

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

HOME WIRING ESSENTIALS

NBN
READY



smartwired®



Age & Assisted Living



Appliances



Digital Home Health



EV Charging



Energy Management



Entertainment



EES System Battery



Information & Communications



Intelligent Lighting & Power



Security & Safety



Solar

INSTALLER HANDBOOK

Planning and Installing cabling for Residential Technology Services

2022 EDITION



International Copper Association Australia
Copper Alliance

PREFACE

HOME WIRING ESSENTIALS - INSTALLER HANDBOOK

This handbook is a how-to-guide for the installation of the **minimum cabling required** to support the residential services covered by this Home Wiring Essential series.

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 “Home Wiring Essentials – Code of Practice”

Recommended by NBN Co.

The following Services are covered by this handbook

- Age & Assisted Living
- Appliances
- Digital Home Health
- Electric Vehicle (EV) Charging
- Energy Management
- Entertainment
- EES Systems (batteries)
- Information and Communications
- Intelligent Lighting & Power
- Security & Safety
- Solar

The handbook sets out what is considered to be best practice 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 document titled “Home Wiring Essentials – Code of Practice”



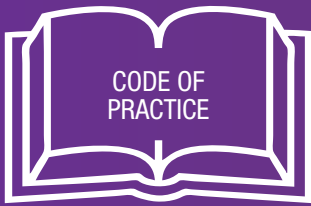
FLOW CHART OF PROCESS

This handbook sets out a step by step process from request for quotation through to testing and commissioning. The steps to follow are:

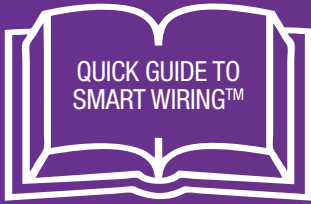


Flow chart 1 Installation process

HOME WIRING ESSENTIALS COMPRISES THREE DOCUMENTS



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 and the Code of Practice for Home Wiring.

Your installer can download the documents from the Australian Registered Cabler's website by following this link: www.registeredcabl原因.com.au/smart-wiring/

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
	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.
	Appliances	A minimum of one telecommunications outlet and associated cabling shall be installed next to the hot water system, air conditioning units, pool pump and the electricity meter.
	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.
	Electric Vehicle (EV) Charging	A minimum of one 32 Amp circuit/outlet with one RJ45 outlet and associated cabling must be installed in the main car-parking area at a location away from pedestrian thoroughfares.
	Energy management	A minimum of one outlet and associated cabling must be installed next to the hot water system, air conditioning units, pool pump and the electricity meter.
	Entertainment	A minimum one dual coax (F-connector) outlet and associated cabling must be installed per living area for television (Free to Air and Pay TV). In addition if not provided for under communications a dual Cat 6A outlet next to the dual Coax outlet."
	EES Systems (batteries)	A minimum of two blank circuit breaker poles for single phase battery inverter protection devices shall be available in the switch board. These are for the "Main Switch (Inverter Supply)" for the backed up circuits and "Battery Inverter (Normal Supply)" for the feed from the main switchboard to the EES inverter. Best practice is to have separate switchboards for Normal Supply and Inverter Supply circuits, if they are in the same switchboard then separate load centres are recommended and clear labelling. For communications purposes one Cat 5 cable (or better) from the Home distributor to the inverter location and one from the home distributor to the battery location(s).
	Information & Communications	A minimum of one dual Cat 6A outlet and associated cabling must be installed in each living area to provide access to the internet for high bandwidth devices. A minimum of four dual Cat 6A outlet locations to support Wireless Access Point
	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. C-Bus, KNX, Dyalite would be deemed compliant.
	Security & Safety	Sufficient movement sensors to detect an intrusion into the home, plus a code pad at the front door. Smoke detectors installed and functioning.
	Solar	Two blank circuit breaker poles for grid-inverter protection devices (assuming single phase) must be installed in the main switchboard, typically "Main Switch (PV Inverter)" and a (recommended) surge protection device. DC cabling shall allow for the maximum size array that could be installed.

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 "Home Wiring Essentials – A Quick Guide" document found at: www.registeredcable.com.au/smart-wiring/ as a working document when consulting with the client.

- Convert the customer's request for quotation into a technical specification.
- Count the number of devices/outlets
- Determine the minimum size of the required home distributor and electrical switchboard
- Determine the location for:
 - Home distributor
 - Carrier lead-in facilities
 - Security system
 - Electrical switch board and sub boards
 - Electric vehicle charging station
 - ESS
 - Solar array
- Determine cable pathways
- Prepare a quote for the customer

CONVERT THE CUSTOMER'S REQUEST FOR QUOTATION INTO A TECHNICAL SPECIFICATION

Sample customer specifications:



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Bringing the future home

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

Your name: Mr. and Mrs Brown
 Address of project: 27a Whimpoal Cres Narandrer NSW 2067
 Phone: 2959 6000 Mobile: 0404 040 040

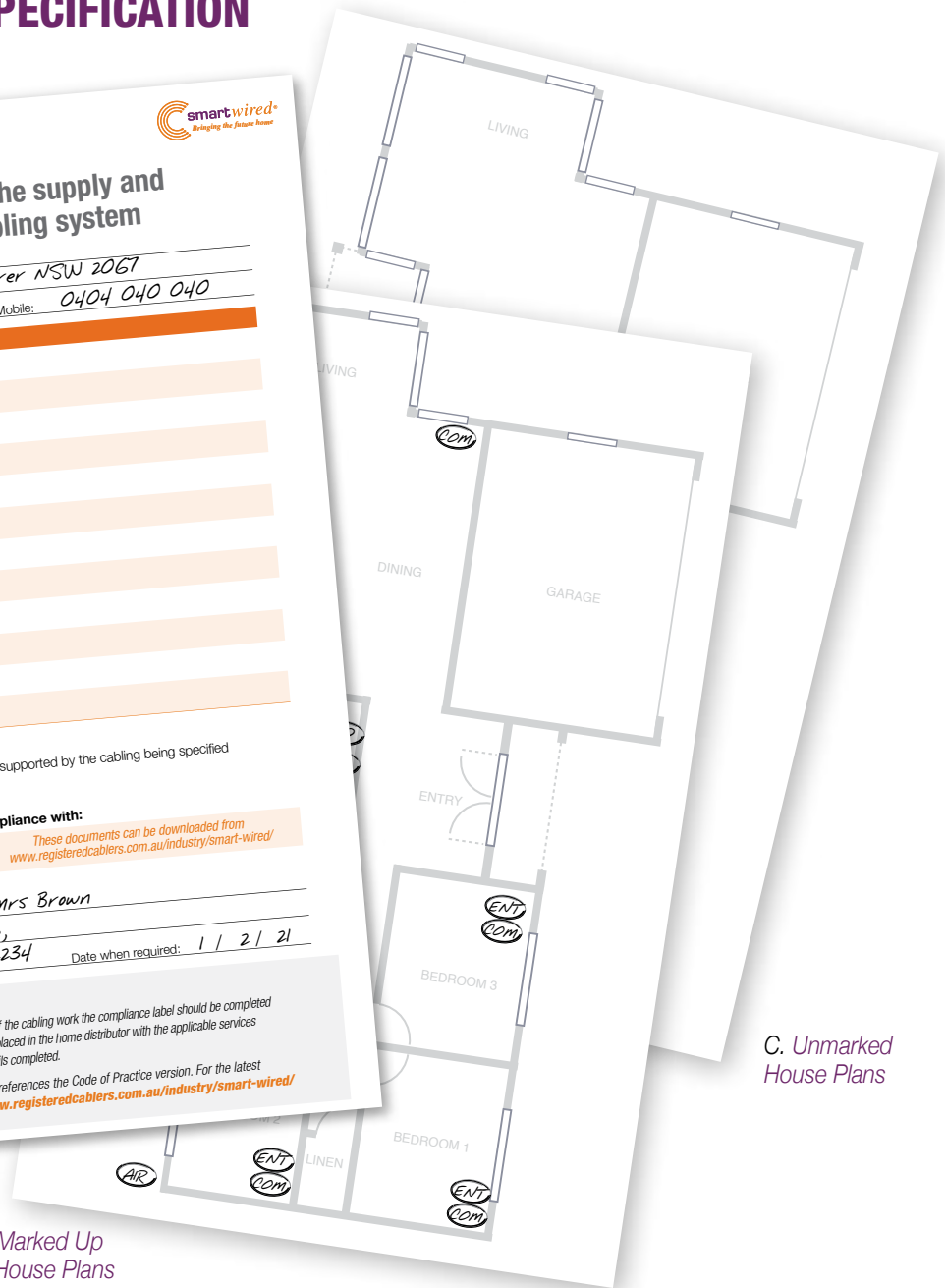
SERVICE NAME	TO BE PROVIDED	PERSONAL NOTES
Age and Assisted Living	<input checked="" type="checkbox"/>	
Appliances	<input checked="" type="checkbox"/>	
Digital Home Health	<input checked="" type="checkbox"/>	
Electric Vehicle Charging	<input type="checkbox"/>	
Energy management	<input type="checkbox"/>	
Entertainment	<input checked="" type="checkbox"/>	
Entertainment with ECS option	<input checked="" type="checkbox"/>	
EES Systems Battery	<input type="checkbox"/>	
Information & Communications	<input checked="" type="checkbox"/>	
Intelligent Light & Power	<input type="checkbox"/>	
Security	<input checked="" type="checkbox"/>	
Solar	<input checked="" type="checkbox"/>	

Please find: (tick box)
 A This form and list of services selected above 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

Please provide the quote to:
 Name quote should be addressed to: Mr. and Mrs Brown
 Address to be delivered: 127 Woodbine Ave, Northcott NSW 2234 Date when required: 1 / 2 / 21

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.registeredcable.com.au/industry/smart-wired/



A. Completed Quote Request Form

B. Marked Up House Plans

C. Unmarked House Plans

NOTE: You may need to augment any electrical schedule or plans developed by the architect or builder to ensure sufficient 230V AC socket-outlets and circuits are installed to meet the requirements of this handbook and provide the functional level of infrastructure required.

With reference to the request for quotation provided by the customer, identify which of the services have been selected by the customer. Now convert the customer's request for quotation into a technical specification one service at a time.

The following section is based on the "Sample customer request for quotation" as shown in the diagram above.

1. Age & Assisted Living
2. Appliances
3. Digital Home Health
4. Electric Vehicle (EV) Charging
5. Energy Management
a) with ECS Option
6. Entertainment
7. EES Systems (batteries)
8. Information & Communications
9. Intelligent Lighting & Power
10. Security & Safety
11. Solar.

CONVERSION OF SYMBOLS

SYMBOL	SERVICE	SYMBOL ON PLAN	TECHNICAL SYMBOLS	PLAN
	Age & Assisted Living		Single RJ45 Outlet	Comms/Ent
	Appliances		Single RJ45 Outlet	Comms/Ent
	Digital Home Health		Single RJ45 Outlet	Comms/Ent
	Energy management		Single RJ45 Outlet	Comms/Ent
	Entertainment		Double F connector outlet	Comms/Ent
	Electric Vehicle (EV) Charging		Single RJ45 Outlet	Comms/Ent
			Light fitting	Electrical
			Power Point	
	EES Systems (batteries)		Storage	Electrical
	Information & Communications		Double RJ45 Outlet	Comms/Ent
	Intelligent Lighting & Power		Light fitting	Electrical
			Power Point	
	Security & Safety		Movement detector	Security
			Smoke detector	
			Code pad	
			CCTV	
	Solar		Solar array	Electrical

Table 2 Technical symbols

Wherever you install an entertainment outlet you must also have a communications outlet and a 230V AC socket-outlet 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 task you should end up with a set of plans titled:

PLAN	SERVICE TO BE INCLUDED
Communications/entertainment	Age & Assisted Living, Appliances, Digital Home Health, Electric Vehicle Charging, Energy Management, Entertainment, EES, Information & Communications and Solar
Security	Security
Electrical	Electrical, Solar and EES

STAGE 1 – DIRECT CONVERSION FROM THE MARKED HOUSE PLANS

The conversion of the customer’s plans means translating the customer’s squiggles into a drawing showing the engineering symbols. This applies to:

- Appliances
- Communications (see appendix E for wireless)
- Energy management
- Entertainment
- Electric vehicle charging

Transfer the communications, entertainment appliances, energy management and Electric Vehicle Charging onto the blank plans.

