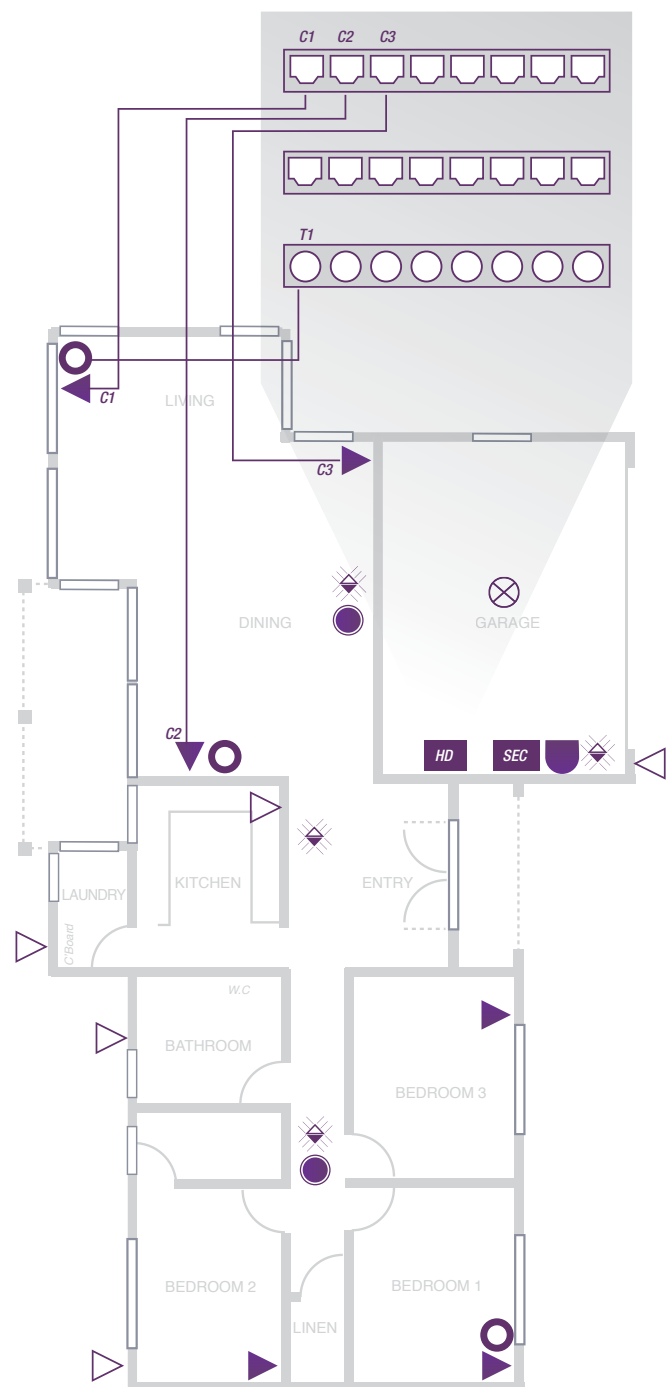


Figure 9 Sample labelling

INTELLIGENT LIGHTING & POWER

ELECTRICAL DISTRIBUTION LIST							
CB	CIRCUIT - Cable	Location	Description	Relay	Dimmer	Dimmer Channel	Relay Channel
	1	Carport	6 Downlights	1			1
	2	Portico	2 Surface Mount 2 uplifters	1			2
	3	Entry	2 Downlights	1			3
	4	Kitchen	2 Downlights over stove	1			4
	5	Lower Deck	4 Downlights	2			5
	6	Dining	1 Light Centre		1	1	
	7	Dining	4 Downlights		1	2	
	8	Passageway	3 Downlights	2		3	6
	9	LivingRoom	6 Downlights		2		
	10	Rear Small Deck	4 Downlights	2			7
	11	Spare					
	12	Bathroom Ground	3 Downlights	2			8
	13	Air Con. Dampers					
	14	Hall to Bedrooms	3 Downlights	3			9
	15	Living Room	2 Downlights next to wall- Picture lights	3			10
	16	Bedroom 2	2 Downlights		2	4	
	17	Bedroom 3	2 Downlights		3	5	
	18	Bedroom 4	2 Downlights		3	6	
	19	Stairs	5 Downlights	3			11
	20	Deck Main	4 Downlights		4	7	
	21	Rear Garden Lights	3 Lights		4	8	
	22	Bathrooms	2 Towel Rail	3			12
	23	Spare					
	24	Kitchen	3 Pendant Lights	4			13
	25	Kitchen	2 Downlights above microwaive and freezer	4			14
	26	Front Top	4 Downlights	4			15
	27	Stairs Deck	1 Light	4			16
	28	Study	2 Downlights		5	9	
	29	Master Bedroom	4 Downlights		5	10	
	30	Ensuite - Mirror Lights	2 Downlights	5			17
	31	Rumpus 1	1 Light		6	11	
	32	Rumpus 2	1 Light		6	12	
	33	Alcove Main Bedroom	1 Light	5			18
	34		2 Lights	5			19
	35	Data Centre	1 Light	5			20
	36	Laundry	1 Light	6			21
	37	Ensuite Ground	Blower Heater	6			22
	38	Kitchen Cabinets	2 Downlights		7	13	
	39	Bathroom Ground		6			23
	40	Walk in Wardrobe	3 Lights		7	14	
	41	Outside Master Bedroom	3 Lights		8	15	
	42	Ensuite Master Bed	1 Main Light		8	16	
	43			6			
	44	Main Filter and Solar		7			
	45	Timer Controlled GPO		7			
	46			7			
	47	Spa pump and Light for pool		7			

