COMMUNICATIONS ALLIANCE LTD

# AUSTRALIAN COMMUNICATIONS AND MEDIA AUTHORITY

## Cabling review - Review of regulation of telecommunications customer cabling

COMMUNICATIONS ALLIANCE SUBMISSION

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# INTRODUCTION

Communications Alliance welcomes the opportunity to provide this submission in response to the Consultation Paper on the *Review of regulation of telecommunications customer cabling* Consultation Paper by the Australian Communications and Media Authority (ACMA).

### Executive Summary

Communications Alliance acknowledges the ACMA's initiation of this review of the effectiveness of the existing cabling regulatory arrangements in our evolving industry. There are a number of drivers for change which make this review timely, including developments in technology, consumer expectations moving from a PSTN-centric environment to ubiquitous fast broadband, the advent of smart homes and the era of the Internet of Things (IoT).

The submission comprises two parts. The first part considers the scope of telecommunications customer cabling regulation in Australia and the application of the concepts of health and safety under customer cabling regulation. The second part of the submission addresses the specific questions posed by the Consultation Paper.

Communications Alliance believes that the application of cabling regulation under Part 21 of the *Telecommunications Act 1997,* with respect to protecting the health and safety of persons, needs to be revaluated in light of the evolving cabling environment. The application has, to date, been focused on electrical safety, but ought now be broadened to encompass service availability supporting an environment underpinned by a range of safety-related systems.

Given that communications is an essential service provided by the telecommunications sector over critical infrastructure, and that the telecommunications industries and the technologies being deployed are evolving, Communications Alliance urges caution against any premature winding back or softening of customer cabling regulations that may adversely affect the health and safety of persons using/working with cabling installations.

Communications Alliance is acutely aware of industry innovation within the cabling sector, particularly in the area of power distribution over communications cables. Although technical solutions for power distribution are becoming evident, traditional approaches to how electrical and communications cabling regulation address cabling within customer premises may become increasingly difficult to manage, as the demarcation lines of these cabling systems increasingly blur.

As new technologies are being deployed in the communications industry, the cabling registration classifications would benefit from a review to address these new technologies, together with consideration of what specific cabling skill sets are needed and the appropriate training required.

Communications Alliance is undertaking a revision of the AS/CA S008 customer cabling product Standard and AS/CA S009 customer cabling installation Standard at the time of this consultation.

### Recommendations

Communications Alliance recommends that the ACMA:

1. Maintains the *Cabling Provider Rules* as allowed under s421 and expand enforcement activities to lift the cabling practices and cabling compliance;
2. Reviews the registration categories to bring them up to date and make them more relevant for the emerging technologies;

3. Reviews the current scope of the training requirements and appropriate skill levels required;
4. On the basis of any feedback received and with a view to future requirements, consider and review the relevance of the heads of power of the ACMA as they are applied today, given the changing communications environment; and
5. Investigates the regulation of power distribution over telecommunications cabling and telecommunications over power cabling in customer premises and look for opportunities where the two regulatory regimes can align into the future.

Communications Alliance is happy to make itself available to the ACMA staff to clarify any of the issues raised within this submission.

**About Communications Alliance**

Communications Alliance is the primary telecommunications industry body in Australia. Its membership is drawn from a wide cross-section of the communications industry, including carriers, carriage and internet service providers, content providers, equipment vendors, IT companies, consultants and business groups.

Its vision is to provide a unified voice for the telecommunications industry and to lead it into the next generation of converging networks, technologies and services. The prime mission of Communications Alliance is to promote the growth of the Australian communications industry and the protection of consumer interests by fostering the highest standards of business ethics and behaviour through industry self-governance.

For more details about Communications Alliance, see http://www.commsalliance.com.au.

## General comments

Communications Alliance welcomes the review of regulation of telecommunications customer cabling by the Australian Communications and Media Authority (ACMA). The Consultation Paper released in October 2018 provides an informed overview of the current status of cabling regulation in Australia today, posing a number of questions and possible directions for regulations for the future.

Communications Alliance suggests that the delivery of communications, whether wired or wireless, is undergoing a transformational change, here in Australia and worldwide. To a greater extent than ever before, consumers are experiencing the opportunity to be better and ubiquitously connected. This ubiquitous connected world is been driven by evolving technologies and the means to deliver them - coupled with a consumer thirst to have access to a vastly richer information ecosystem. In the context of customer cabling regulation, this leads us to consider the following developments more closely:

- Carrier access networks comprising a variety of technologies: Fibre to the Premises/Node/Curb, HFC, Fixed Wireless, Satellite, 3G/4G/5G wireless, PSTN;
- increasing number of connected customer devices and the growing Internet of Things (IoT) ecosystem;
- power distribution over communications cabling;
- public dependence on essential services over telecommunications networks that are now considered as critical infrastructure; and
- regulatory frameworks for communications and power distribution that are experiencing overlap specifically in the regulation of their respective cabling areas.

These issues are addressed in the *Responses to specific questions* section of this submission, following this *General comments* section. The remainder of the *General comments* section expands upon the application of customer cabling regulation today and where Communications Alliance believes consideration should be given into the future.

## Network resilience and critical infrastructure

To set the stage for the discussion of the provision of communications services over customer cabling, the submission draws upon the Government's current approach to the management of critical infrastructure. Communications is considered to be an essential service provided by the telecommunications sector over critical infrastructure[1]. The Explanatory Memorandum of the *Security of Critical Infrastructure Act 2018* states that the definition of critical infrastructure asset 'minimises the regulatory burden by ensuring the legislation and its obligations only apply to Australia's highest-risk critical infrastructure assets'. The Explanatory Memorandum identifies the telecommunications, electricity, gas, water and ports sectors as the highest-risk sectors and notes that the *Telecommunications Sector Security Reforms* (TSSR) legislation is managing risks in the telecommunications sector.

By extension, Communications Alliance would argue that network resilience needs to extend beyond telecommunications networks and into the customers' premises and apply to customer cabling in order for these essential services to be provided.

The Critical Infrastructure Centre (CIC) coordinates the management of the complex and evolving national security risks to Australia's critical infrastructure, with an initial focus on the

[1] Security of Critical Infrastructure Act 2018. https://www.aph.gov.au/Parliamentary_Business/Committees/Joint/Intelligence_and_Security/CriticalInfrastructure/Report/section?id=committees%2Freportjnt%2F024155%2F25767

risks of sabotage, espionage and coercion in telecommunications, electricity, gas, water and ports sectors. The CIC notes that 'critical infrastructure underpins the functioning of Australia's society and economy and is integral to the prosperity of the nation. It enables the provision of essential services such as food, water, health, energy, communications, transportation and banking. Secure and resilient infrastructure supports productivity and helps to drive the business activity that underpins economic growth. The availability of reliable critical infrastructure promotes market confidence and economic stability, and increases the attractiveness of Australia as a place to invest.' [2]

Communications Alliance suggests that any consideration of changes to the regulation of customer cabling take into account the role that it plays in providing essential services to the Australian public.