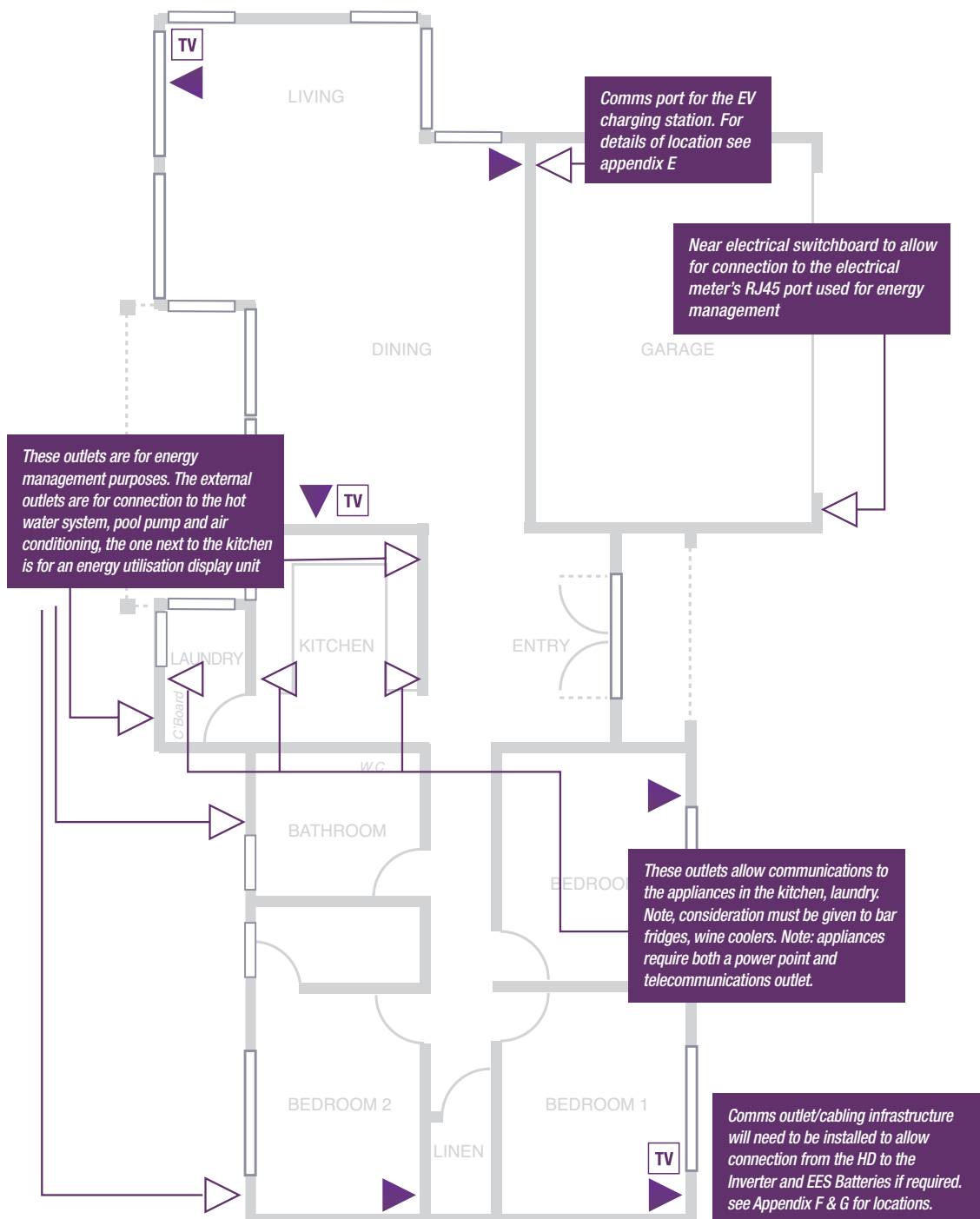


Figure 1 Develop the Communications and Entertainment Plan

STAGE 1 – DIRECT CONVERSION FROM THE MARKED HOUSE PLANS

(continued)

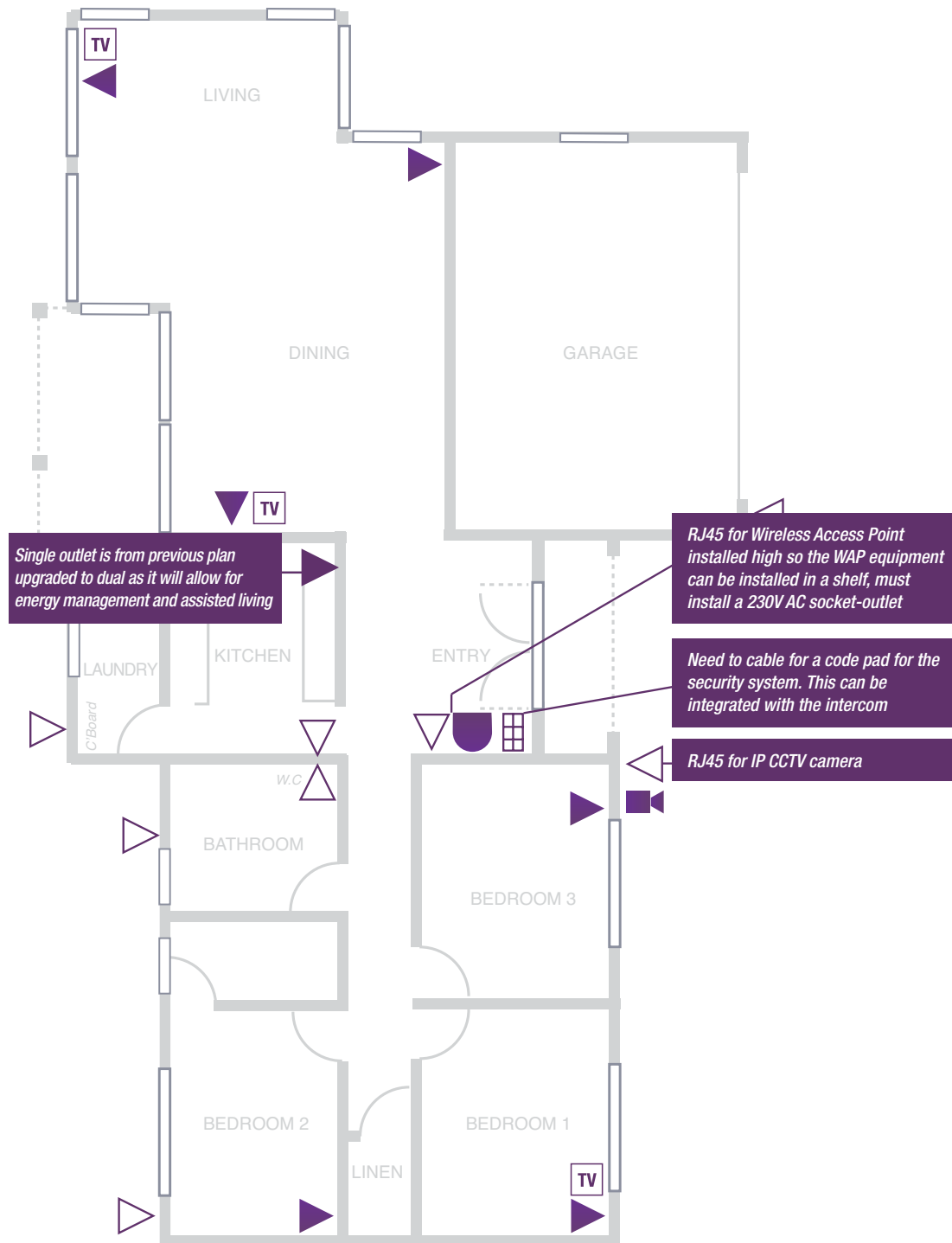


Figure 2 Add the requirements for Age and Assisted Living and Digital Home Health to the Communications and Entertainment Plan

STAGE 2 - DEVELOP A SECURITY PLAN

NOTE: *If a movement detector is installed in the garage you will need to consider how to provide access to the garage without setting the alarm off when the householders open the garage and the alarm is armed.*

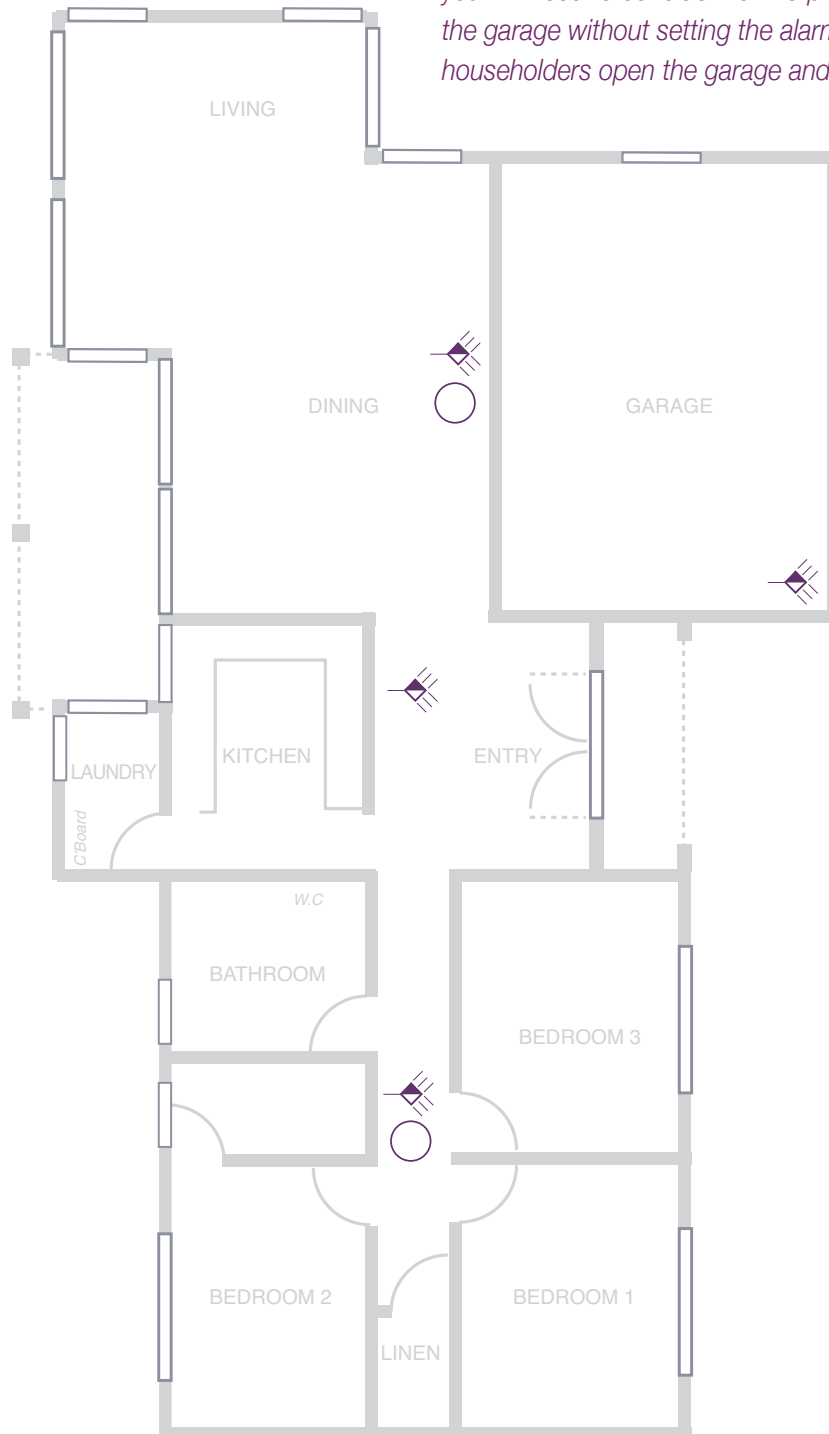


Figure 3 Stage 2 Developing the Plan for Security

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), 230V AC socket-outlets and pool pumps.
- Part II. Cabling of the data bus for the installation of control devices such as light switches, movement, light and rain sensors etc.