Table 9 Sample Electrical Sub Board Schedule

STEP 4

TESTING AND COMMISSIONING GUIDE

TESTING REQUIREMENTS

This section sets out the testing regime required to test the cabling infrastructure installed.

SYMBOL	SERVICE	TESTING REQUIREMENTS
	Communications	Pair continuity and integrity.
	Entertainment	DC and resistance testing of the outlets.
	Energy management	Pair continuity and integrity.
	Security	Conductor continuity and integrity ¹
	Digital Home Health	Pair continuity and integrity.
	Age & Assisted Living	Pair continuity and integrity.
	Intelligent Lighting & Power	All electrical cabling shall be tested in compliance with the Australian standards. All bus cabling shall be tested for continuity.

Table 10 Testing requirements

Note 1: if smoke detectors are installed as part of the security system they must be fully operational and commissioned.

All test results should be documented and provided to the customer with all documentation.

SAMPLE TEST RESULT SHEET

The sample test sheets provided are for installations where only the cabling is installed and there is no hardware installed. If you as the installer are also supplying active equipment it is your responsibility to provide full functional testing and commissioning records to the customer.

COMMUNICATIONS AND ENTERTAINMENT						
RJ45 Outlet No.	Pair Integrity	Full Certification if Provided		F. Connector No.	DC Testing	Resistance
1				1		
2				2		
3				3		
4				4		
5				5		
6				6		
7				7		
8				8		
9				9		
10				10		
11				11		
12				12		
13				13		
14				14		
15				15		
16				16		

Table 11 Sample test result sheet for Comms, Ent, Energy Mgr, Digital health and Age & Assist living

SECURITY	CABLE CONDUCTOR INTEGRITY	INTERCOM STATION	CABLE CONDUCTOR INTEGRITY
PIR		1	
1		2	
2		3	
3		4	
4		5	
5		6	
6		7	
7		8	
8			
CODE PAD			
1			
2			
3			