## Scope of telecommunications customer cabling regulation

Communications Alliance posits that the practical application of cabling regulation under Part 21 of the *Telecommunications Act 1997* with respect to protecting the health and safety of persons using, operating or working on telecommunications networks, needs to be revaluated in light of the evolving cabling environment.

To summarise the relevant sections of the *Telecommunications Act 1997*:

- s376 provides the ACMA powers to make Standards for health/safety relating to equipment (i.e. all the S00x CE Standards) and cables/cabling products (i.e. mandating AS/CA S008).
- s421 gives the ACMA powers to make rules for performance and supervision of cabling work via the Cabling Provider Rules (CPRs) (i.e. mandating AS/CA S009). It also provides the ability for the ACMA to fine persons not complying with the CPRs and to request non-compliant actors surrender licences (s436).
- s439 also gives the ACMA the ability to develop a Declaration which defines what constitutes customer cabling.

It has been the approach to date that the requirements in AS/CA S009[3] provide at least the same level of health and safety requirements under s376 of the *Telecommunications Act 1997* to support AS/CA S008[4] and the other Communications Alliance customer equipment Standards.

It should be noted, that poor cabling practices could undermine the objective of having Standards for equipment and cabling.

The existing ACMA Heads of Power to make customer equipment and cable Standards under s376 of the *Telecommunications Act 1997* centre around the following (simplified) objectives:

- **a working network** - prevent equipment/cables from impairing the functioning (integrity) of the network – s376(2)(a);
- **a safe network** - prevent telecommunications lines that enter premises from exposing customers and operational staff from hazards – s376(2)(b); and
- **provide 'essential' services** – allowing any-to-any voice calls - s376(2)(d), and allowing access to the emergency call service – s376(2)(c).

[2] Critical Infrastructure Centre - Safeguarding Critical Infrastructure. https://cicentre.gov.au/infrastructure

[3] AS/CA S009:2013 *Installation requirements for customer cabling (Wiring rules)*. Communications Alliance. http://www.commsalliance.com.au/Documents/all/Standards/s009

[4] AS/CA S008:2010 *Requirements for customer cabling products*. Communications Alliance. http://www.commsalliance.com.au/Documents/all/Standards/s008

It appears that the objectives for a user to be able to make calls and to dial an emergency call service were the only important services identified when these objectives were drafted, more than 20 years ago.

It is argued that moving into the future, telecommunications networks are providing many services that, if these objectives were revisited, would be areas that cabling regulations ought to encompass. These services include:

- significantly more product and service options in the market for end users of telecommunications services to communicate with the Emergency Call Person via either Triple Zero or 106. End users now expect to be able to contact emergency services via the mostly data-based services and applications they use in daily life – text, VoIP and social media;[5]
- remote health monitoring services;
- data centres hosting cloud services essential to societies' critical infrastructure[6];
- remotely monitored services for security and public safety, including CCTV surveillance;
- remotely monitoring services for the aged and disabled individuals;
- the use of back-to-base smoke detectors;
- nbn-based services, M2M services and NB-IoT services;
- services for devices employing battery backup, the prevalence of which are increasing; and
- services that are susceptible to radiofrequency interference (RFI), for example RF emanating from HDMI cables in office environments where the aggregate RF is sufficient to knock out mobile phone communication on some bands.

Communications Alliance, therefore, proposes that the regulatory oversight of customer cabling ought to be adjusted to address the types of services that networks are providing today. These issues are elaborated upon in the in the following sections.

## Health and safety

The *Telecommunications Act 1997* empowers the ACMA to make Standards protecting the health and safety of persons who operate, work on, use services supplied by means of, or are otherwise reasonably likely to be affected by the operation of a telecommunications network or a facility.

Communications Alliance argues that the focus of the practical application of this ACMA power to date has been towards safety, and specifically electrical safety. It is now argued that safety now extends beyond the traditional application of electrical safety (and avoiding electrocution)[7] and is transitioning to service availability supporting safety-related systems, systems increasing performing the roles of providing essential services.

To ensure the health and safety of users of communications services, the telecommunications system must be cabled in a safe manner and function as a whole when

[5] Communications Alliance/AMTA Telecommunications (Emergency Call Service) Determination 2009 submission – November 2018
https://www.commsalliance.com.au/__data/assets/pdf_file/0019/61930/November-2018_CA-AMTA_-ECS-Determination-Review-2018.pdf

[6] TISN 'Those physical facilities, supply chains, information technologies and communication networks, which if destroyed, degraded or rendered unavailable for an extended period, would significantly impact on the social or economic wellbeing of the nation, or affect Australia's ability to conduct national defence and ensure national security.'
https://www.tisn.gov.au/pages/critical_infrastructure.aspx

[7] ACMA Using a registered cabler https://www.acma.gov.au/theACMA/using-a-registered-cabler

required. Today users depend on life saving and life preserving technologies, e.g. medical alarm services, security alarm services, services for aged care and hospitals. Other such services include services supporting data centres, airports and stadiums, and IoT technologies which assist in managing the environment to ensure the quality of air and water.

These considerations also need to be taken into account against the background of Government regulatory policy. For example, the recently published *Telecommunications (NBN Consumer Information) Industry Standard 2018*, made by the ACMA upon Ministerial Direction, expressly requires Carriage Service Providers to provide consumers with certain information about the use of medical devices prior to sale, to ensure that they are aware of the potential limitations of such devices in case of power outages and the potential detriment to their health and safety[8]. Similarly, the nbn medical alarm register was established for the purpose of safeguarding consumers' health and safety. Consequently, it appears that the general health and safety of consumers is, understandably, already a relevant consideration in the development of policy and regulatory instruments.

## Addressing safety requirements

The following details specific examples of the need to address safety requirements for the installation of customer cabling and selection of cabling-related customer equipment.

**The Internet of Things (IoT)**

The projected large-scale adoption of IoT and the deployment of disruptive technologies see physical infrastructure as a key risk element in the effective deployment of safety systems.

A number of industries are utilising technology to address specific safety needs over multiple social economic sectors, providing the Australian community with net benefits over traditional delivery models.

Current technologies support 100 Watts (500 mA per conductor or 1 Amp per pair) to allow technologies to support zero client ('ultra-thin' client terminals with minimal processor/memory/storage) and access control by facial recognition. These technologies, along with numerous other deployed technologies and technologies currently under development, utilise communication cabling to deliver both communication and power.

Remote powering over twisted pair cabling provides higher dependency services and lower operational cost over wireless technologies as the twisted pair delivers both communication and power to a device. Wireless devices need to address power at the device and issues around power availability at the device, i.e. a proximity sensor that is deployed as part of a safety system would be impacted by the lack of battery charge within the device.