PART I – CABLING TO THE MANAGED DEVICES

This is the cabling from the light fitting (bank of light fittings) and 230V AC socket-outlets 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.

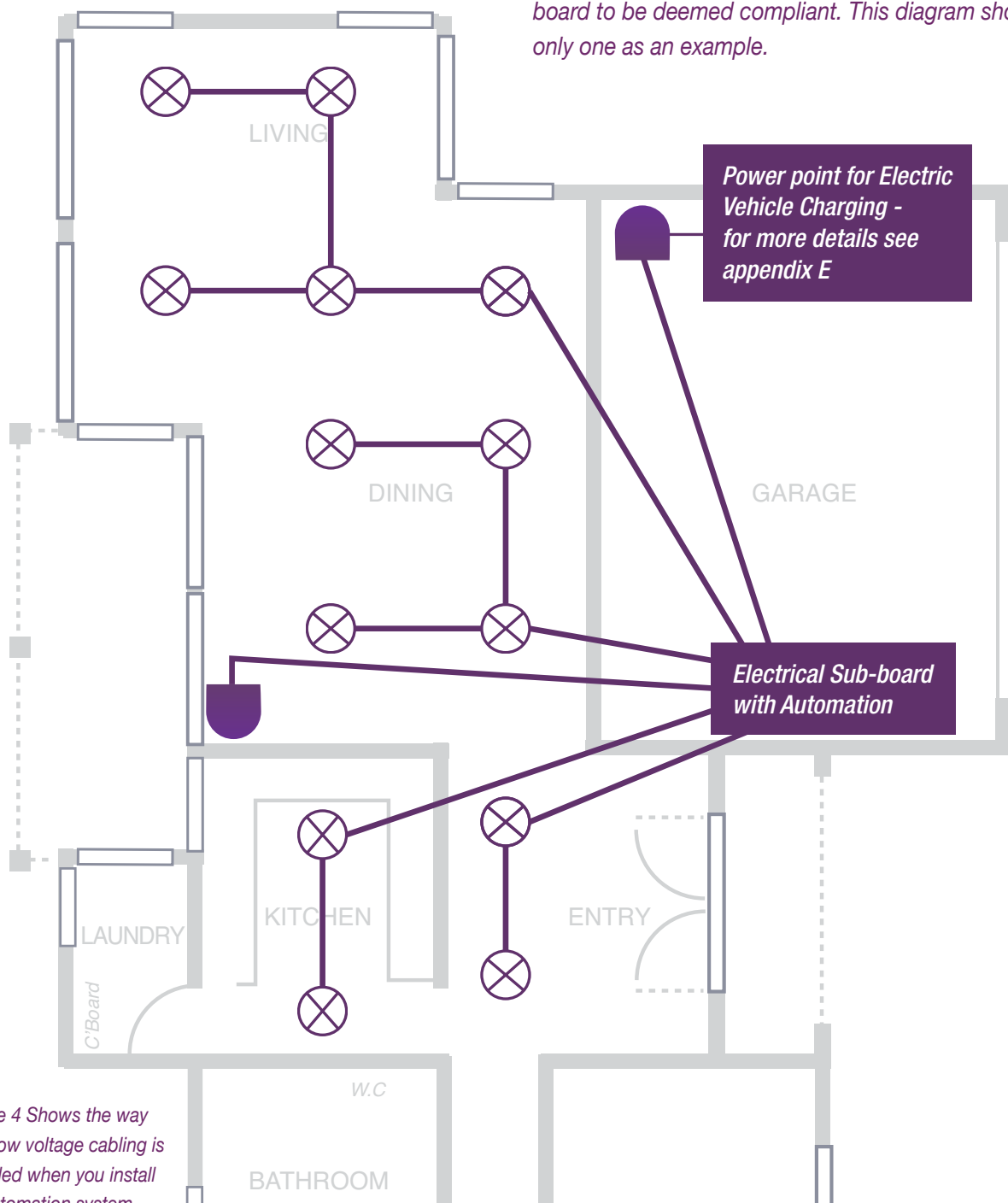


Figure 4 Shows the way the Low voltage cabling is installed when you install an automation system

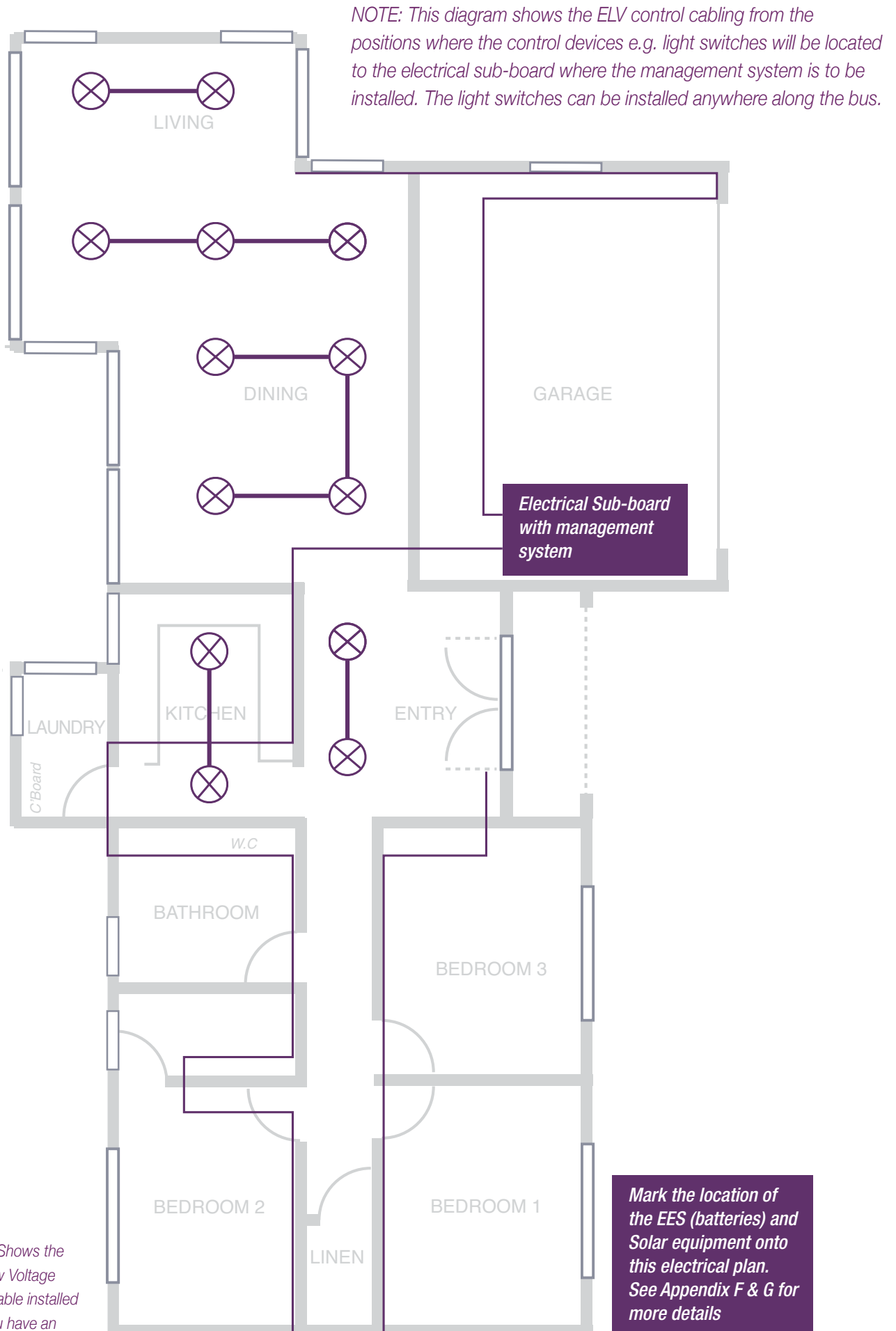


Figure 5 Shows the Extra Low Voltage control cable installed when you have an automation system

STAGE 4 - HOME DISTRIBUTOR AND SECURITY MAIN EQUIPMENT



Figure 6 Stage 3 Home Distributor and Security systems location

WHERE TO LOCATE EQUIPMENT

This section provides requirements for the location of the home distributor, security system, carrier lead-in facilities, free to air antenna, pay TV entry facility, ESS, Solar system and electric vehicle charging systems.

The location of these will need to take into account the type of dwelling the cabling is being designed for. There are two main categories of dwelling:

- SDU (Single Dwelling Unit)
- MDU (Multiple Dwelling Unit)

Home distributor (HD)

Home Distributor is the focal point for the following cabling:

- A. Communications
- B. Entertainment
- C. Energy Management
- D. Security System
- E. Digital Home Health
- F. Age & Assisted Living

The location of the HD should be a central location with easy access for maintenance purposes.

Consideration should be given to:

- a. Location of the NBP.
(Note: In the case of FTTH and HFC the NBP can be in the HD)
- b. Free to air TV facility as this could be of the FTTH, Antenna or Satellite dish.
- c. In the case of an SDU such as the house plan used in this document one possible location could be in the garage as long as it is reasonably central. 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 must be located within the private dwelling for security/privacy reasons and to allow for ease of access by the residents.

Security system

The location of the security system is either in the HD or a stand-alone system. Again the best location for the security system may be in the garage (as long as it is monitored by a motion sensor) 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 three main types:

1. Copper
2. Coax
3. Fibre

Lead-in

Copper cabling can be divided into two types:

1. Aerial
2. Underground

Aerial

Telecommunications network will be extended to the dwelling from a pole in the street and typically attached to the facade of the dwelling and then extended via a conduit through the PCD and onto the NBP. with an external connection point and then to the location of the HD.

Underground

Telecommunications network will be extended to the dwelling from the start pipe near the pit in the nature strip by installing a communications conduit up to the PCD located typically near the electrical switch board on the dwelling and then extended to the location of the HD.

Network boundary *(The external or internal connection point may or may not be the NBP)*

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

- I. First Telecommunications Outlet/socket for twisted pair
- II. Every Telecommunications Outlet/socket for coaxial cable
- III. Network Termination Device (NTD)
- IV. 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 outdoor cable to the indoor cable but this is not a network boundary point (unless it is marked "NTD" or "NETWORK TERMINATION DEVICE").

Network termination device (NTD)

Network termination device is a box or device clearly marked "NTD" or "NETWORK TERMINATION DEVICE". The NTD may be installed inside the premises or on the outside wall.

Main distribution frame (MDF) Common in MDU

Main Distribution Frame (MDF) is normally 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 HD.

NOTE: the HD is not a NETWORK BOUNDARY but the network boundary could be installed in the HD.

For more details see [Appendix A – Connectivity](#) and [Appendix C - Sources of information](#). For details on who does what when installing the carrier lead-in cable, see [Appendix B - Carrier lead-in facilities](#).