Table 12: Sample test result sheets for security and intercom

STEP 5

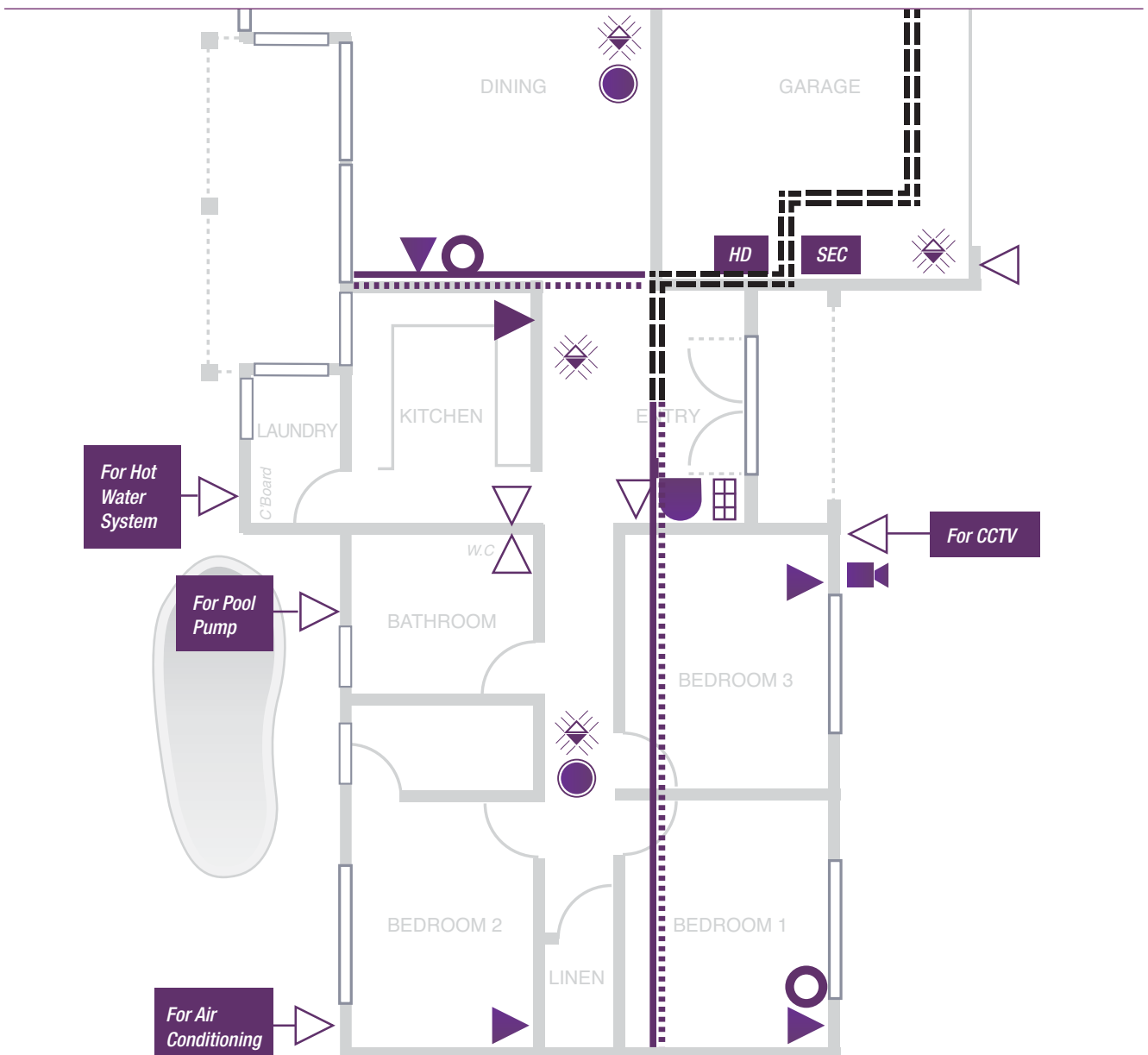
USER DOCUMENTATION

The documentation to be provided to the customer is:

1. As-built plans of the installation
2. Copy of test results
3. Telecommunications cabling advice form
4. Certificate of Compliance for electrical installations as per State & Territory requirement
5. Code Compliance label

SAMPLE USER DOCUMENTATION

As built plans of the installation



COPY OF TEST RESULTS

COMMUNICATIONS AND ENTERTAINMENT					
RJ45 Outlet No.	Pair Integrity	Full Certification if Provided	F. Connector No.	DC Testing	Impedance
1	OK	<i>This is completed if full certification testing has been done</i>	1	OK	OK
2	OK		2	OK	OK
3	OK		3	OK	OK
4	OK		4	OK	OK
5	OK		5	OK	OK
6	OK		6	OK	OK
7	OK		7	OK	OK
8	OK		8	OK	OK
9	OK		9	OK	OK
10	OK		10	OK	OK
11	OK		11	OK	OK
12	OK		12	OK	OK
13	OK		13	OK	OK
14	OK		14	OK	OK
15	OK		15	OK	OK
16	OK		16	OK	OK

Table 11 Sample test result sheet for Comms, Ent, Energy Mgr, Digital health and Age & Assist living

SECURITY		CABLE CONDUCTOR INTEGRITY	
PIR		OK	
1		OK	
2		OK	
3		OK	
4		OK	
5		OK	
6		OK	
7		OK	
8		OK	
CODE PAD			
1		OK	
2		OK	
3		OK	

INTERCOM STATION		CABLE CONDUCTOR INTEGRITY	
1		OK	
2		OK	
3		OK	
4		OK	
5		OK	
6		OK	
7		OK	
8		OK	

Table 12 Sample test result sheets for security and intercom

TELECOMMUNICATIONS ADVICE FORM

Telecommunications cabling advice

Copies required for customer, cabler and employer (if applicable)



Australian Government
Australian Communications
and Media Authority

Instructions for completion

Requirements

A registered cabling provider must complete this form after each cabling job (except for certain exemptions). Cablers must retain a copy of this form for at least 12 months and pass a copy to the customer and/or employer.
Print clearly. Illegible, unclear or incomplete application forms may delay processing.

Enquiries

For advice on completing this form, please go to ACMA's website at www.acma.gov.au (go to For licensees & industry: Service & technical requirements > Telecommunications : Cabling requirements > TCA forms > How to complete TCA forms).
Technical enquiries about cabling should be directed to:
Email: cablingqueries@acma.gov.au
Phone: 1300 850 115.

Registered cabling provider

Name

SURNAME

GIVEN NAMES

Address

POSTCODE

Contact details

WORK ()

MOBILE

Registration number

Name of registrar

Employer (IF APPLICABLE)

Name of company

Contact details

WORK ()

MOBILE

Address

POSTCODE

Description of work (INCLUDING ANY SUPERVISION)

Customer details

Name

Address

POSTCODE

Contact details

WORK ()

FAX ()

Certification

I hereby certify that the cabling work described in this advice complies with the Wiring Rules (AS/ACIF S009:2006 or its replacement).