**Aged care facilities**

The aged care sector allows aging Australians to stay in their homes longer with the utilisation of technologies. Technologies include:

- access control allowing family members to remotely open doors for emergency personnel;
- connected devices such as kettles and chairs to establish patterns (using Big Data) for changes in resident behaviour to trigger a response to support organisations or family members;
- camera and intercom systems to check on the well-being of individuals by family members and health professionals remotely;

[8] *Telecommunications (NBN Consumer Information) Industry Standard 2018*
Section 10 *Minimum requirements - medical alarm services and security alarm services*.
Section12 *Minimum requirements to provide advice about NBN services*

- medical alert systems as a distress alarm for residents;
- life style and social interactive software to help address mental health issues; and
- food order and delivery platforms to help ensure quality of life and dietary requirements are met.

**Digital hospitals**

- hospitals are moving towards digital hospitals which will have a higher dependency on technologies to operate. It is noted that Australian Standards have recently developed a digital hospital handbook.
- Sydney Adventist Hospital has recently deployed zero client terminals in place of mobile computers (or Computers on Wheels - COWS). Zero client delivers power and communication on four-pair communication cabling to the device (dumb screen with keyboard and mouse) without the need for local power.

**Other deployments**

- airports, stadia and smart campuses world-wide are deploying digital power, i.e. a system that allows for 1,000 Watts of power over communication cabling to 2,000 metres. This technology allows for the effective deployment of safety and security systems throughout the facility which may include but not be limited to Wireless Access Points (WAPs), cameras and in the future 5G base stations.
- access control in dementia wards and other controlled areas (e.g. special-needs schools) may utilise current facial recognition equipment to restrict special-need individuals' movements while allowing nursing and teaching staff easy access.

## Issues arising from advancements in technology

Communications Alliance notes that in addition to mitigating the risks of extending hazards from the electrical system to customer cabling, there are broader electrical risks when addressing safety and network integrity.

**Heat rise in cable/cable bundles**

- current deployment of remote power feeding can cause heat rise in cable bundles to such an extent as to make the cabling inoperable. This can make all cables within that bundle inoperable. As an example, failure of a gas detection sensor cable will impact safety. The cable or the cable bundle may require replacement before the associated safety system can become operational again.

**Cable separation**

- telecommunication cabling supporting ES3 and LV Telecommunication circuits are deemed hazardous and need to be separated from other communication cabling to ensure the safety of ordinary people and the network.

**Reverse powering of network equipment**

- back-fed carrier equipment may be affected or damaged by transient voltages. nbn currently utilises reverse powering to power devices at the node, potentially extending hazardous voltage to the node which could affect network equipment and present a hazard for network employees.

**Surge protection for external mounted devices**

- with the growing IoT ecosystem and increasing number of external devices, it is critical that adequate surge protection is present within buildings to help protect equipment supporting safety and minimise the risk of fire and electrical hazards to ordinary people.

**Optical fibre cabling**

- optical fibre cabling requirements for safety within customer premises are not addressed in other safety standards. While the ISO/IEC 11801.x series of Standards do address optical fibre in customers premises, their scope excludes safety. Of specific interest:
    - internationally, Low Smoke Zero Halogen (LSZH) cable manufacturers are looking at developing light armoured cables to meet both LZSH and termite/rodent resistant cable requirements;
    - used in the wrong location, light armoured optical fibre cables can extend hazardous voltages;
    - the use of hybrid cabling which contains both optical fibre for communication and copper for power delivery are now commonplace for long reach camera and WAPs; and
    - safety systems have a high dependency on optical fibre systems in the delivery of their services.
- Optical fibre laser warning labels are currently only mandated for customer cabling by AS/CA S009. Of specific interest:
    - laser classes up to 3B are currently utilised in customer premises;
    - Class 3B lasers may damage eyes and burn skin; and
    - the use of optical MPO/MTP terminations (12 optical fibre cores within one connector) have a higher risk associated with the connector than a connector with one core, i.e. 12 Class 1 lasers in close proximity pose a higher risk than one Class 1 laser.

## Responses to specific questions

The following table provides responses from our members on the specific questions posed in the Consultation Paper.

| **Safety and network integrity risks** | | |
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| 1 | Considering the separate regulatory requirements that exist for electrical cabling, including the mandatory use of ELCBs/RCDs and public information and awareness campaigns conducted by electricity distributors about electrical safety, are the electrical safety risks from customer cabling already effectively mitigated by other regulatory regimes and associated activities? | Communications Alliance does not agree that electrical safety risks from customer cabling can be effectively mitigated by other regulatory regimes. Reliance on risk mitigation being provided by another industry would require careful and considered coordination between the two industries.<br>The following reasons are provided to support why this is risky:<br>• copper and other conductive cables in Carrier networks will persist for some time, the safety of carrier personnel working inside carrier networks, continues to be at risk if untrained persons are permitted to make metallic or conductive connections to the carrier network, at or beyond the network boundary.<br>• customer cabling will still be using copper into the foreseeable future.<br>• connection to fixed networks of wireless devices continues to rely on conductive cabling in a typical residential or small business setting, where cabling is terminated to carrier networks appropriate electrical safety standards continue to be essential to safety.<br>• not all premises are protected by Earth-leakage circuit breakers (ELCBs)<br>• the two regulatory regimes should be coordinated but one should not be reliant on the other<br>• customer cabling is increasingly being used as the means to remotely power devices, such as WAPs and security cameras and a myriad of sensors and actuators used in building automation and management systems and more broadly the deployment of IoT devices. These voltages can be hazardous and appropriate safety requirements need to be in place to mitigate the risks.<br>• Zero-client systems supply power over a comms line to a device, this can be up to 100 W under new regulations<br>• electrical safety for communications cabling is paramount. Reliance on personnel carrying out their responsibilities under another regime would appear to introduce |

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| | | uncertainty for the ACMA to manage its risks under cabling regulations. Customer cabling installers are reliant on the protection afforded to them under the cabling regulatory arrangements.<br>• for example, an installer working in a high voltage area of a factory with long cable runs can be exposed to dangers that need to be mitigated independently of the electrical regulatory arrangements.<br>• the NCD for an nbn FTTC service emanates an AC signal from the lead-in that is picked up by voltage detector pens. The AC signal is displayed the same as a 240VAC power circuit. Telecoms Line Test instruments with an earth reference also show a Hazardous AC condition which needs to be overridden to perform testing on a copper lead-in. It is even more important that customer cabling rules be maintained rules for this situation. Complacency leads to mistakes or even worse.<br>• concealed cabling for wireless system antennas connected to modems is a potential hazard for end users, where not installed by suitably qualified personnel.<br>• network performance and integrity can be compromised by poorly installed fixed cabling, this is critical for DSL networks such as Telstra's ADSL 2+ services and will be more critical for nbn Co FTTN and FTTC services. Reliability of equipment is likely to be significantly impacted by AC power, either induced into circuits due to poor installation practices or inadvertently connected to conductive network cables due to poor separation or insulation of cables.<br>A regime that incorporates robust inspection and auditing and applies penalties where necessary enhances the safety and performance of cabling systems. |
| 2 | Given the availability and increasing use of modern networking technologies that are non-conductive (for example, Wi-Fi and fibre) or addressed through other regulatory regimes (such as broadband-over-powerline), are the harms that could result from Wiring Rule breaches still significant enough to require a regulatory response? | Communications Alliance would argue that the introduction of non-conductive access technologies (fibre/wireless) would not necessarily reduce possible safety risks related to customer cabling from a regulatory perspective.<br>**Premises cabling**<br>Potential harms reduction due to the introduction of non-conductive domestic cabling is unlikely to be significant for some time. Typical domestic services will remain predominantly reliant on at least some conductive cabling for the foreseeable future unless consumers have an incentive to upgrade existing conductive cabling systems which in many cases can support gigabit speeds. Regulation of the installation of conductive telecommunications cabling remains important from a safety perspective. |