Free to air Antenna

In an SDU, 75ohm coaxial cabling (preferably RG6 quad shield) needs to be installed from the location where the antenna will be installed to the HD. In an 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. Cable network HFC
3. Fibre

Satellite

- **SDU** - Install four RG6 quad shield cables from the north facing roof to the HD to ensure line of site is available for the satellite location.
- **MDU** - Install four RG6 quad shield cables as a backbone¹ and install four RG6 quad shield cables from the back bone cabling installed for Pay TV services.

Cable network HFC

- **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 cable from the back bone cabling installed for Pay TV services.

Fibre

- **SDU** - See Appendix A – Connectivity.
- **MDU** - See Appendix D - Sources of information.

EES

This document describes the requirements of battery EESS (BEES).

The installation location must first be established to allow cabling to be installed to connect the batteries to the power distribution system via a compatible and CEC approved battery inverter in the premises.

Batteries shall be located as per the relevant standards AS/NZS 4509, AS/NZS 2676, AS/NZS 3011, AS/NZS 4086 and CEC Design and Installation guidelines. Note that a new battery standard DR 5139 is currently being developed by Australian

Standards Committee EL-042.

Batteries must be:

- Located in a well ventilated area and not subject to direct sunlight
- Mounted on a structure that is sufficiently robust to take the weight of the batteries which are generally very heavy.
- Protected from physical damage
- Located as close as practical to the switch board where connection can be made to the inverter.
- Able to be quickly isolated in an emergency
- Not be accessible by unqualified persons
- Easily accessed for installation and maintenance purposes

Solar System

Solar system systems typically consist of a solar array, inverter and Balance of System (BOS) components such as cabling, electrical protection devices, metering, and system monitoring devices.

Solar Array

Solar arrays perform better when installed on the north facing roof of the premises. Cabling must be installed to allow the array to connect to the power distribution of the premises via a CEC approved grid-connect inverter. Installing a PV array to the East or West (or even South at a shallow angle) is also acceptable, but the designer/installer should explain the reason and provide calculations to show the impact on the system yield. Cabling from the roof-top PV array to the inverter should use the same model/brand connectors as the solar array cabling. All connectors plugged together must be same model/brand. All cables exposed to sunlight shall have insulation with TUV PV1-F certification in accordance with AS/NZS 5033.

Inverter

Should be located close to the distribution board or main switch board allowing for the manufacturers recommended clearance area and not exposed to direct sunlight. In the case of micro-inverters these will be located on the roof underneath the PV modules themselves.

All surface mounted DC cable within the building shall be enclosed in medium-duty conduit.

Electric Vehicle (EV) Charging

EV Charging electrical supply needs are both large and sensitive to location. General requirements regarding supply specification and location, and requirements specific to MDUs can be found in [Appendix E – Electric Vehicle Charging](#).

¹ See the Pay TV requirements of the local provider

STAGE 5 - PLAN CABLE PATHWAYS

Pathways are required to facilitate the installation, maintenance and upgrades of all cabling within a premises:

- Carrier lead-in
- Customer cabling (ELV)
- Electrical (LV)

Carrier lead-in pathways are typically from the starter pipe near the property boundary or, in the case of aerial cabling, from the street pole to the PCD, then from the PCD to the HD.

Inside the building it is possible to share the pathways for both carrier and customer cabling. The design and planning of pathways is considered best practice 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 mandated 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.

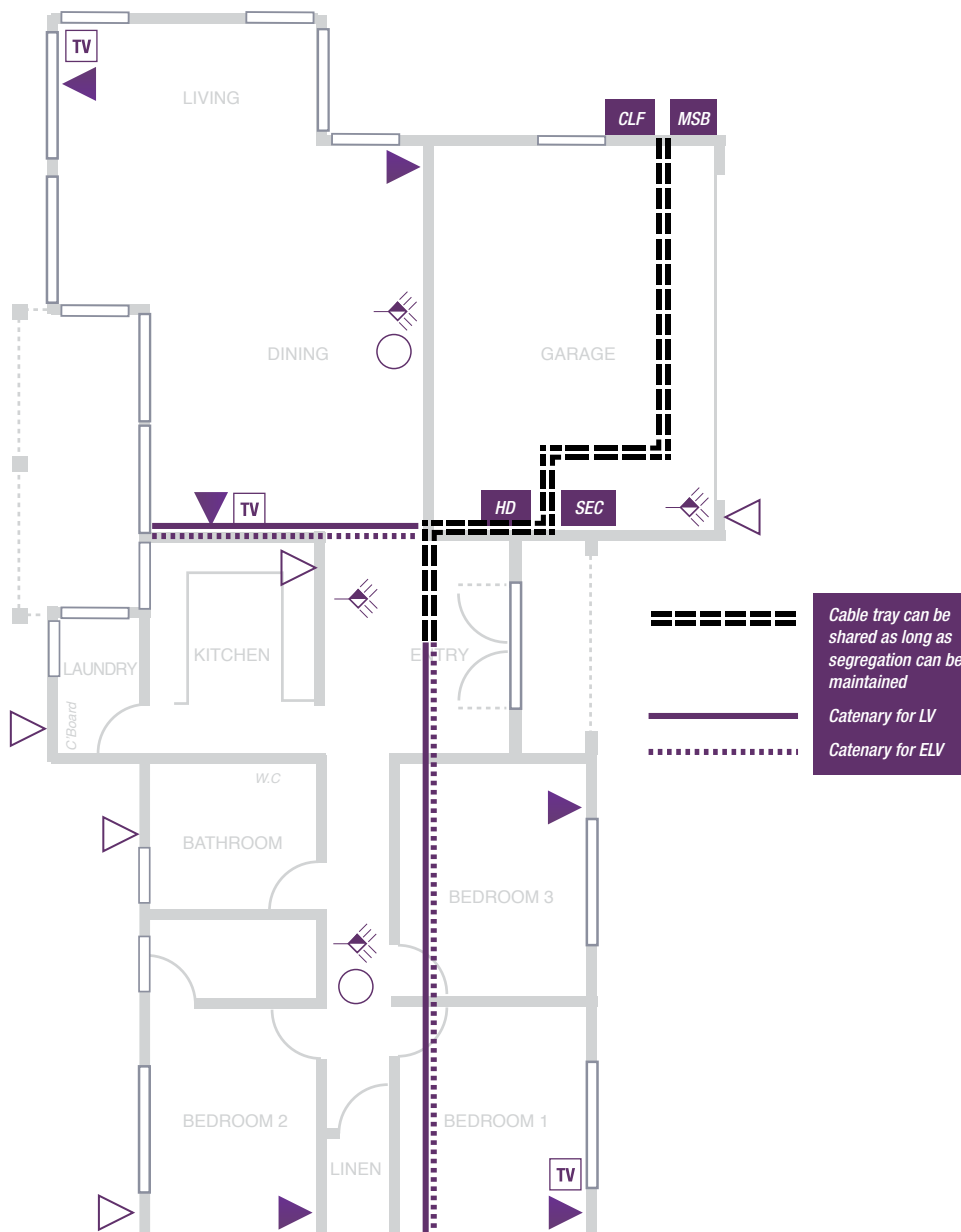


Figure 7 Location of cable pathways

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				F CONNECTORS	
	INTERNAL		EXTERNAL		Single	Double
	Single	Double	Single	Double		
HOUSE						
Garage						
EV Charging						
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 Home Health, Age & Assisted Living and Electric Vehicle (EV) Charging are RJ45 they are included in this table.

SECURITY	SECURITY			INTERCOM	
	PIR	Smoke Detector	Code Pad	Outdoor Stations	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

Electrical schedule for use when Intelligent light and power are required	230V AC socket-outlet				Light Fittings or Groupings				Light Switches					
	Internal		External		1	2	3	4	1	2	3	4	5	6
	Single	Double	Single	Double										
HOUSE														
HD														
Garage														
EV Charging ¹														
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 materials; Intelligent Lighting & Power

NOTE 1: refer to Appendix F notes below for further explanation

NOTE 2: 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. Age & Assisted living
2. Appliances
3. Digital Home Health
4. Electric Vehicle (EV) Charging
5. Energy management
6. Entertainment
7. EES Systems (batteries)
8. Information & Communications
9. Intelligent Lighting & Power
10. Security & Safety
11. Solar

SERVICE	TECHNICAL SYMBOLS	CABLE AND CONNECTOR SPECIFICATION
Age & Assisted Living	Single RJ45 Outlet 	Cabling used to each RJ45 outlet is four pair Category 6A or better UTP. All RJ45 shall be Category 6A or equivalent to the cable installed.
Appliances	Single RJ45 Outlet 	Cabling used to each RJ45 outlet is four pair Category 6A or better UTP. All RJ45 shall be Category 6A or equivalent to the cable installed.
Digital Home Health	Single RJ45 Outlet 	Cabling used to each RJ45 outlet is four pair Category 6A or better UTP. All RJ45 shall be Category 6A or equivalent to the cable installed.
Energy Management	Single RJ45 Outlet 	Cabling used to connect to each RJ45 outlet is four pair Category 6A or better UTP cable. All RJ45 outlets shall be Category 6A or equivalent to the cable installed. Cables installed to connect storage hot water systems, spa heaters, air conditioning units, pool and spa pumps, EES (Batteries), Solar and EV charging shall be selected in according to the ECS guidelines, see appendix H – ECS
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.
Electric Vehicle (EV) Charging	Single RJ45 Outlet  Light Fitting  ² Power Point 	Cabling used to each RJ45 outlet is four pair Category 6A or better UTP cable. All RJ45 shall be Category 6A or equivalent to the cable installed. TPS as per AS3000. TPS as per AS3000 for a 32A socket outlet.
EES	Batteries 	Cabling shall meet the requirements of AS/NZS 3000 and AS/NZS 3008 and if “energy management” has been selected should be upgraded to meet Economic Cable Sizing (ECS) requirements. Note that while AS/NZS 3000 allows for 10% volt drop in ELV cables, AS/NZS 4509 is more restrictive at 5% and industry best practice (as well as inverter manufacturer requirements) generally mean a maximum of 1% voltage drop is allowed between the battery terminals and the battery inverter. All DC cables shall be installed in orange heavy-duty PVC conduit and shall be marked “SOLAR DC” at 2m intervals. A minimum 32mm ² conduit shall be installed to allow for 2 PV arrays facing different directions. DC cables must not be run through AC switchboards. DC cabling must have TUV PV1 -F certification in accordance with AS/NZS 5033.
Information & Communications	Double RJ45 Outlet 	Cabling used to each RJ45 outlet is four pair Category 6A or better UTP. All RJ45 shall be Category 6A or better unless fibre is used.
Intelligent Lighting & Power	Light fitting and Power point Control bus	TPS as per AS3000. Unshielded Twisted Pair.





Security & Safety	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.
Solar	Solar array		<p>Cabling shall be as per AS/NZS 3000, 3008 and 5033 and if “energy management” has been selected should be upgraded to meet ECS requirements. AS/NZS 5033 requires no greater than 3% voltage drop between the furthest PV module and the input terminals of the PCE or inverter.</p> <p>All DC cables shall be installed orange heavy-duty PVC conduit and shall be marked “SOLAR DC” at 2m intervals. A minimum 32mm² conduit shall be installed to allow for 2 PV arrays facing different directions. DC cables must not be run through the AC switchboards.</p> <p>DC cabling must have TUV PV1-F certification in accordance with AS/NZS 5033.</p>

Table 6 Cable types and drafting symbols. It is recommended to use the international symbols. See www.graphical-symbols.info/

For high speed, and uniformity consideration could be given to the use of Category 7 cable. This will provide the highest performance and a uniform cabling system.

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 C - Sources of information](#).

Note 2: Only necessary in MDUs where the parking area is not covered by an existing light fitting.