SIGNATURE

DATE

PRINT FULL NAME

CERTIFICATE OF COMPLIANCE FOR ELECTRICAL WORK

CERTIFICATE OF COMPLIANCE - ELECTRICAL WORK

CUSTOMER DETAILS
CUSTOMER/PREMISES DETAILS

Name: _____
 Address: _____
 Cross Street: _____
 Post Code: 3456

Customer/DNSP OFT/Contractor
CERTIFICATE NO: _____
 COPY

Telephone contact: _____
 Meter No: _____
 NMI (if available): _____

INSTALLATION WORK DETAILS

Type Of Installation: ☐ Residential ☐ Commercial ☐ Industrial ☐ Rural ☐ Other

Special conditions: ☐ over 100 amps ☐ High Voltage ☐ Hazardous Area ☐ Generator

Indicate the type of installation and types of work performed under this

CERTIFICATE MUST BE ISSUED TO THE CUSTOMER FOR ALL ELECTRICAL WORK

Work of the following type must ALSO be notified to the ELECTRICITY DISTRIBUTOR (DNSP)

☐ New Installation ☐ Network connection or metering

☐ Additions or alterations to a switchboard or associated equipment ☐ Defect Rectification No: _____

DETAILS OF EQUIPMENT

EQUIPMENT	RATING	No.	PARTICULARS OF WORK
☐ Switchboards			
☐ Circuits			
☐ Lighting			
☐ Socket-outlets			
☐ Appliances			

Describe the equipment and estimate load increase of the work affected by this Notice.

Estimated increase in load A/ph: _____

☐ Work is connected to supply ☐ Increased load is within capacity of installation/service mains

☐ Work is not connected to supply pending inspection by DNSP

The work has been carried out or supervised by: _____ Licence No: _____

TEST REPORT

☐ Earthing system integrity Ω ☐ Residual current device operation

☐ Insulation resistance, M Ω ☐ Visual check that installation is suitable for connection to supply

☐ Polarity ☐ Stand-alone power system complies with AS 4509

☐ Correct circuit connections ☐ Fault Loop Impedance (if necessary)

I confirm that I have carried out the above tests and visually checked that the installation work described in this Certificate complies with AS/NZS 3000 and is suitable for its intended use

Name: _____
 Signature: _____

Licence No: _____
 Date of Testing: _____

CERTIFICATION

I, the Electrical Contractor give notice to the Customer and of DNSP or OFT, that the work described in this Certificate has been completed in accordance with the Electricity (Consumer Safety) Regulation 2006

Name: _____
 Signature: _____
 Address: _____

Licence No: _____
 Date of Notice: _____
 Telephone No or Other Contact: _____

Assessor remarks

Assessed by: _____
 Comments: _____
 Date: _____

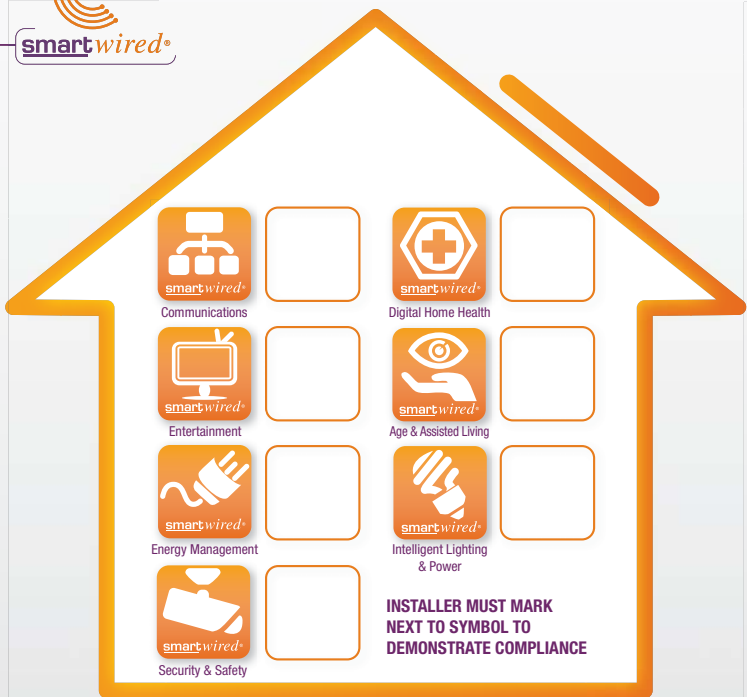


NOTE: This form will vary from State/ Territory

CODE COMPLIANCE LABEL



COMPLIANCE WITH THE CODE OF PRACTICE FOR HOME WIRING



Installers Details:

Company Name

Date

Contact Details

Open Registration

Compliance with the Code of Practice for Home Wiring 2010 available from www.smartwiredhouse.com.au

Note: If the installer details are not completed the installation is not compliant and the symbols cannot be used.

These symbols indicate that the home has had a minimum level of cabling installed to support the services in accordance with The Code of Practice for Home Wiring, which can be downloaded free of charge from www.smartwiredhouse.com.au

NOTE: Compliance with the Code of Practice requires the Code Compliance Label to be located in the Home Distributor. It is therefore recommended all customer documentation be located in the Home Distributor.