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| | | Cable regulations will not affect Wi-Fi or optic fibre performance, however, wiring breaches can be dangerous to both customer equipment and cable installers so a relevant regulatory regime is considered essential.<br>The volume of both copper and fibre cable will need to increase into building to cater for the growth of wireless technologies. Fibre for communications, copper for power and telecommunications.<br>Low speed long-line communications for the IoT is based on copper.<br>Wi-Fi is dependent on cabling to it for both connectivity and power, which can be delivered using proprietary technologies such as Prysmian's Digital Power which could be customer supplied rather than Carrier supplied.<br>**Carrier access networks**<br>Copper and other conductive cables in Carrier networks will persist for some time, the safety of carrier personnel working inside carrier networks, continues to be at risk if untrained persons are permitted to make metallic or conductive connections to the Carrier network, at or beyond the network boundary.<br>FTTC, FTTN & FTTB lead-ins will be around for many years into the future. FTTB will in the very near future be upgraded to G.Fast which is delivered on customer copper cabling. Additionally, a lot of new houses are Ethernet cabled which is a copper solution.<br>**New applications**<br>There are a number of new applications and scenarios to be considered:<br>• cable reach can now be up to 10 km for IoT customer services.<br>• 2 km cables carrying 1000 W may be a consideration in not too distant future.<br>• four-pair cabling specified within ISO/IEC 11801-6 (and AS 11801-6 when published) sets out the generic copper cabling requirements for communication and power to support 2.5, 5 and 10 Gbit/s WAPs.<br>• 5G towers as part of a Carrier's network or smart city, suburb or campus will still require power and communication. Carrier and non-carrier delivery models will require power and communication.<br>• risks associated with both fibre and copper cabling systems, 'Digital power' and hybrid fibre/copper cables will need to be addressed.<br>**One Pair**<br>One pair cabling, IEEE and ISO/IEC JTC1 SC25 have a current project to develop one Pair cabling to 1000 m with ten connectors and delivering power. |

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| | | One pair cabling is seen internationally as the mechanism for delivery of conductivity and power to cheaper IoT devices and work is underway in ISO/IEC JTC1 SC25 WG3 to develop for one pair generic cabling standards for customer premises.<br>**IoT**<br>Wireless deployment for IoT devices is dependent on the device being powered locally. LoRa Alliance devices and other IoT battery powered devices typically have a five-year life cycle. While this allows for rapid deployment of technology from one base station reducing the Capex the long term, Opex is substantially reduced when hard wiring devices. Both fixed and wireless technology have their advantages, both should be considered as viable options dependent on the application.<br>**Electrical hazards**<br>Any copper communication cable has the potential to extend a hazardous voltage:<br>• remote power on copper cabling provides an effective power delivery model for current and emerging technologies.<br>• electrical hazards may arise from surge (lightning) induction and contact.<br>• heat rise caused by current flow within a cable bundle may make the cabling non-operational, effecting the delivery of services in support of safety.<br>Disconnection under load of an energised telecommunication circuit may cause an electrical arc which is a point of ignition and additionally may render the telecommunication outlet non-operational. This may affect safety if this outlet is utilised in support of a safety system.<br>Even more of a concern is the potential for introducing hazardous voltages in hazardous areas, where explosive gas atmosphere or dust/air mixture may be present, e.g. next to gas bottles or gas meters. |
| **Operation of current arrangements** | | |
| 3 | Are the three types of cabling registration (Open, Lift, Restricted) still appropriate? | Communications Alliance observes that the Restricted cabling registration is becoming less relevant, given that nbn 2020 rollout completion of 11.7 million premises Ready to Connect (RTC)[9]. Under the document '*Pathway to cable registration.pdf*' there is a specialist competency for restricted to allow them to work in residential premises. This registration on its own has little value as the original intent for the registration was targeted at legacy |

[9] nbn Corporate Plan 2019-2022

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| | | telephony cabling. In addition to broadband today cabling in homes covers a huge range of areas such as:<br>• Communications<br>• Entertainment<br>• Security<br>• Digital Home Health<br>• Age and Assisted technologies<br>• Appliances<br>• Energy management<br>• Home and Building automation<br>• Electric vehicle charging communications<br>• Solar or other type of generation communications<br>• Battery storage communications<br>Consideration needs to be given to potentially a wider range of cabler registration or broader set of specialist competencies to cover:<br>o Remote Power & IoT<br>o ES3 may be a port of the Hazardous Voltage Communications Training<br>o POE specific training – may need to be handled in AS/CA S008 and AS/CA S009<br>o Customer cabling failure would be a functional safety issue |
| 4 | Are additional types of cabling registration needed? If so, why? | Communications Alliance proposes that the minimum entry should be *Open Registration* and could be renamed a *Residential Cabler Registration,* that would cover all cabling captured by the *Telecommunications Act*.<br>Above that, a commercial registered cabler that also covers structured, fibre, coax, aerial and underground with the skills to test the cabling to ensure the expected performance will be met and can install ES3 services that have been done under an engineered solution.<br>The following three areas for new registrations are suggested, together listing specific issues for each, for consideration:<br>• ES3 issues<br>o ES3 Circuits are deemed hazardous.<br>o installers of ES3 cabling will need to ensure cabling is installed in such a way that does not present danger to ordinary people. |