STEP 3

INSTALLATION

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

1. Age & Assisted Living
2. Appliances
3. Digital Home Health
4. Electric Vehicle (EV) Charging
5. Energy Management
6. Entertainment
7. EES Systems (batteries)
8. Information & Communications
9. Intelligent Lighting & Power
10. Security & Safety
11. Solar

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
	Age & Assisted Living	Shall hold an Open Registration with endorsements for Structured and Coaxial Cabling. If using fibre then the installer must hold the fibre endorsement.
	Appliance	Shall hold an Open Registration with endorsements for Structured Cabling.
	Digital Home Health	Shall hold an Open Registration with endorsements for Structured and Coaxial Cabling. If using fibre then the installer must hold the fibre endorsement.
	Electric Vehicle (EV) Charging	Shall be an Licensed electrician and have the Open Registration with endorsements for Structured cabling.
	Energy management	Shall hold an Open Registration with endorsements for Structured cabling. If Economic cable sizing (ECS) is being requested any such work must be done by a licensed electrician.
	Entertainment	Shall hold an Open Registration with endorsements for Structured and Coaxial Cabling. If using fibre then the installer must hold the fibre endorsement.
	EES Systems (batteries)	Licensed electrician endorsed by the Clean Energy Council and a Registered Cabler.
	information & Communications	Shall 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	Shall be a licensed electrician and hold an Open Registration.
	Security & Safety	Shall 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. Note: 230VAC main, hard wired, smoke detectors must be installed by a licensed electrician.
	Solar	Licensed electrician endorsed by the Clean Energy Council.

Table 7 Licensing requirements

GENERAL CABLING SYSTEM

All cabling should be:

1. Compliant with the standards listed in the Code of Practice for Home Wiring.
2. Properly supported ensuring the cabling will not be under any mechanical stress throughout the life of the installation.
3. Installed in a manner to ensure minimum bend radius is maintained. A minimum bend radius is generally 8 times the cable diameter (check cable manufacturer's specification to confirm).
4. Installed using cable pathways that ensure segregation is maintained.
5. Mechanically supported at termination points.
6. Run parallel to the walls of the dwelling.
7. Installed with spare cable length of 300 to 500mm at the termination points to allow for maintenance.
8. Where possible installed in conduit in concealed locations.
9. Installed using a pulling tension less than the cable manufacturer's specified maximum, to avoid excessive mechanical stress or forming any kinks or knots in the cable.
10. Installed without using staples or other fasteners that could crush or otherwise damage the cables. 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.
11. Installed as a continuous run when it forms part of a star wired configuration. Do not join or splice cables.
12. Stripped where required using strippers designed for the cable.

Outlets should all be:

1. Installed at least 300mm above the walked on surface or as required in specific locations.
2. Carefully placed to ensure they are not in places where furniture will make them inaccessible.
3. Segregated as per standards.
4. 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 locations 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.

AGE & ASSISTED LIVING

Cabling for Age and Assisted Living should be the same as that specified for Communications,

APPLIANCES

Cabling for Appliances should be the same as that specified for Communications.

DIGITAL HOME HEALTH

Cabling for Digital Home Health should be the same as that specified for Communications.

ELECTRIC VEHICLE (EV) CHARGING

EV charging facility requires both:

1. Communications outlet
2. Electrical supply 230V AC socket-outlet

The communications cabling should be installed in accordance with the communications specification listed within.

Cabling for charging should be TPS as per AS3000 and wired directly form a separate circuit in the electrical switchboard.

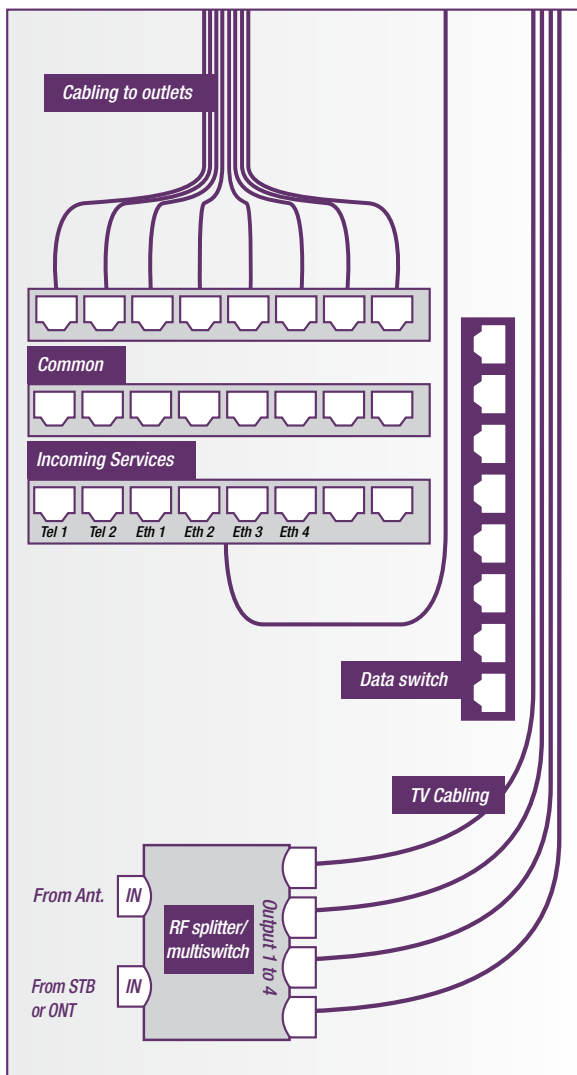


Figure 8 Sample HD layout

ENERGY MANAGEMENT

Energy management cabling is the same as communications cabling and should be installed as per Communications cabling.

ENTERTAINMENT

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

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

5. Test all outlets to ensure the level and quality of the signal comply with the requirements of the current version of AS/ NZS 1367. All connectors shall be installed using appropriate tools.

EES SYSTEMS (BATTERIES)

Cabling shall comply with the requirements of AS/NZS 4509.2, AS/NZS 3000, 3008 and 5033, ECS if the customer has selected "Energy Management".

Appropriate protection devices between battery and battery inverter shall be calculated and chosen according to AS/NZS 4509.2, AS/NZS 3000 and AS/NZS 3008.

All equipment shall be labelled according to the standards AS/NZS 5033, AS/NZS 4777

If all that is being installed at the time is the cabling, the cabling location shall be clearly documented in the customer documentation so it can be utilised when required.

INFORMATION & COMMUNICATIONS

Cabling for all communications should be:

1. Star wired from the HD.
2. Terminated on RJ45 sockets and terminated using T568A pin configuration. Both ends must be terminated using the same configuration.
3. Installed to maintain the twist of the pair up to the point of termination.
4. Installed so that the cable length shall not exceed 90 metres from the HD.

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, but overall length of the bus must be kept as short as practically possible.
3. Termination of the bus cable will vary depending on the manufacturer.

SECURITY & SAFETY

Cabling should be installed for:

1. Smoke detectors
2. Movement sensors
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 Australian Building Code Board's National Construction Code, Smoke detectors are mandatory, please refer to the National Construction Code for details.

Movement sensors

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

Code pad

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

CCTV Camera

CCTV cabling is the same as communications cabling and should be installed as per communications cabling

SOLAR

Install heavy-duty insulating orange conduits from the location identified for the solar array and the location identified for the inverter. Cabling shall comply with the requirements of AS/NZS3000, 3008, 5033 (in particular TUV PV1-F insulation rating) and ECS if the customer has selected "Energy Management".

Appropriate protection devices between PV array and inverter shall be chosen and installed according to AS/NZS 5033 and AS/NZS 3000.

All equipment shall be labelled according to the standards AS/NZS 5033, AS/NZS 4777

If all that is being installed at the time is the cabling, the cabling location shall be clearly documented in the customer documentation so it can be utilised at a point in time in the future.

LABELLING

Figure 9 and Table 8 show the record and 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.

AS/NZS ISO/IEC 15018 states: "In order to maintain consistent and correct point-to-point connections, provision shall be made to ensure that terminations are properly located with respect to connector positions and their corresponding cable elements. Such provisions may include the use of colours, alphanumeric identifiers or other means designed to ensure that cables are connected in a consistent manner throughout the system".