NOTES

APPENDIX A

SMART WIRED™ UNIVERSAL INTERFACE

THE ONT INTERFACES

ONT can have up to three different types of interfaces to support the delivery of voice, data and video. The physical connection may vary and are detailed below.

Plain Old Telephone Service (POTS)

The connection from the ONT to the home cabling for the POTS services is typically achieved in one of the following ways:

1. Screw terminals
2. 6P4C modular socket (commonly referred to as RJ12)

Internet

The connection from the ONT to the home cabling for data networking purposes is achieved via 1 to 4 8P8C modular sockets, (commonly referred to as RJ45).

Television

The connection from the ONT to the home cabling for Television signals be it Free to Air or Pay TV is achieved via one F type connector.

UNIVERSAL INTERFACE

ONT side

The universal interface is designed to be installed adjacent to the ONT. On the ONT side it can accept:

1. Either manufactured patch cords or IDC for direct termination to extend the POTS services from the ONT to the customer cabling
2. Pre manufactured patch cords with RJ45 modular plugs to extend the data ports into the customer cabling
3. Pre manufactured patch cords with F connector to extend the RF output into the customer cabling.

Customer side

On the customer side the Universal Interface provides only one type of physical interface for voice and data this being IDC terminations. For the video it provides an RF Connector interface.

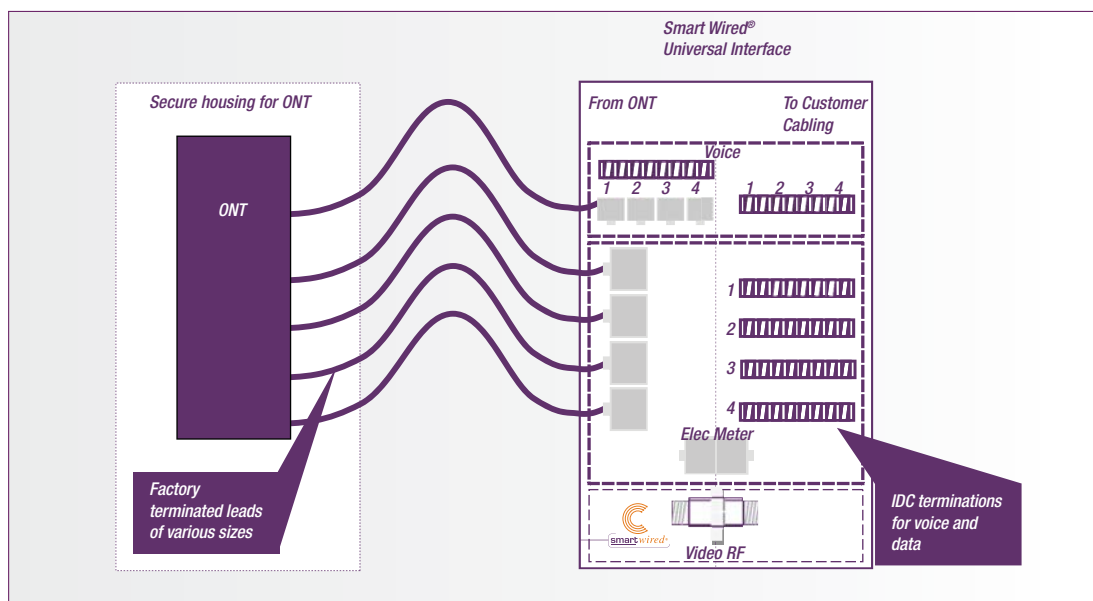


Figure 11 Details of the Smart Wired™ Universal Interface

The advantage of the Universal Interface is the type of field termination required is Insulation displacement which is easily achieved in comparison to crimping of 8P8C and 6P4C modular sockets.

The leads from the ONT to the Universal Interface can be factory manufactured and tested in a range of sizes to cater for a variety of possible locations of the Universal Interface.

PORT SPECIFICATION

The Smart Wired™ Universal Interface (SWUI) has the following port specifications.

CONNECTIVITY TO	PORT	SPECIFICATION	CONNECTED TO
For connection from the ONT	Voice 1	6P4C Skt & IDC	CC V1
	Voice 2	6P4C Skt & IDC	CC V2
	Voice 3	6P4C Skt & IDC	CC V3
	Voice 4	6P4C Skt & IDC	CC V4
	Data 1	8P8C Skt	CC D1
	Data 2	8P8C Skt	CC D2
	Data 3	8P8C Skt	CC D3
	Data 4	8P8C Skt	CC D4
	Elec Meter	8P8C Skt	CC Elec Meter
	RF	F type barrel connector	
For connection to Customer cabling	Voice 1	IDC	ONT Voice 1
	Voice 2	IDC	ONT Voice 2
	Voice 3	IDC	ONT Voice 3
	Voice 4	IDC	ONT Voice 4
	Data 1	IDC	ONT Data 1
	Data 2	IDC	ONT Data 2
	Data 3	IDC	ONT Data 3
	Data 4	IDC	ONT Data 4
	Elect Meter	RJ45 Skt	ONT elec meter
	RF	F type barrel connector	