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| | | ○ working live policies will need to be developed and supported by the standards. This may require the cablers working on ES3 to be dual trade or have more technical electrical endorsement.<br>○ it is recommended that live ES3 special application services be only addressed by skilled persons with an electrical licence and a communication registration.<br>• Remote Power issues<br>○ heat rise of cable bundles exceeding the operational temperature of the cable.<br>○ the determination of heat rise based on product selection, installation conditions, average current for circuits, number of circuits activated, cable length and maximum ambient temperature including local heat source<br>○ currently remote power modelling of ISO/IEC TS 21925 does not support cabling to 100 metres in most cases.<br>▪ The current industry standard for generic cable is 100m<br>○ telecommunication outlet classifications may need to be determined by an installer.<br>▪ the Outlet classification will indicate the supported circuit current for an outlet.<br>▪ the outlets may need to have control mechanism in place so that additional cabling does not affect existing services (Additional cabling increasing heat load).<br>▪ the outlet may be required to be labelled as to the rating of the maximum current supported by the cabling to enable ordinary people to connect devices without adversely affecting a service or services (i.e. RP1, RP2 and RP3 of the draft ISO/IEC 14763.2).<br>▪ 750 mA and > 750 mA+ circuits will also need to be addressed.<br>• IoT issues<br>○ IoT delivers both power and communication to devices.<br>○ One pair cabling to 1000m 20 Mb/s 10 connector IEEE 802.3 requiring new structured cabling systems under development (ISO/IEC SC25 WG3).<br>○ Low cost Sensors.<br>○ High dependency Sensors.<br>○ Digital power (ES2- 1000 Watts - 2,000 metre reach).<br>○ Will support converging and disruptive technologies. |

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| | | ○ IoT cabling will support devices in support of safety, security and service availability. |
| 5 | In light of changes to the environment and consumer and public interest considerations, are there other types of customer cabling activities that can be safely undertaken by any person and able to be included in Schedule 1 of the Telecommunications (Types of Cabling Work) Declaration 2013? | Communication Alliance has not identified cabling activities that could be added to the exceptions listed in the *Telecommunications (Types of Cabling Work) Declaration 2013*.<br>All processes in cabling carries some risk to the cabler, the customer and to the equipment. The most menial task is installing cable runs, however the cabler needs to know the risks and spacing requirements for this task.<br>Regulation protects ordinary and skilled people from hazardous sources and protects network equipment that connected via the access network.<br>With the higher requirement of dependency for devices, cabling regulations provide a benchmark to help ensure that all social economic groups in all geographical locations have access to infrastructure capable of delivering services safely.<br>The following hazards need to be identified ad addressed:<br>• ES3 telecommunication cabling is hazardous.<br>• there are more external devices being connected to customers cabling and as such there is more cabling entering buildings increasing the chance of surges entering the building.<br>• in home cabling can support remote powered devices HDBaseT, PoE, Zero client, age care technology, lighting, access control, WAPs and PZT cameras. When the associated cabling is installed incorrectly, this can cause heat rise in the cable bundle which exceeds manufacturer requirements of the cable and can leave the building without critical services<br>It is recognised that remote powering is now becoming more commonplace and at higher levels, suggesting that further regulation is to be considered. It is noted that 100 W Ethernet was ratified the later part of 2018.<br>It is timely to be reminded that the issue for customer cabling regulation is to address the health and safety of those using and coming into contact with telecommunicators services and infrastructure. In addition to electrical safety, the mitigation of harm dues to water ingress, gases, chemicals, explosive gases and fire propagation are to be taken into account. |

| Cabler skills and training | | |
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| 6 | Are existing training requirements adequate in ensuring cablers are suitably skilled for the current and emerging cabling environment? | Communications Alliance is concerned that the current training arrangements are not suitable due to the lack of practical skills development, courses are too short leading to poor practices and installation standards which over time adversely affect the long-term reliability of the service, impacting on:<br>• access to standard telephone service.<br>• access and performance to the national broadband network or any other superfast telecommunications network.<br>Attached to this submission (see Appendix) is a list of the elements and performance criteria for the Open Registration. It lists the range of content required to be covered by the RTOs, made up of 17 elements and 74 Performance Criteria. It is worth noting, the performance criteria use the words 'Prepare, Identify, develop, notify, install…' which are active requirements. Students must be able to 'install underground cable (and) aerial cable' - it is felt that under the current industry-based course duration this is highly unlikely.<br>In addition, the training is not covering the following:<br>• emerging technologies to support the IOT (new way of cabling low speed long circuits), Remote Powering and ES3 circuits.<br>• heat rise on PoE and the impact on performance. Note that this is standard practice in the electrical training, as this has always been an issue.<br>General issues with the current training practices:<br>• contractors have time constraints leading to compressed training programs.<br>• RTOs are in a very competitive environment and cannot afford to extend training hours.<br>• course material doesn't have to be technically correct<br>• teaching correct test methods.<br>• ASQA does not undertake technical audit of the training material, resources and facilities. |
| 7 | Are additional training requirements necessary to prepare cablers for PoE and other converged (telecommunications/ | Yes, as discussed previously, the current structured cabling course needs to be extended for students to develop competency in testing and certification of the cabling as well as deal with potential derating of a cabling installation when PoE is applied or other engineered solutions as ES3 becomes a reality. |

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| | electrical) cabling technologies that may develop? | It should be noted, that under the electrical regime all apprentices are required to be able to calculate the impact of performance on the cable given different environmental conditions and type of cable based on AS/NZS 3008. Given the development of PoE and the impact on performance and safety, this will be a requirement for cablers. It is noted that cable performance can impact on the ability to make emergency calls. |
| 8 | Are there other new or upcoming technologies that may also require additional specialised training? | The following technologies are provided as examples where specialized training will be required:<br>• wireless connectivity, Wi-Fi or 5G, will require both power and high speed connectivity to support the growing number of wireless devices.<br>• IoT devices used for monitoring and control using IP or related protocols that work at low speed over long distances. The communications link provides both connectivity and power to the devices over kilometres.<br>• Li-Fi, a variant on Wi-Fi, that uses structured cabling to connect to lights that are used for sensing and wireless connectivity.<br>• distributed building services, supported by ISO/IEC 11801-6, now adopted.<br>• CCTV systems using cameras that are power fed from the source with potentially 100W constant power delivery. This will lead to the increased use of customer cabling.<br>• 1-pair cable delivering 20 MHz, 10 connectors and remotely powered. |
| 9 | Are there any other additional skills and training required for cablers that are not already covered in the current mandatory training requirements? | The following additional skills are listed as examples:<br>• heat rise on PoE deployment.<br>• working on ES3 which is hazardous both generic and application specific.<br>• performance testing to ensure the cabling practices do not degrade the performance standards that form part of the equipment and cabling standards as this will impact on the service delivery of the high speed broadband services which the public expect as a ubiquitous service. |
| 10 | Are there any areas where the training requirements mandated through the Cabling Rules are unnecessary or excessive? | Communications Alliance has not identified any areas of excessive or unnecessary training. It is felt that the opposite is the reality, stemming from to the competitive nature of the private RTO sector and the lack of competency in the audits undertake by the Australian Skills Quality Authority (ASQA). Not enough time is allowed for due to the competitive nature of the RTO business and ASQA conducting audits of RTOs by non-technical auditors which relay on a paper trail and cannot tell the difference between a multimeter and a GPON tester. |