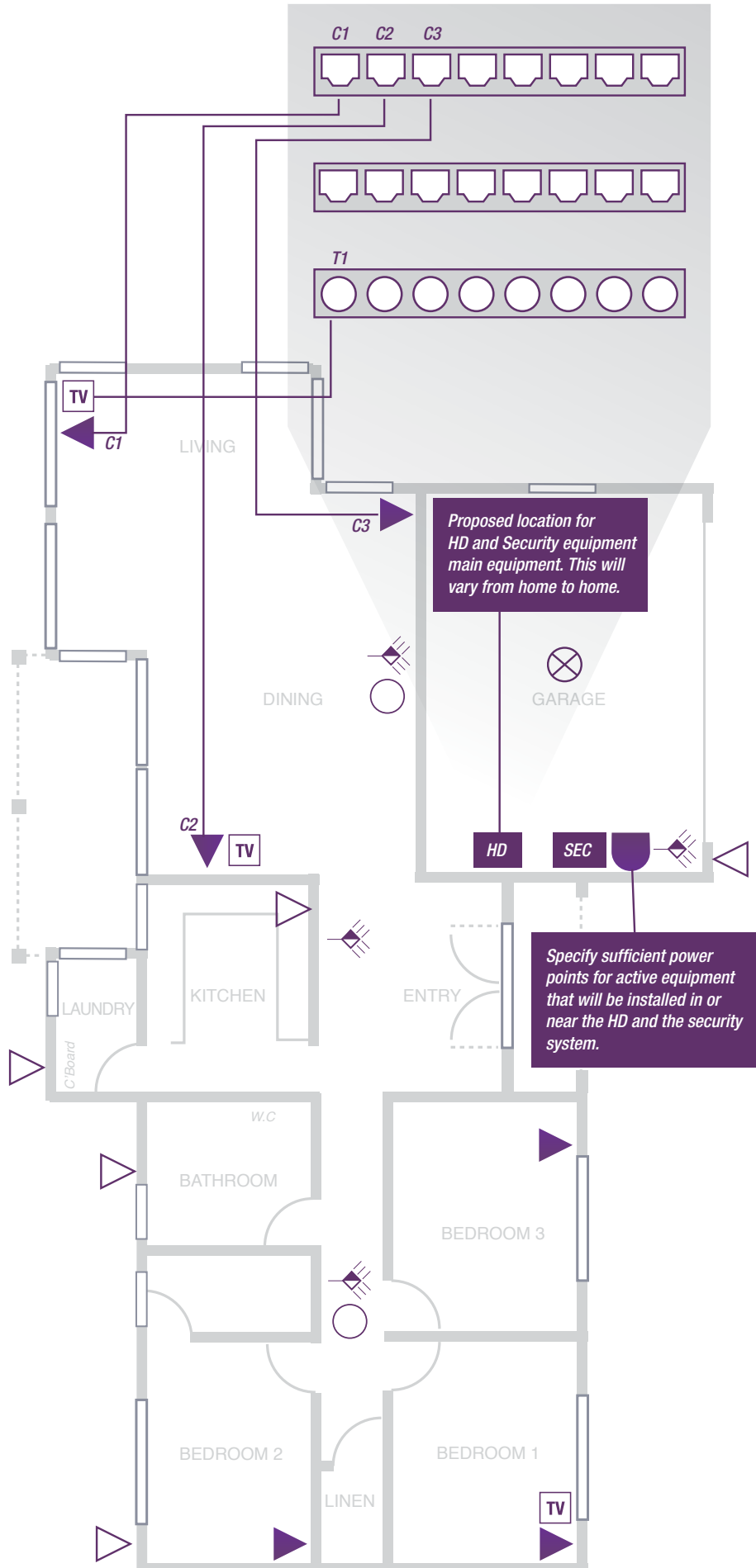


Figure 9 Sample labelling

INTELLIGENT LIGHTING & POWER

ELECTRICAL DISTRIBUTION LIST								
CB	CIRCUIT - Cable	Neutral	Location	Description	Relay	Dimmer	Dimmer Channel	Relay Channel
	1	R1	Carport	6 Downlights	1			1
	2	R2	Portico	2 Surface Mount 2 uplifters	1			2
	3	R3	Entry	2 Downlights	1			3
	4	R4	Kitchen	2 Downlights over stove	1			4
	5	R5	Lower Deck	4 Downlights	2			5
	6	D1	Dining	1 Light Centre		1	1	
	7	D2	Dining	4 Downlights		1	2	
	8	R6	Passageway	3 Downlights	2			6
	9	D3	Living Room	6 Downlights		2	3	
	10	R7	Rear Small Deck	4 Downlights	2			7
	11		Spare					
	12	R8	Bathroom Ground	3 Downlights	2			8
	13		Air Con. Dampers					
	14	R9	Hall	3 Downlights	3			9
	15	R10	Living Room	2 Downlights next to wall- Picture lights	3			10
	16	D4	Bedroom 2	2 Downlights		2	4	
	17	D5	Bedroom 3	2 Downlights		3	5	
	20	D7	Deck Main	4 Downlights		4	7	
	21	D8	Rear Garden Lights	3 Lights		4	8	
	22	R12	Bathrooms	2 Towel Rail	3			12
	23		Spare					
	24	R13	Kitchen	3 Pendant Lights	4			13
	25	R14	Kitchen	2 Downlights above microwave and freezer	4			14
	26	R15	Front Top	4 Downlights	4			15
	27	R16	Stairs Deck	1 Light	4			16
	28	D9	Study	2 Downlights		5	9	
	29	D10	Master Bedroom	4 Downlights		5	10	
	30	R25	Ensuite - Mirror Lights	2 Downlights	5			17
	31	D11	Rumpus 1	1 Light		6	11	
	32	D12	Rumpus 2	1 Light		6	12	
	33	R26	Alcove Main Bedroom	1 Light	5			18
	34	D27	Spare	2 Lights	5			19
	35	R28	Data Centre	1 Light	5			20
	36	R17	Laundry	1 Light	6			21
	37	R18	Ensuite Ground	Blower Heater	6			22
	38	D13	Kitchen Cabinets	2 Downlights		7	13	
	39	R19	Bathroom Ground		6			23
	40	D14	Walk in Wardrobe	3 Lights		7	14	
	41	D15	Outside Master Bedroom	3 Lights		8	15	
	42	D16	Ensuite Master Bedroom	1 Main Light		8	16	
	43	R20	Spare		6			
	44	R21	Main Filter and Solar		7			
	45	R22	Timer Controlled GPO		7			
	46	R23	Spare		7			
	47	R24	Spa pump and Light for pool		7			
	48		Garage	EV charging facility				

Table 8 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
	Age & Assisted Living	Perform pair integrity and speed test.
	Appliances	Perform pair integrity and speed test.
	Digital Home Health	Perform pair integrity and speed test.
	Electric Vehicle (EV) Charging	Communications cabling shall be tested as all other communications cabling. All electrical cabling shall be tested in accordance with AS3000.
	Energy management	Perform pair integrity, speed test and if ECS undertake all electrical testing as per AS/NZS3000.
	Entertainment	Testing level and quality.
	EES Systems (batteries)	Testing shall be done to AS/NZS 4509, AS/NZS 3000, ASNZS 4777 and AS/NZS 3017.
	Information & Communications	Perform pair integrity and speed test.
	Intelligent Lighting & Power	All electrical cabling shall be tested in compliance with the Australian standards. All bus cabling shall be tested for continuity.
	Security & Safety	Conductor continuity and integrity ¹ .
	Solar	Testing shall be done to AS/NZS 5033, AS/NZS 3000, ASNZS 4777 and AS/NZS 3017.

Table 9 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 shall be documented and provided to the customer with the user 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.	Level (dBmV for Cable or μ V for Satellite/FTA)	MER (dB)
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 10 Sample test result sheet for Comms, Ent, Energy Mgr, Digital Home Health and Age & Assisted 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 11: Sample test result sheets for security intercom and EV charging

STEP 5

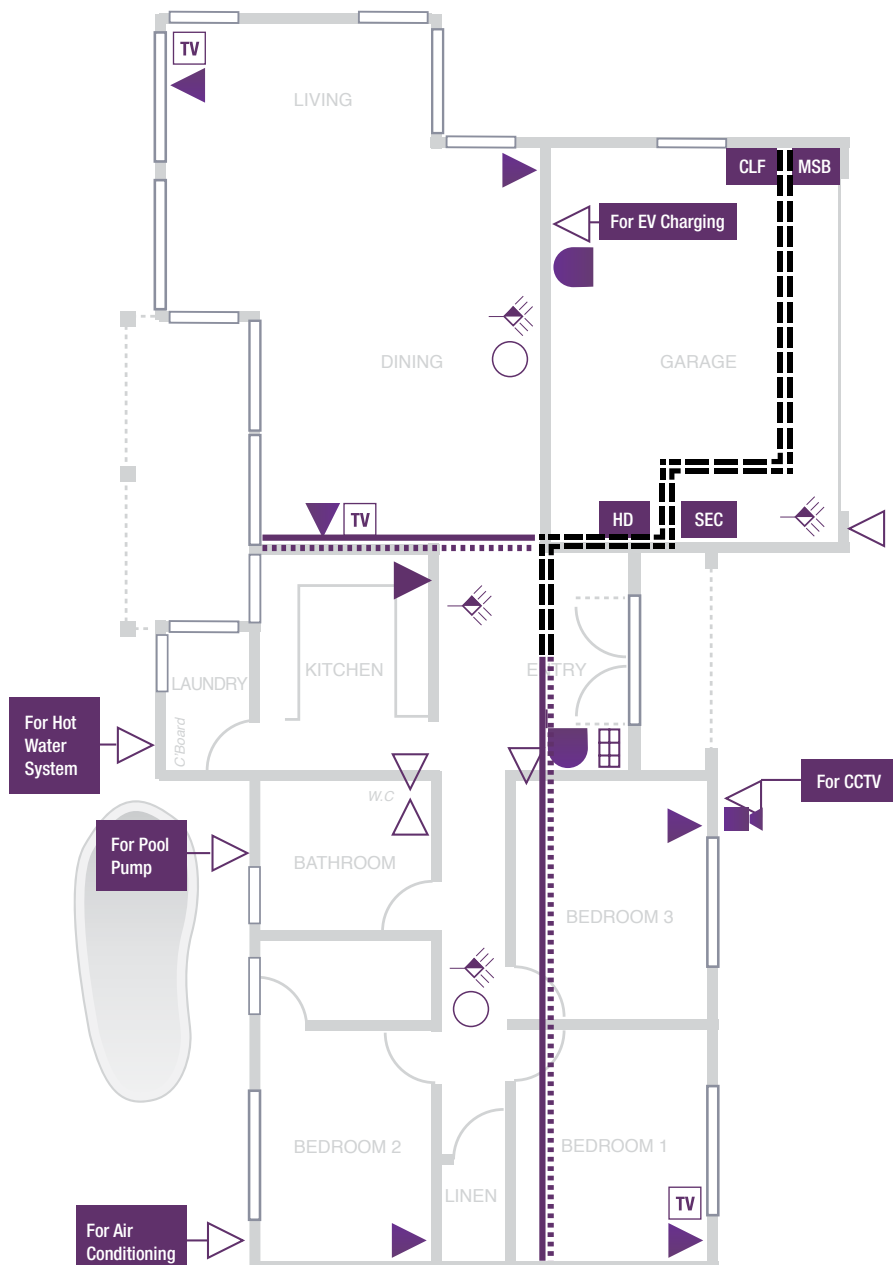
USER DOCUMENTATION

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.	Level (dBmV for Cable or uV for Satellite/FTA)	MER (dB)
1	OK	<i>This is completed if full certification testing has been done</i>	1	>X.XdBmv	>X.XdB
2	OK		2	>X.XdBmv	>X.XdB
3	OK		3	>X.XdBmv	>X.XdB
4	OK		4	>X.XdBmv	>X.XdB
5	OK		5	>X.XdBmv	>X.XdB
6	OK		6	>X.XdBmv	>X.XdB
7	OK		7	>X.XdBmv	>X.XdB
8	OK		8	>X.XdBmv	>X.XdB
9	OK		9	>X.XdBmv	>X.XdB
10	OK		10	>X.XdBmv	>X.XdB
11	OK		11	>X.XdBmv	>X.XdB
12	OK		12	>X.XdBmv	>X.XdB
13	OK		13	>X.XdBmv	>X.XdB
14	OK		14	>X.XdBmv	>X.XdB
15	OK		15	>X.XdBmv	>X.XdB
16	OK		16	>X.XdBmv	>X.XdB

Table 12 Sample test result sheet for Comms, Ent, Energy Mgr, Digital Home Health and Age & Assisted Living

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

Table 13 Sample test result sheets for security and intercom

TELECOMMUNICATIONS ADVICE FORM

Compliance form - telecommunications customer cabling (TCA1 form)

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



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.

Where proposed works may be compromised by existing cabling, a TCA2 form should be completed.

Enquiries

For advice on completing this form, please go to the ACMA website at www.acma.gov.au.

Technical enquiries about cabling should be directed to:
Email: info@acma.gov.au
Tel: 1300 850 115

Registered cabling provider

Name

SURNAME
GIVEN NAMES
Address
POSTCODE

Contact details

WORK ()
MOBILE
EMAIL

Registration number

Expiry Date

Employer (IF APPLICABLE)

Name of company

Address
POSTCODE

Contact details

WORK ()
MOBILE
EMAIL

Description of work (INCLUDING ANY SUPERVISION)

Multiple horizontal lines for describing the work.

Customer details

Name

Address
POSTCODE

Contact details

HOME ()
MOBILE
EMAIL

Certification

I hereby certify that the cabling work described in this advice complies with the Wiring Rules (AS/CA S009:2013 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

INSTALLATION WORK DETAILS

Type Of Installation: _____

Special conditions: Residential Commercial Industrial Rural Other
 over 100 amps High Voltage Hazardous Area Generator

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

Customer/DNSP OFT/Contractor
CERTIFICATE NO: _____
COPY

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

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: _____

EQUIPMENT		Describe the equipment and estimate load increase of the work affected by this Notice.	
	RATING	No.	PARTICULARS OF WORK
<input type="checkbox"/> Switchboards			
<input type="checkbox"/> Circuits			
<input type="checkbox"/> Lighting			
<input type="checkbox"/> Socket-outlets			
<input type="checkbox"/> Appliances			
Estimated increase in load A/ph			
<input type="checkbox"/> Work is connected to supply		<input type="checkbox"/> Increased load is within capacity of installation/service mains	
		<input type="checkbox"/> 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: _____ Licence No: _____
 Signature: _____ 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: _____ (Name)
 Signature: _____
 Address: _____
 Licence No: _____
 Date of Notice: _____
 Telephone No or Other Contact: _____


Assessor remarks

Assessed by: _____ Date: _____
 Comments: _____














NOTE: This form will vary from State/ Territory

CODE COMPLIANCE LABEL



COMPLIANCE WITH THE CODE OF PRACTICE FOR HOME WIRING

**INSTALLER MUST MARK
NEXT TO SYMBOL TO
DEMONSTRATE COMPLIANCE**

		
AGE & ASSISTED LIVING	ENERGY MANAGEMENT	INTELLIGENT LIGHTING & POWER
		
APPLIANCES	ENTERTAINMENT	SECURITY & SAFETY
		
DIGITAL HOME HEALTH	EES SYSTEM BATTERY	SOLAR
		
EV CHARGING	INFORMATION & COMMUNICATIONS	

Installer's Details:

Company Name

Date

Contact Details

Open Registration

The latest compliance with the Code of Practice for Home Wiring is available from
www.registeredcablers.com.au/industry/smart-wired/

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.registeredcablers.com.au/industry/smart-wired/

NOTE:

1. Compliance with the Code of Practice requires the Code Compliance Label to be located in the HD. It is therefore recommended all customer documentation be located in the HD.
2. The minimum functional requirement is Communications and Entertainment.
3. Compliance label can be downloaded from www.registeredcablers.com.au/smart-wiring/.