Table 13 Outlet mapping on the Smart Wired™ Universal Interface

APPENDIX B

CARRIER/CARRIAGE SERVICE PROVIDER LEAD-IN FACILITIES

This section provides a guide to the carrier services entry facilities required. It is the responsibility of the installer to consult with the carrier or carriage service provider for more specific details and requirements as these will vary from provider to provider and local circumstances. Consideration should be given to the location of the development as the access network may vary from:

1. Greenfield estates
2. Brownfield estates

Greenfield estates will be primarily serviced by fibre in the major population areas and in more remote location by alternate means such as radio or satellite.

In Brownfield areas, that is existing urban areas the telecommunications services to a home could be provided by any of the technologies listed below.

Lead-in facility can be divided into the following:

1. Copper
2. Fibre
3. Satellite

COPPER

Copper carrier services facility can be further sub divided into:

- Aerial
- Underground.

The details here deal with the Telstra requirement as they are the primary supplier of copper lead-in cables.

Aerial

In cases where an aerial lead-in is to be installed you need to consult: <http://www.telstra.com.au/smartcommunity/mybuilder.html>, section titled General Specifications.

NOTE: Telstra will not use a third party supplied pole.

UNDERGROUND

In cases where an underground lead-in is to be installed the home owner or developer must provide a trench from the property entry point to the Building Entry point for details of the trenching required you can go to: http://www.telstra.com.au/smartcommunity/assets/leadintrenching_0609.pdf

FIBRE

In cases where the development will have a fibre lead-in you will need to consult with the service provider as to the requirements. See section titled Communications in Appendix D - Sources of information page for details

SATELLITE

In cases where the services are provided via Satellite you will need to contact your service provider for details see section titled Appendix D - Sources of information for more details.

PROVISIONING FOR THE LEAD-IN

Whilst every effort should be made to contact your service provider to identify the requirements of the lead-in, in situations where this is not possible then some pre wiring/provisioning should be done.

To understand what provisioning of pre-wiring you can do we need to look at the lead-in in more detail. The definition of the lead-in cable according to AS/ACIF S009 is:

“3.1.51 lead-in cabling: a carrier’s telecommunications network cabling from the carrier’s distribution point to the network boundary.”

Figure 12 shows three possible configurations of a lead-in cable. The lead-in extends in all cases from the carrier's distribution point to the Network Boundary (NB), but the NB can be located either inside or outside the building. In all cases a cable is required from the Building Entry point to the location where the network boundary is located and onto the location of the HD. If unsure what cabling to provide between the Building Entry point and the NB, the best option is to install conduit from the

Property Entry point to the proposed location of the NB. If a conduit is provided it should not have any sharp bends and should include a draw wire for the installation of the lead-in cable.

Provisioning for the external section of the lead-in is a trench if underground.