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| | | The lack of enforcement has allowed poor practices both at the installer and training ends, allowing non-compliance as an accepted practice. Refer to Public Report Cabling PCA 2016-7 key findings:<br>'> *Sixty-seven per cent of registered cablers who completed the ACMA's online survey reported having observed non-compliant cabling.*<br>> *In contrast, ACMA inspectors observed non-compliant cabling work at 65 of the 178 sites they inspected (35 per cent).'*[10] |
| 11 | Are existing industry-driven arrangements the most effective way to address the ongoing skills requirements of cablers? | Although not entirely clear on the meaning of 'industry-driven arrangements' in the question, Communications Alliance makes the observation that there is an apparent failing in the existing industry arrangements that are currently in place to address the required skills of cablers. It is noted that there is additional skills development by manufacturers to ensure their products are deployed correctly. This is typically targeted by large commercial suppliers and their products and does not cater for the wide extent of obligations under cabling regulations. |
| 12 | In light of continuing developments in technology and changing business requirements, should there be ongoing training and development requirements for cablers? | Communications Alliance firmly agrees that ongoing professional development is critical, as technology is advancing at a rapid rate. This goes beyond just maintaining existing cabling skills and concerns the ongoing development of the new skills to cater for the latest technological developments. The telecommunications industry underpins the economic development of the nation and cabling underpins the delivery of the technology, so cablers need to keep abreast of developments within their industry, for example by attending update briefings for new techniques and developments in customer equipment. |
| 13 | If ongoing skills training and development were to be implemented, what mechanisms could be used to facilitate this requirement? | An example of a suggested model is the *Continuous professional development* model, employed by the Clean Energy Council.[11] |

[10] ACMA 'Priority compliance area 2016–17—Customer cabling - Final report'. December 2017. Page 5
[11] Clean Energy Council, Accredited Installer. Continuous professional development. http://www.solaraccreditation.com.au/installers/continuous-professional-development.html.

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| **International perspectives** | | |
| 14 | Given the minimalist approach taken by overseas regulators to regulation of customer cabling, do the Australian requirements impose unreasonable or unnecessary costs on industry and consumers? | Communications Alliance would caution arguing change for Australian cabling regulation based on a view that cabling regulations under overseas national regimes are minimalist without undertaking further in-depth studies in this developing sector, particularly in light of developments discussed in the response to earlier questions in this submission.<br>For example, changes within the following regimes are highlighted:<br>• the European Fire Rating of cabling is becoming more regulated.<br>• Europe is considering an 'AS/CA S008/S009' approach to cabling.<br>• the United States has the National Construction Code (NEC)[12] for electrical regulation, which is called on by all States and local legislation. It has a specific section dedicated to the telecommunications cabling. The cabling is inspected for compliance by the local authority which can be the building inspector, electrical inspector or a fire marshal. Bearing in mind the NEC is in fact published by the National Fire Protection Association. Further the NEC states in article 800.24 'Mechanical Execution of Work. Communications circuits and equipment shall be installed in a neat and workmanlike manner.' In addition to this, the NEC is designed to protect life, property and the mission of the building. |
| 15 | Given that regulators in other comparable countries do not apply registration requirements for customer cablers, does Australia need to continue to register cablers to undertake telecommunications customer cabling work? | Again, Communications Alliance would caution arguing change for Australian cabling regulation based on regimes that do not have registration requirements. The awareness of examples of poor and potentially dangerous cabling performed by untrained cablers would suggest that a robust regulatory regime supported by proper training is a necessity. |
| **New technologies and changing environment** | | |
| 16 | Given the changes in both the telecommunications environment and the electricity industry, are the safety risks associated with | The Consultation Paper argues that the ACMA's customer cabling arrangements apply to PoE but only for the telecommunications aspects, because the electrical power aspects of PoE are outside the scope of the ACMA's regulatory arrangements, which are limited by |

[12] NFPA 70 National Electrical Code 2017

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| | reticulation of telecommunications services within customer premises still best addressed by the Cabling Rules? | section 51(v) of the Australian Constitution to communications (rather than electrical safety) matters.'<br>***Part V – Powers of the Parliament (Excerpt from Commonwealth of Australia Constitution Act)***<br>***51. Legislative powers of the Parliament***<br>*The Parliament shall, subject to this Constitution, have power to make laws for the peace, order, and good government of the Commonwealth with respect to:*<br>*(i) trade and commerce with other countries, and among the States;*<br>*(ii) taxation; but so as not to discriminate between States or parts of States;*<br>*(iii) bounties on the production or export of goods, but so that such bounties shall be uniform throughout the Commonwealth;*<br>*(iv) borrowing money on the public credit of the Commonwealth;*<br>*(v) postal, telegraphic, telephonic, and other like services;*<br>The Federal Government has power over telegraphic, telephonic and other like services such as broadband etc., so the question arises - what is telecommunications?<br>Telecommunication services today requires power distributed specifically for the purposes of those services. The distinction between electrical and comms distribution blurs with the advent of devices that will use distributed or remote powering, examples being communications devices that also provide advertising or lightning, e.g. a lit advertising sign with a built-in WAP or a LiFi light. Cabling may be used for either only comms or only powering initially and then the other being introduced at a later stage. Although regulations may be crafted to define the use at the time of the installation of the cabling, this does not alter the fact that there are fundamental health and safety concerns dependant of the use of the cabling over its lifetime.<br>This is a complex issue, flowing on from the historical fact that the current electrical and communications legislation and subsequent regulations were drafted at a time when comms and electricity distribution could be defined as two discrete services.<br>One approach is to consider what service is being cabled for at the time of installation:<br>1) if communications (including EWIS), then it would fall under comms regulations<br>2) if to supply energy to a device to make it function, e.g. remote lighting, powering of any remote device, then it falls under electrical regulations<br>This does not allow for devices requiring comms and power, such as a CCTV camera, which then arguably it falls under both comms and electrical regulation. This also does not |

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| | | take into account, for example, the introduction of a comms service over a cable that was initially to a powered-only device.<br>So the question is posed, when does a communications signal that inherently carries electrical energy start to be considered as power transmission - it there to be an arbitrary cut off limit that determines what regulations apply? Such an approach where regulations would be based on variable electrical parameters is potentially subject to abuse and inherently risky. |
| 17 | Given the changes in both the telecommunications environment and the electricity industry, are the network integrity risks associated with reticulation of telecommunications services within the customer's premises still best addressed by the Cabling Rules? | Network integrity is underpinned by the cabling that will allow the network to deliver the service over an extended period of time and in any likely environment. Communications services running over customer cabling are susceptible to both the physical environment (e.g. moisture and weather effects) and electromagnetic environment (e.g. signal interference) that they operate in.<br>As access networks will continue to use copper twisted pair, optical fibre and HFC for the foreseeable future, Communications Alliance has not identified any reason to change how cabling regulations address network integrity obligations.<br>Section 376 of the *Telecommunications Act 1997* provides the ACMA with the power to make technical standard for customer equipment and cabling. The standard for customer equipment and cabling must lead to the provision of network integrity, safety, access to emergency calls and interoperability. The link between the Carrier network, be it the national broadband network or any other super-fast network, is the cabling. This cabling can impact on achieving the above requirements if at the time of installation it does not comply with standard and best practices. The impact may not be imminent but caused over time due to deterioration or due to the maintenance of the cabling plant or associated utilities which impact on the cabling due to poor installation practices. |
| 18 | Are there other mechanisms (including self-regulatory mechanisms) that could be used to better address any continuing or residual risks? | There is a concern that in the current competitive environment, a weakening of existing cabling regulation may lead to an adverse outcome of a 'a race to the bottom', driven primarily by financial considerations that will adversely impact health and safety and failure of services to be delivered. Due to the nature and complexity of the service being provided, the consumer will often not be in a position to adequately verify the quality the cabling installation.<br>As a good example, the success of the migration from analogue to digital TV was due to the investment in skills development and an accreditation program driven by the Government. Whilst this was not regulation per se, it was due to Government intervention over a period when the migration was being implemented. |