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APPENDIX

A

CONNECTIVITY TO BROADBAND NETWORK PROVIDERS

This section provides guidelines for the installer when pre-wiring a home in an area where connection is provided to the National Broadband Network. This connection may be via one of the following Network Providers:

nbn™, Telstra,
OptiComm, Pivit,
Places Victoria NT Technology Services
and more...

The contractor should take all reasonable steps to identify who is the Broadband Network Provider and consult with them as to their specific requirements. Appendix D in this document provides links to the organisations listed above.

The National Broadband Network is not only being provided by a number of network providers as listed above but it is using a range of technologies. These technologies are:

- Fibre to the Premises (FTTP also referred to as fibre to the home FTTH)
- Fibre to the Node (FTTN)
- Fibre to the Basement (FTTB)
- Fibre to the distribution point (FTTC)
- Hybrid Fibre Coax commonly known as Pay TV cable
- Fixed Wireless
- Satellite

During the transition period and in regional areas served by Fixed Wireless and Satellite some existing copper services may remain. In these cases, the network boundary point is the first telephone socket or a copper NTD or an MDF.

Access technology	NBP
FTTP HFC Fixed Wireless Satellite	i. NTD
FTTN FTTB FTTC	i. MDF ii. no MDF an NTDcu iii. no NTDcu a first socket

cu – depicts copper NTD

NTD

The NTD function varies between the access technology and the network provider.

Access technology	NTD details
FTTP (also referred to has FTTH)	The NTD will typically have: <ul style="list-style-type: none"> • 2 voice ports that can be used for telephony, but rarely • 4 data ports to access the broadband network. Each ports is for a separate service provider.
HFC	The NTD will have 1 data port to access the broadband network
Fixed wireless	The NTD has only one data port to access the broadband service.
Satellite	The NTD has only one data port to access the broadband service.

PREPARING FOR FIBRE TO THE HOME

When the home is in a fibre to the home area you need to provide the infrastructure for the fibre to be installed. The infrastructure needed is:

1. External conduit from the street to the house
2. Conduit from the external conduit location to the HD

In locations where there is no information as to the provider then a draw wire should be included in the conduit to allow the service provider to install their fibre from the street to the side of the house and extend the services to the HD area either as fibre or copper.

Refer to relevant carrier's website for their lead-in conduit installation requirements. Some carriers may prefer to install their own lead-in conduit.

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.

Lead-in facility requirements are dictated by the access technology:

1. Copper twisted pair
2. Coax
3. Fibre
4. Satellite
5. Radio

The lead-in facility can be divided into two categories:

- Cable which includes copper, coax and fibre.
- Others which included satellite and fibre.

To determine what is required you need to:

1. Identify the network provider
2. Determine the access technology
 - a. Cable
 - b. Other

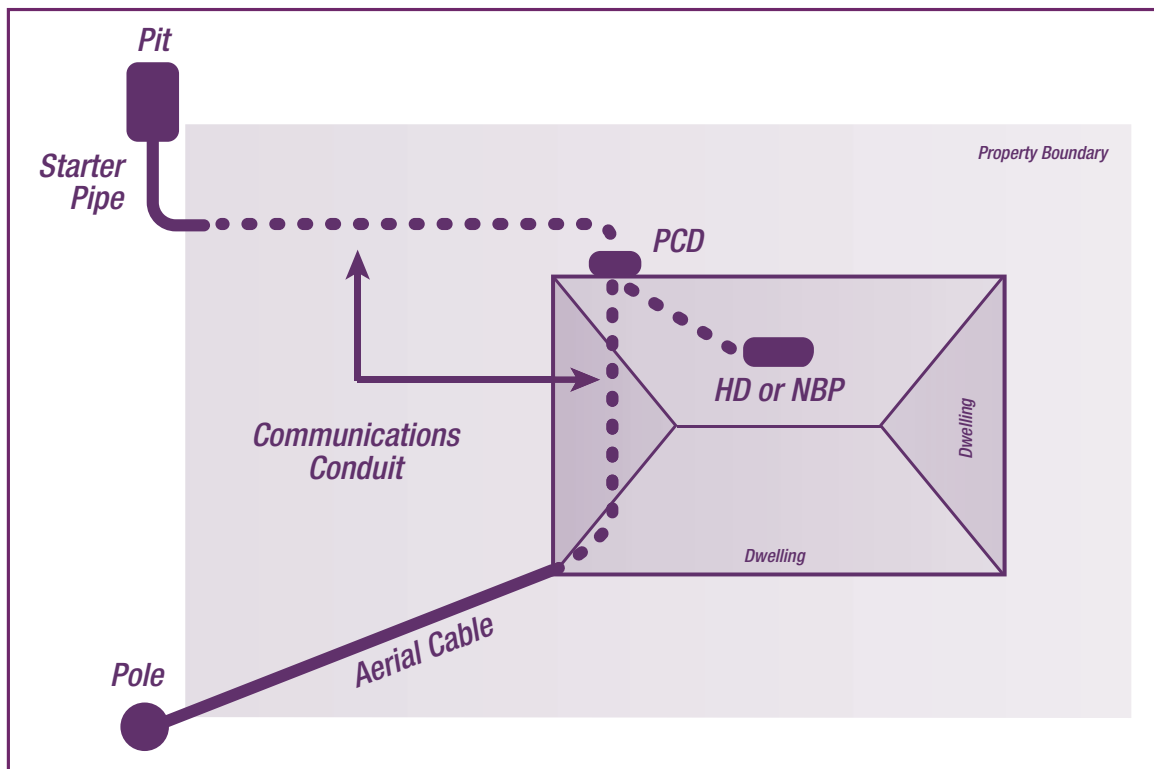


Figure 15 lead-in pathway

CABLE

In general, with any of the cable access technologies, the facility required is a pathway from the carrier's distribution point. This may be a starter pipe or a pole to the location of the PCD.

Figure 15 shows the generic pathway (underground or aerial) from the carrier distribution point to the PCD and to the HD or NBP.

In summary what is needed is:

1. Communications conduit from the starter pipe in the case of underground cabling or the point of attachment for aerial cable to the PCD location.
2. Conduit from the PCD location to the HD or NBP
3. All conduits installed must have a draw wire included.

For more details, see [Appendix D - Sources of information](#) for links to the various network providers.

OTHERS

In cases where the lead-in is fibre you will need to consult with the service provider as to the requirements. For details see [Appendix D - Sources of information](#).

Satellite

In cases where the services are provided via satellite you will need to contact your service provider. For details see [Appendix D - Sources of information](#).

Radio

In cases where the services are provided via radio you will need to contact your service provider. For details see [Appendix D - Sources of information](#).

SOURCES OF INFORMATION

COMMUNICATIONS

ESS

Clean Energy Council's accreditation program can be found at:

www.solaraccreditation.com.au/

LBN Co

LBN Co provides multi dwelling unit connectivity, see: www.lbnco.com.au/

nbn® Co

nbn® Co In home wiring solutions for SDU and MDU:

<https://www.nbnco.com.au/develop-or-plan-with-the-nbn/new-developments/design-build-install>

Opticomm

OptiComm provides fibre solutions to greenfield estates, Details of their services are found at:

<http://www.opticomm.net.au> or 1800 137 800

OpeNetworks

Provides fibre connected communities, see:

<https://www.openetworks.com.au/>

RedTrain Networks

RedTrain Networks provides telecommunications infrastructure solutions, see:

<https://www.redtrain.com.au/>

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:

<https://www.telstra.com.au/smart-community>

ENTERTAINMENT

Foxtel

See www.foxtel.com.au/mdu

APPENDIX D

RESIDENTIAL CONNECTIVITY 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 is 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 complemented by wireless technologies as being the only one that is fully compliant with the code of practice as it provides a fixed level of infrastructure that is permanent.

Whilst other connectivity solutions, will play a part in many homes and businesses they are generally temporary in nature. The tenant, when moving out, can remove the connectivity solutions leaving the home with no connectivity infrastructure. On the other hand, where cabling is provided, removal of the active hardware still leaves the cabling infrastructure.

WIRELESS

The Home Wiring Essential calls for a minimum of 4 dual Cat 6A outlets to be installed to allow for the deployment of PoE wireless access points (WAP). Note, this is considered a minimum and consideration should be give

to the size of the property and the type of construction of the building to ensure consistent access to the network from any location within the property.

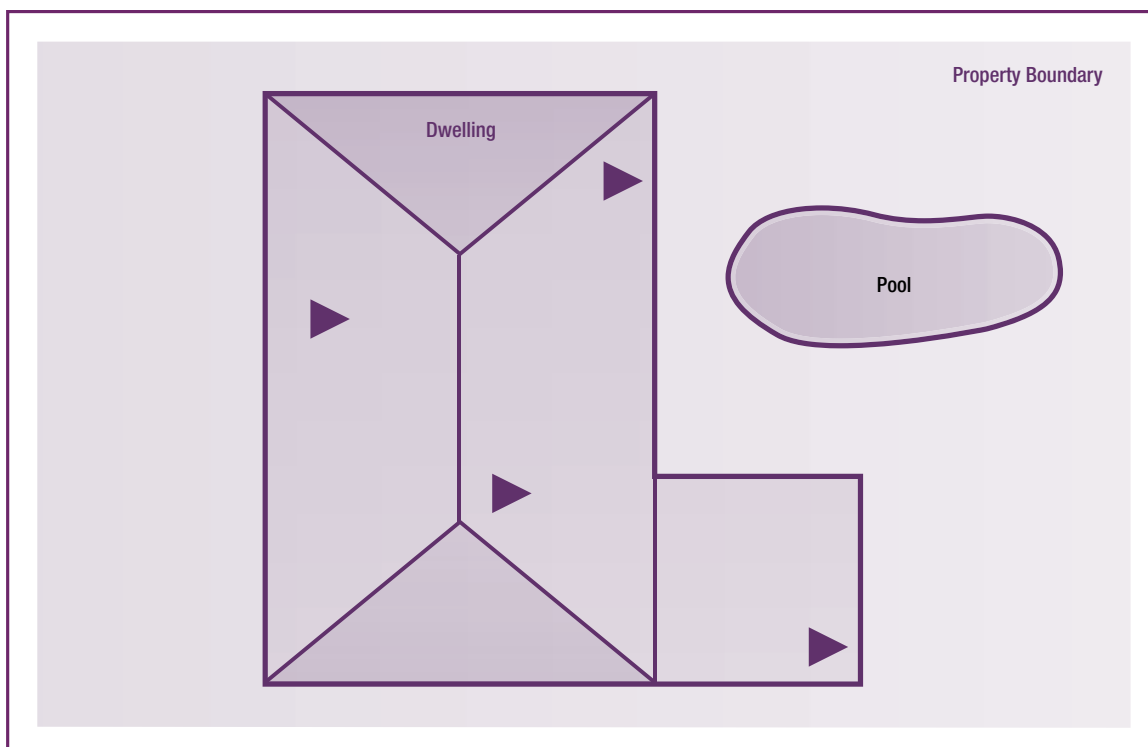


Figure 16

In the above example, dual RJ45 outlets are placed ideally in the ceiling or high locations that are not obtrusive but can have a PoE WAP easily installed and provide the coverage

required for the property. Note, the above is an example only, consideration must be given to the type of construction materials used.