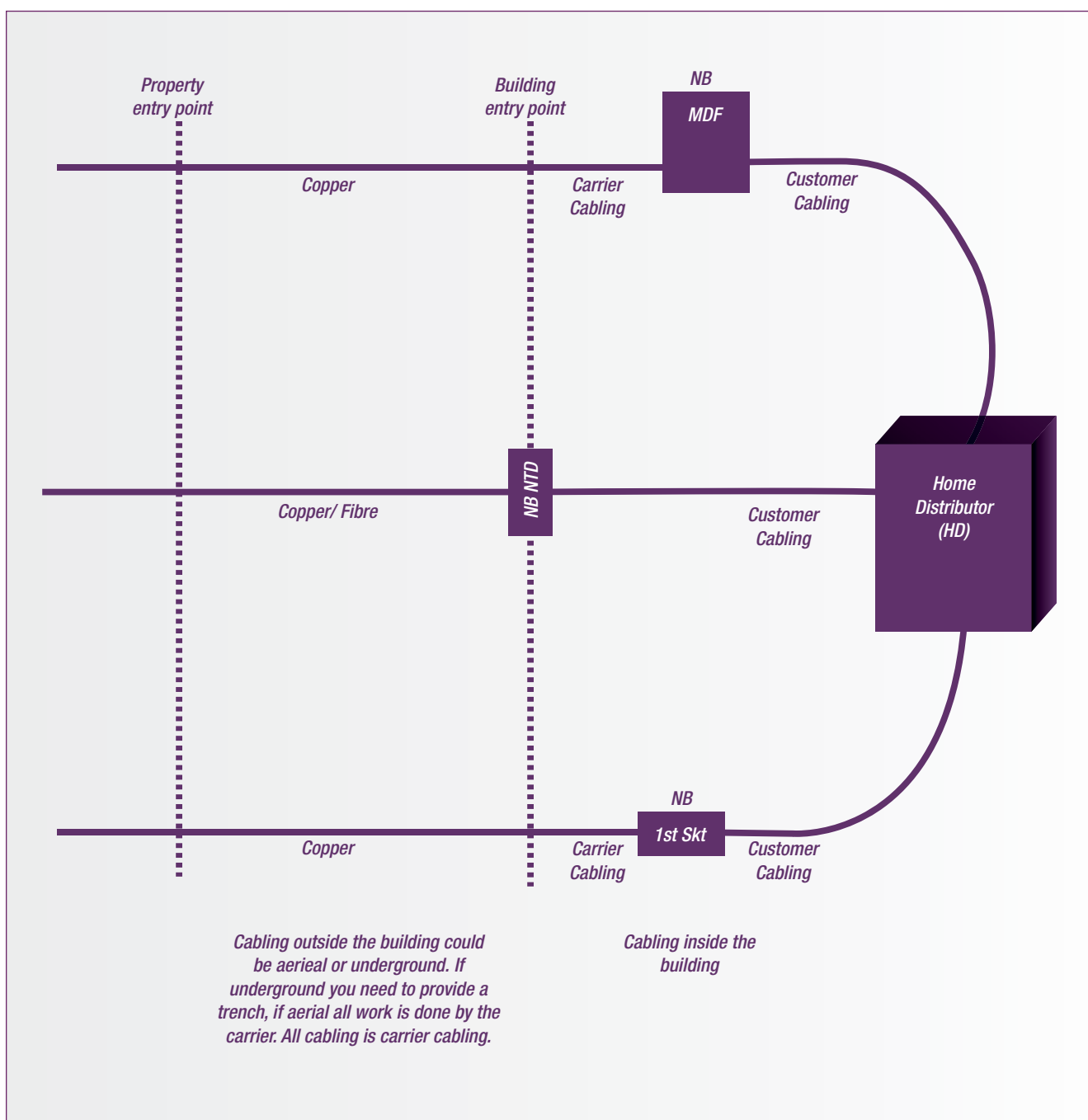


Figure 12 Example of copper lead-in cables

TERMINOLOGY

9.1 ABBREVIATION

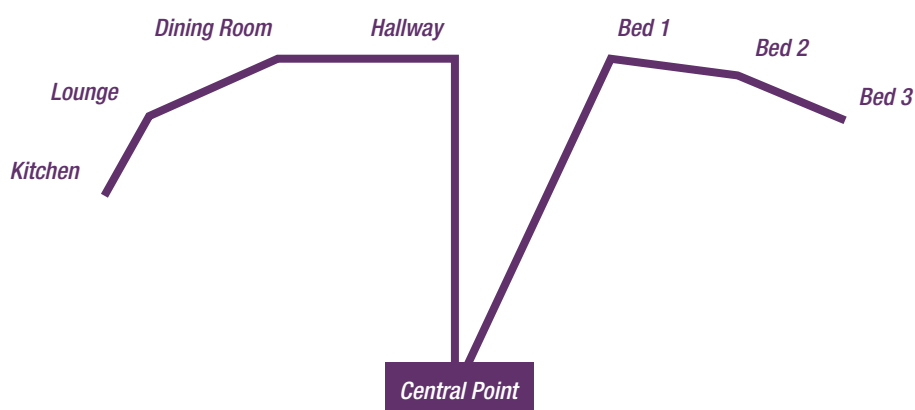
HD	Home Distributor
IDC	Insulation displacement connector
MDU	Multi Dwelling Unit
NBN	National Broadband Network
ONT	Optical Network Termination
POTS	Plain Old Telephone Service
RSP	RSP - Retail Service Provider
SDU	Single Dwelling Unit

9.2 DEFINITION

Daisy Chain wiring

This is when cabling is installed from a central location onto various points where the equipment is to be installed in a continuous run.

Typically used when installing power points and the data bus for a lighting control system. Never recommended when cabling is installed when the active equipment is not known.



MDU



Services in an MDU are generally provided to a central point in the MDU. The major difference to an SDU is that services will be provided to a common place in the building and then fed through risers to each floor.

In an MDU, most services will be fed from the riser to the HD in an apartment. This is true of telephony and broadband internet. Traditional delivery of these services is via a copper pair to a Building Distributor (BD) and that is then cabled to another distributor on each floor called a Floor Distributor (FD). The service is then cabled from the floor distributor to the apartment from the FD.

Video services be it free to air or Pay TV are generally provided via an MATV backbone with access points located in each floor or as deemed necessary. All video services are fed from the MATV system to the home distributor and patched at the home distributor as required. Within the apartment the wiring is the same as an SDU.

There are services to be delivered by Service Providers on optical fibre. The fibre will be a "tri-service" cable and can carry telephony, broadband internet and PayTV. These services will terminate on an Optical Network Termination (ONT) and will then be cabled to an apartment from the output of the ONT. In this environment, the cabling of the dwelling in the MDU is to be exactly the same as an SDU.