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| 19 | What are the implications of convergence for regulation of telecommunications customer cabling such as PoE and broadband-over-powerline? | As discussed previously in this submission, the electrical/comms demarcation line for certain aspects of customer cabling is becoming increasingly grey for the communications and electrical regulators to identify. As both industries evolve, these issues will only become more difficult to resolve as the electrical and communications services continue to converge and overlap.<br>Nationally, the ACMA needs to continue its close ties with the State electrical regulators and ERAC, and internationally, it is suggested that the ACMA monitor international developments within other regulatory regimes.<br>With respect to the example of Broadband over Powerline, it may not be useful to compare this to the advent of power distribution over comms cabling technologies (such as PoE). Broadband over Powerline has had marginal commercial success and will not likely have the need for the same regulatory attention as will the power distribution over comms cabling technologies. |
| 20 | In addition to PoE and broadband-over-powerline, are there other new or emerging converged technologies relevant to customer cabling? | The distribution of power over communications cabling to devices is a rapidly evolving market and much of the development is commercial-in-confidence.<br>Manufacturers are developing a means to distribute power (in kilowatts over kilometres) over communications cabling as a digital signal that is not hazardous.<br>Lighting systems are being developed with built in sensors, such as movement sensors. These systems are using SELV or ELV, powered by PoE and use LiFi technology. |
| 21 | Are there new requirements that need to be addressed such as additional cabler skills? What is the best way to respond to these requirements? | AS PoE, remote power feeding and IoT technologies explode, it is critical that the cabler can not only install the cabling but ensure the installation meets the performance requirements. Given there are standards for equipment and cabling hardware, we need to ensure the cabling practices do not undermine these standards. |
| 22 | Are there any other issues relevant to telecommunications customer cabling that the ACMA should consider? | Cabling underpins the communications systems by providing power and communications signals. Any cabling system must therefore be installed to ensure full compliance with safety and performance standards. |
| **Reform model** | | |
| 23 | Is it necessary to regulate qualification and training requirements of cablers? | Communications Alliance notes that cabling can be the weakest link in the supply of a telecommunications service when not installed correctly as it leads to unpredictable and intermittent faults which impact on productivity. |

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| 24 | Are there any impediments to using the AQF to establish qualification and training requirements for cablers? | AQF is the Australian Quality Framework, not a training course that will in fact deliver tangible outcomes. Secondly, ASQA who is the Authority does not use auditors that have technical knowledge. The quality of training cannot be verified based on a paper trail. Graduates that can perform the basics required by the training received need to be assessed.<br>It should be noted that in the case of RTO applying to deliver training for electricians are in fact subject to an ASQA audit and in many states accompanied by the office of electrical safety or equivalent. |
| 25 | Is the development and registration of an industry code or codes necessary to minimise potential harms that can arise from customer cabling work? | Communications Alliance does not believe that superseding the existing requirements of the *Telecommunications Cabling Provider Rules 2014* with a new industry code developed by industry registered by the ACMA is necessary. |
| 26 | Are there any impediments to the development of an industry code or codes that would apply to customer cabling work, including the qualification and registration of cablers? | See response to Q25. |

# Appendix – Elements and performance criteria for the Open Registration

The table below provides the Elements and Performance criteria required to be covered by the RTO. In addition, there is are pre-requisite which are electrical principles and work health and safety and in addition specific knowledge.

For full details go to:

Restricted registration - https://training.gov.au/Training/Details/ICTCBL236
Open Registration - https://training.gov.au/Training/Details/ICTCBL237

| Elements | Performance Criteria |
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| 1. Plan for restricted cabling work | 1.1 Prepare for restricted cabling work within the ACMA regulatory environment, cabling environment, cable type, cable identification, termination systems, earthing and protection, records and according to requirements of relevant legislation, codes, regulations and standards |
| | 1.2 Identify building infrastructure which places critical constraints on cabling |
| | 1.3 Develop strategies to manage other infrastructure in relation to cabling |
| | 1.4 Notify appropriate personnel of safety hazards at the cabling work site |
| 2. Manage remote power feed | 2.1 Identify and avoid the risks posed by contact with remote power feeding services when performing cabling activity |
| | 2.2 Make site safe by identifying remote power feeding services which operate at above telecommunications network voltage (TNV) inside customer premises |
| 3. Install cables and protective earth wires | 3.1 Install cables according to manufacturer's application specifications, including tension and bending stress requirements |
| | 3.2 Identify and avoid sources of possible damage to cable, including hot pipes, sharp edges and cable burn |
| | 3.3 Allow sufficient excess at cable ends to facilitate termination |
| | 3.4 Place and secure cable to maintain safety and interference segregation according to legislative and industry standards |
| | 3.5 Install cable fasteners with correct tension to prevent cable sheath damage or transmission impairment and trimmed flush to prevent risk of personal damage |

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| | 3.6 Install underground cables to minimum depth of cover and segregation from hazardous electrical and other services according to current Australian Standards |
| | 3.7 Install underground cables excluding blown fibre tube systems to incorporate a blocking agent within the cable to prevent the ingress of water |
| | 3.8 Install aerial cables to minimum clearance, segregation from hazardous electrical and other services and minimum height requirements according to current Australian Standards |
| | 3.9 Install over-voltage protection devices according to Australian Standards to all cable pairs, where required, to suppress voltage surges and protect from earth potential rise (EPR) hazards and protectively earth the devices |
| | 3.10 Protect earth wire insulation against damage and segregate protective earths according to relevant legislative and industry standards |
| 4. Terminate and test cables and earth wires | 4.1 Remove cable sheath to allow for correct termination length and without damage to underlying conductors and their insulation |
| | 4.2 Install Network Termination Device (NTD) modules according to manufacturer's specifications and cable pairs neatly and sequentially fanned for termination |
| | 4.3 Terminate conductors according to recommended colour code sequence using appropriate termination tools in the manufacturer's specified manner |
| | 4.4 Earth cable shield, if applicable, to manufacturer's specifications, relevant industry codes of practice and Australian Standards |
| | 4.5 Conduct visual inspection to confirm termination colour code sequence has been followed prior to end-to-end testing of wire and pair termination integrity |
| | 4.6 Terminate earth wire according to industry accepted codes of practice and Australian Standards |
| | 4.7 Ensure earth wire continuity throughout and observe interface requirements with electrical systems |
| | 4.8 Test earthing installation for continuity, insulation resistance and conductive resistance according to accepted industry standards and Australian Standards |
| | 4.9 Confirm compatibility of alterations with existing systems and test new work both in isolation and when integrated with existing systems |
| 5. Inspect cable route to ensure correct separations | 5.1 Inspect separations along the entirety of the cable route and rectify separations which do not comply with regulations |
| | 5.2 Install barriers to achieve separations where sufficient spatial separation cannot be met |