APPENDIX F

ELECTRIC VEHICLE (EV) CHARGING

EV CHARGING

EV Charging is a relatively large residential electrical load:

- The current generation of vehicles available in Australia draw 16A at 240V AC
- The next generation of vehicles likely to arrive in Australia will draw up to 32A at 240V AC

For this reason, a dedicated EV charging circuit rated to 40A on a 32A RCBO is recommended where an EV Charging service has been specified by the home owner.

Locating the outlet should take the outlet-to-vehicle charging cable into account. When the vehicle is plugged in, the charging cable should be routed away from walkways so as to avoid creating a trip hazard. A sample diagram is provided below showing preferred and non-preferred outlet locations for a double-garage. In some cases it may be feasible to have the

EV charging facility suspended from the ceiling making it accessible to both vehicles and avoiding a trip hazard.

MDUs are a special case for EV Charging as parking locations are often remote from the dwellings. In these instances it is recommended that a standalone, revenue-grade meter be installed on each charging circuit. This will allow for the EV charging electricity use to be billed to whoever subsequently enters into a supply agreement for the location.

The EV Charging service installation should include both communications and lighting. For the latter, the lighting should be located so as to illuminate the outlet-to-vehicle region.

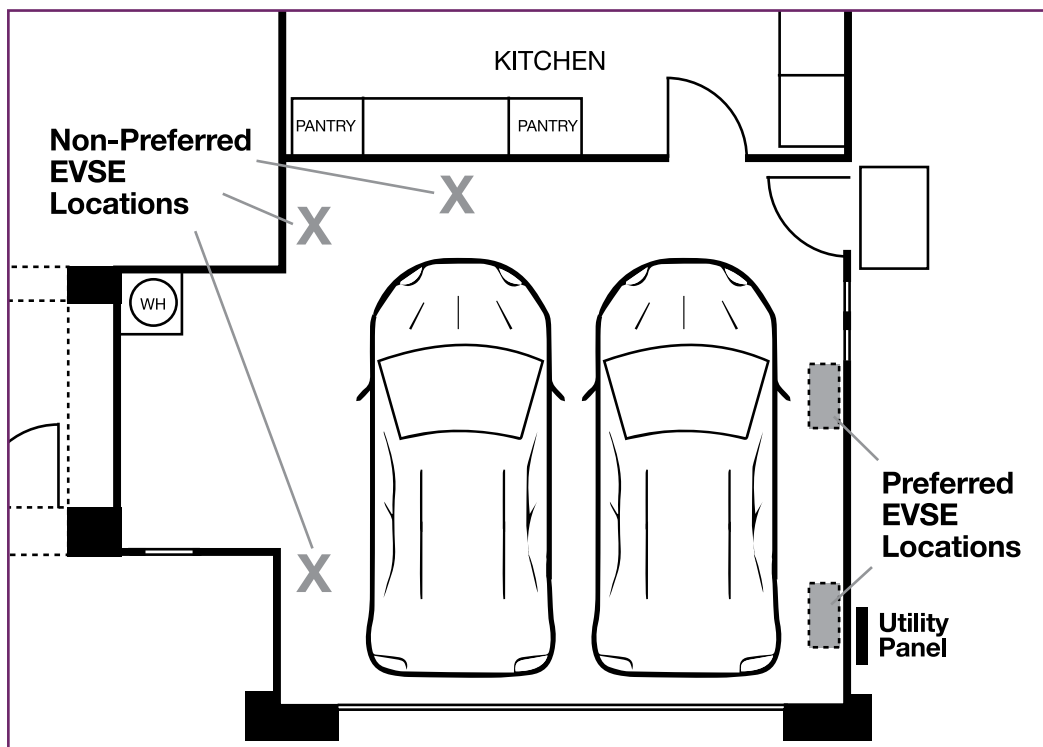


Figure 17 Double Garage Location for EVSE

SOLAR

Before commencing any physical work for the connection of PV inverter to the grid, an 'Application for Connection' shall be submitted to the local network provider. Only after the approval has been sought and provided, can the connection of inverter to grid be made.

A net meter shall be installed to avoid future metering upgrades when a PV system is installed in the premises. The switchboard shall also have enough space beside the meter if the PV system requires installation of a monitoring system. Consideration should be given to space behind the switchboard mounting panel for installation of current measuring transformers.

The switchboard shall have a minimum of 2 circuit-breaker spaces (2 pole positions) available for the grid-connect inverter protection circuits. The switchboard should have enough space for all signage that shall be installed as per AS/NZS 5033, AS/NZS 4777 AS/NZS4509 and any local DNSP requirements.

Earth cable of minimum 4mm² shall be run in the conduits from the roof to the proposed inverter location near the switchboard. If the PV array requires earthing for lightning protection as per AS/NZS 5033 and AS/NZS 1768, then a minimum of 16mm² cables shall be run in the conduit. The PV array may have to be installed all across the length or width of the roof. Hence The earthing cable shall be connected to all PV mounting rails and these rails could span across length/width of roof.

APPENDIX

H

EES

Before commencing any physical work for the connection of PV or battery inverter to the grid, an 'Application for Connection' shall be submitted to the local network provider. Only after the approval has been provided, can the connection of inverter to the grid begin.

The battery bank shall be installed in a dedicated room/enclosure or in a section of a non-habitable large room that is fenced off from the rest of the room as per AS/NZS 4086. The cable sizes cannot be installed before-hand without being designed by a qualified/ accredited system designer. The battery inverter shall be protected by fuse circuits from the battery input hence conduits can be put in place only at the time of installation based on the fuse and cable ratings selected during the design process.

The switchboard shall have a minimum of 2 circuit-breaker spaces (2 pole positions) available for the battery inverter protection circuits. The switchboard should have enough space for all signage that shall be installed as per AS/NZS 5033, AS/NZS 4777, AS/NZS 4086, AS/NZS4509 and local DNSP requirements.

At the time of writing this document a new standard is under development (DR5139) and in conjunction with potential amendments with the National Building Code will supersede AS/NZS 4086. Until the new standard is published, the existing standards must be used in conjunction with Clean Energy Council guidelines.

ECONOMIC CABLE SIZING (ECS)

ECS, Economic Cable Sizing is using a larger cable size to improve the efficiency of the electrical cabling and reduce the losses allowed by standards.

There are two options available:

1. Use next size cable
2. Calculate the optimum cable size

USE NEXT SIZE CABLE

In this option all you are required to do is the next size cable to connect to:

- Hot water systems
- Pool pump
- Air Conditioning
- Solar panels
- EES Batteries

CALCULATE THE OPTIMUM CABLE SIZE

In this option you will need to apply the recommendation in AS/NZS3008, see section 2.6 Determination of cable size based on the economic optimisation considerations.

You can also find a number of worked examples in AS/NZS3008 in Appendix A.

Principle of economic and energy efficient cable sizing see www.copper.com.au/about/projects/principles-of-economic-and-energy-efficient-cable-sizing/

APPENDIX

J

TERMINOLOGY

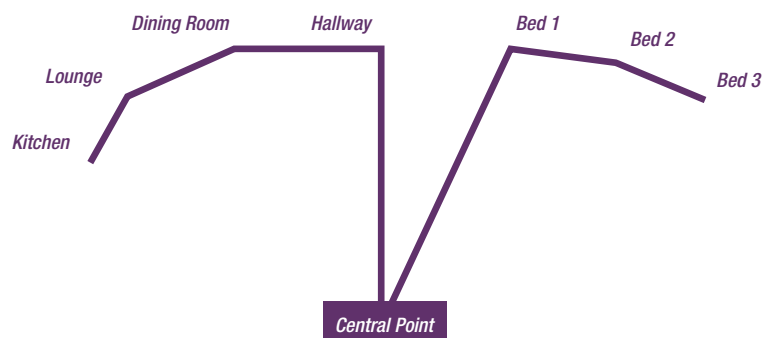
ABBREVIATIONS

CLF	Carrier lead-in facility	NBN	National Broadband Network
ECS	Economic cable sizing (ECS) is the selection of electrical cables for residential and commercial buildings that is based on economic considerations in addition to safety considerations.	NTD	Network termination device
EES	Electrical Energy Storage, a device that can store electrical energy for use at a later time. For example batteries can store electrical energy produced by PV modules during the day and make it available for loads at night. Note: generally referred to in AS3000 and AS4777 as an IES (Inverter Energy System) or BESS (Battery Energy Storage System).	ONT	Optical network terminal
ELV	Extra low voltage as defined in AS/ACIF S009	PCD	Premises Connection device
FTA	Free to air TV HD Home distributor	PLN	Phone line networking
FTTH	Fibre to the home also known as Fibre to the premises	POTS	Plain old telephone service
FTTP	Fibre to the premises, also known as Fibre to the home	RF	Radio frequency
FTTN	Fibre to the node	RSP	Retail service provider
FTTB	Fibre to the basement	RJ11	Refers to a 6 position modular connector 4 contact (plug/socket) commonly used to connect telephone equipment and services
FTTdp	Fibre to the distribution point	RJ12	Refers to a 6 position module connector with 6 contacts (plug/socket)
HFC	Hybrid fibre Coax network	RJ45	Refers to an 8 position modular connector (plug/socket) used to connect equipment to standards based generic cabling and to interconnect Ethernet devices
IDC	Insulation displacement connector	SDU	Single dwelling unit
LV	Low voltage as defined in AS/ACIF S009	STB	Set top box
MATV	Master Antenna Television	TPS	Thermo plastic sheathed
MDF	Main distribution frame	UTP	Unshielded twisted pair cable
MDU	multi dwelling unit	μ V	micro volts
MER	Modulation Error Ratio		
mV	milli Volts		
NBP	Network boundary point		

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.



LIVING AREAS

The following are considered living areas: bedrooms, lounge, dining, kitchen, family, rumpus, home theatre, study, studio, workshop, garage or any other area where people can sit, lounge, work. What would typically be excluded would be bathrooms, ensuite, walk-in wardrobe.

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 -multi service cable and can carry telephony, broadband internet, Pay TV, access control and other services. These services will terminate on a Network Termination Device (NTD) 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.

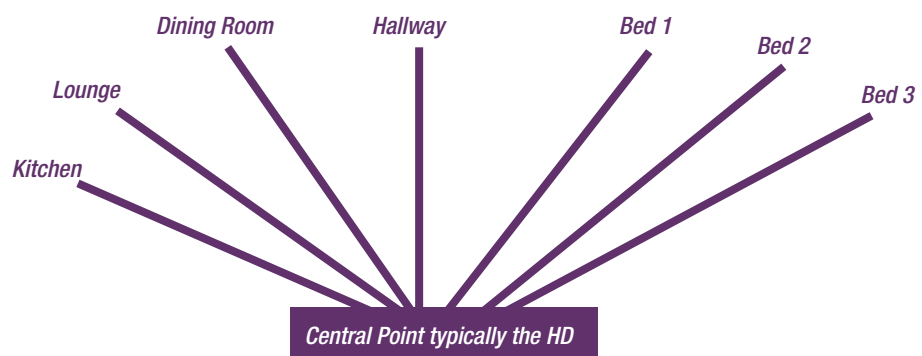
SDU



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 which all services, regardless of the delivery mechanism by the Service Provider, are terminated 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.

APPENDIX K

SYMBOLS

SMART WIRED™ SYMBOLS


This is 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.



SMART WIRED™ is a registered trade mark and the SMART WIRED™ service symbols are trade marks of the International Copper Association, with exception of the EV symbol that is used with permission from VicRoads.

This document is proudly supported by:





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, Intelligent Lighting & Power and Electric Vehicle (EV) Charging.

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