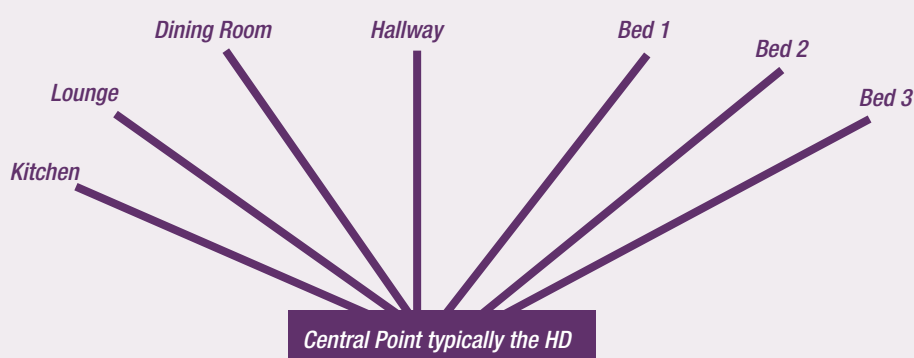
SDU



In an SDU, all services are provided specifically for that dwelling. They are not shared with other dwellings on the same property or adjoining properties. Typically, this would be a free-standing house. The requirements set out in this document are based on an SDU. In an SDU, all services regardless of the delivery mechanism by the Service Provider will terminate in the HD for reticulation via a star topology.

Star Wiring

Star wiring is when cabling is installed in a point to point structure. The cabling is installed from the location where a device is to be installed back to a central point such as the HD



This type of wiring is used for voice and data outlets, Television outlets and where the cabling topology is not known. A star wiring topology can be used to support many logical cabling connections and therefore is the most commonly recommended type of cabling where the equipment has not been selected.

SOURCES OF INFORMATION

COMMUNICATIONS

Comverge

Comverge provides fibre solutions to greenfield estates, details of their services are found at:
http://www.comverge.com.au/our-solutions/residential/FTTH_Head_End_Guidelines.pdf

Opticomm

Opticomm provides fibre solutions to greenfield estates, details of their services are found at:
<http://www.opticomm.net.au/html/services.htm>

Telstra

Telstra provides a range of documents to assist the consumer, developer, builder and contractor in providing the cabling to a new or renovated home. See <http://www.telstra.com.au/smartcommunity/mybuilder.html>

In addition to the above there are documents dealing with specific issues such as:

Altering the lead-in cable: http://www.telstra.com.au/smartcommunity/assets/facilitiesalteration_0609.pdf

Cable entry facility for Network Termination Device: http://www.telstra.com.au/smartcommunity/assets/ntdcableentryfacilities_0609.pdf

Telstra's lead-in trenching requirements:
http://www.telstra.com.au/smartcommunity/assets/leadintrenching_0609.pdf

Transact

Transact fibre to the home guide:
http://www.transact.com.au/documents/Home_preparation_guideline.pdf

Transact lead-in facilities:
<http://www.transact.com.au/knowledge/installTransACT.aspx>

ENTERTAINMENT

Foxtel

see www.foxtel.com.au and go to Support and then select Developers & Contractors

Austar

See www.austar.com.au and go to Support and then Installation Information

TECHNOLOGIES

The key to the ability to deliver today's services is having the connectivity. This handbook has been designed to set the minimum cabling infrastructure to allow for the connectivity requirements. Clearly there are a range of technologies that can be used to achieve some degree of connectivity these being:

- Wired
- Wireless (Wi-Fi)
- Power line communications (PLC)
- Phone Line Networking (PLN)

This handbook considers the Wired solution as being the only that is fully compliant with the code of practice as it provides a fixed level of infrastructure that is permanent. On the other hand Wireless, PLC and PLN are all temporary connectivity solutions as removal of the active equipment leaves the home with no connectivity infrastructure. On the other hand where cabling is provided, removal of the active hardware still leaves the cabling infrastructure.

APPENDIX E

SYMBOLS

SMART WIRED™ SYMBOLS

The following are the full range of symbols that can be used by the installer and the home owner in any promotion of the home that has been cabled in compliance with the Code of Practice for Home Wiring and the associated handbooks.



NOTES

NOTES



This document lays out the minimum levels of cabling for your home to meet the Smart Wiring™ standard. It prepares your house for Communications, Entertainment, Energy Management, Security, Digital Home Health, Age & Assisted Living and Intelligent Lighting & Power. If you want to go beyond the minimum you can find an Accredited Smart Wired™ Designer by going to www.smartwiredhouse.com.au.

For further information email us at cdc@copperdev.com or call us direct on 1800 075 060.

Copper Development Centre. Australia
Suite 1, Level 7, Westfield Towers
100 William Street, Sydney NSW 2011
Tel: (+612) 9380 2000 Fax: (+612) 9380 2666

www.smartwiredhouse.com.au