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| 6. Create records | 6.1 Provide the client with a job sign-off, telecommunications cabling advice form, at the completion of each cabling task |
| | 6.2 Complete NTD record cards for the work undertaken |
| 7. Monitor work activity | 7.1 Supervise cablers not holding appropriate registration for the task to ensure cabling activity is according to legislative requirements for safety and network integrity including the relevant Australian Standards |

| **Elements** | **Performance Criteria** |
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| 1. Plan open cabling work | 1.1 Prepare for open cabling work according to the ACMA regulatory environment, cabling environment, cable type, cable identification, termination systems, earthing and protection, records and relevant legislation, codes, regulations and standards |
| | 1.2 Identify building infrastructure which places critical constraints on cabling |
| | 1.3 Develop strategies to manage other infrastructure in relation to cabling |
| | 1.4 Notify appropriate personnel of identified safety hazards at cabling worksite |
| 2. Manage remote power feed | 2.1 Identify and avoid the risks posed by contact with remote power feeding services when performing cabling activity |
| | 2.2 Make site safe identifying remote power feeding services which operate at above telecommunications network voltage (TNV) inside customer premises |
| 3. Install and modify cable support, earthing and termination infrastructure | 3.1 Install fixings and cable support structures of adequate strength, safely and aligned with the environment according to manufacturer's and customer's specifications |
| | 3.2 Secure catenary supports to building structure and tension, where necessary, to ensure cable weight can be carried in operating conditions with interference and safety segregation maintained including adherence to current Australian Standards |
| | 3.3 Install protective earthing of metal work to industry standards where required |
| | 3.4 Inspect installed support structure to ensure cable will not be exposed to damage during installation and general operation |
| | 3.5 Position terminating equipment and fixing to accepted industry codes of practice, standards and customer requirements |
| | 3.6 Inspect back-mount and outlet layout for compliance to manufacturer's specifications and allow adequate work space for ease of access and avoid overlaying |

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| | 3.7 Segregate incoming and outgoing cables for ease of access and avoid overlaying |
| 4. Install cables and earth wires | 4.1 Install cables according to manufacturer's application specifications, including tension and bending stress requirements |
| | 4.2 Identify and avoid sources of possible damage to cable, including hot pipes, sharp edges, cable burn, kinks, crushing or stretching |
| | 4.3 Allow sufficient excess at cable ends to facilitate termination |
| | 4.4 Label telecommunication outlet ends of cable uniquely to match identifier at originating location |
| | 4.5 Place and secure cable to maintain safety and interference segregation according to legislative and industry standards |
| | 4.6 Install cable fasteners with correct tension to prevent cable sheath damage or transmission impairment and trimmed or fitted flush to prevent risk of personal damage |
| | 4.7 Install aerial cables supported by catenaries in external environment to meet minimum above ground clearances and clearances from hazardous electrical services according to current Australian Standards |
| | 4.8 Install underground cables to minimum depth of cover and segregation from hazardous electrical and other services according to current Australian Standards |
| | 4.9 Install cables underground (excluding blown fibre tube systems) to incorporate a blocking agent within the cable to prevent the ingress of water |
| | 4.10 Install over-voltage protection devices to all cable pairs, where required, according to current Australian Standards, to suppress voltage surges with the devices protectively earthed |
| | 4.11 Conduct a visual inspection to verify telecommunications reference conductor (TRC)/ communications earthing system (CES)/ earth wire insulation is protected against damage and TRC/CES/ protective earths segregated according to relevant industry and legislative standards and current Australian Standards |
| 5. Terminate and test cables and earth wires | 5.1 Remove cable sheath to allow for correct termination length and without damage to underlying conductors and their insulation |
| | 5.2 Install terminating modules to different telecommunications cables according to manufacturer's specifications and cable pairs neatly and sequentially fanned for termination |
| | 5.3 Terminate conductors according to recommended colour code sequence using appropriate termination tools in the manufacturer's specified manner |
| | 5.4 Earth cable shield, if applicable, to manufacturer's specifications, relevant industry codes of practice and current Australian Standards |

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| | 5.5 Conduct visual inspection to confirm termination colour code sequence has been followed prior to end-to-end testing of wire and pair termination integrity |
| | 5.6 Terminate earth wires with connectors recommended by manufacturers according to accepted industry codes of practice and current Australian Standards |
| | 5.7 Ensure earth wire continuity throughout and observe interface requirements with electrical systems |
| | 5.8 Test earthing installation for continuity, insulation resistance and conductive resistance according to accepted industry standards including current Australian Standards |
| | 5.9 Confirm compatibility of alterations with existing systems and test new work both in isolation and when integrated with existing systems |
| | 5.10 Test installed cable continuity after termination |
| 6. Inspect cable route to ensure correct separations | 6.1 Inspect separations along the entirety of the cable route and rectify separations which do not comply with regulations |
| | 6.2 Install barriers to achieve separations where sufficient spatial separation cannot be met |
| 7. Evaluate earthing needs for cable systems on customer premises | 7.1 Locate existing earthing systems in customer premises and analyse the earthing needs of cable products |
| | 7.2 Calculate the upper and lower limits of resistance for a variety of cable system earths using relevant cable characteristics |
| 8. Label earthing systems | 8.1 Identify label requirements for telecommunications earthing systems |
| | 8.2 Attach label to earthing systems according to industry regulations |
| 9. Create or update cable plans and records | 9.1 Document installation details on record sheets and plans and store according to customer requirements |
| | 9.2 Label cable pairs clearly to provide an accurate identification according to manufacturer's, industry and client standards |
| | 9.3 Record cabling details in cable pair record books to provide an accurate record according to industry codes of practice and current Australian Standards |
| | 9.4 Complete telecommunications cabling advice (TCA) forms |
| 10. Monitor work activity | 10.1 Supervise cablers not holding appropriate registration for the task to ensure installation and maintenance activity comply with legislative requirements and industry standards for safety and network integrity including current Australian Standards |

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